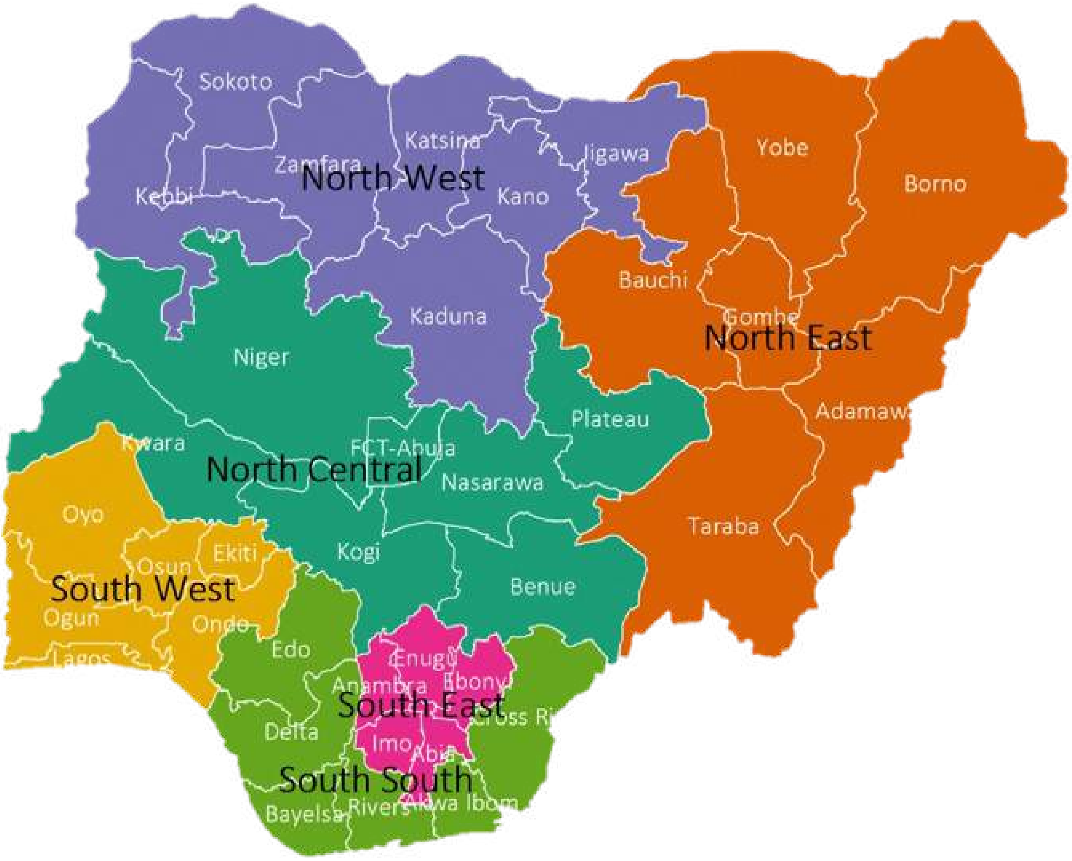
The Federal Republic of Nigeria

National Food Consumption and Micronutrient Survey 2021

Final Report

January 2024



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Published by the Federal Government of Nigeria through the Federal Ministry of Health and Social Welfare, Federal Ministry of Agriculture and Food Security, and Federal Ministry of Budget and Economic Planning in collaboration with the International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria.

ISBN 978-978-131-414-8

Recommended citation: Federal Government of Nigeria (FGoN) and the International Institute of Tropical Agriculture (IITA). 2024. National Food Consumption and Micronutrient Survey 2021. Final Report. Abuja and Ibadan, Nigeria: FGoN and IITA. 550 pp.

Printed in Nigeria.

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The 2021 National Food Consumption and Micronutrient Survey is a project of the FGoN and the implementation was led by the International Institute of Tropical Agriculture (IITA), in collaboration with the following organizations:

Federal Ministry of Health and Social Welfare (FMOHSW)
Federal Ministry of Agriculture and Food Security (FMAFS)
Federal Ministry of Budget, and Economic Planning (FMBEP)
National Population Commission, Nigeria (NPC)
National Bureau of Statistics, Nigeria (NBS)
United Nations Children's Fund (UNICEF)
Tufts University- International Dietary Data Expansion Project (INDDEX)
FHI 360-*Intake* Center for Dietary Assessment
Oxford Policy Management (OPM)
Food and Agriculture Organization of the United Nations (FAO)
University of Ibadan
University of Calabar
University of Wisconsin-Madison, USA
Cornell University, USA
Bill & Melinda Gates Foundation
World Bank Group

Donor Support and Disclaimer
This project was supported by the Federal Ministry of Health and Social Welfare through the World Bank supported Nutrition Division ANRIN Project under the cooperative agreement # NG-ND, FMOHSW-127145-CS- CDS/01, and the Gates Foundation, United Nations Children's Fund, and Foreign, Commonwealth & Development Office under the cooperative agreement # NIWPCA2020240/PD2020200, United States Agency for International Development, Nutrition International under the cooperative agreement # 10-2097-INTINS-01, and Federal Ministry of Agriculture and Food Security. The findings and conclusions of this report are those of the authors and do not necessarily represent the official position of the funding agencies.

Contact Information
Information about the NFCMS 2021 may be obtained from the headquarters of the Federal Ministries of Health and Social Welfare and Agriculture and Food Security, Nutrition Divisions, Abuja, Nigeria.

Additional information about the NFCMS 2021 may be obtained from the International Institute of Tropical Agriculture, Oyo Road, Ibadan, Nigeria (telephone: +234-803-4035281; fax: +44-208-7113786; email: iita@cgiar.org; internet: www.iita.org)

Acronyms and Abbreviations

ANC	Antenatal Care
ASF	Animal Source Foods
CAPI	Computer-Assisted Personal Interviews
CI	Confidence Interval
CM	Community Mobilizers
DHS	Demographic and Health Survey
EAs	Enumeration Areas
FAO	Food and Agriculture Organization of the United Nations
FCDB	Food Composition Database
FCDO	Foreign, Commonwealth & Development Office
FCT	Federal Capital Territory
FGN	Federal Government of Nigeria
FIES	Food Insecurity Experience Scale
FMAFS	Federal Ministry of Agriculture and Food Security
FMB&EP	Federal Ministry of Budget, and Economic Planning
FMOHSW	Federal Ministry of Health and Social Welfare
FRIL	Food, Recipe, And Ingredient Listing
GAIN	Global Alliance for Improved Nutrition
GLP	Good Laboratory Practice
Hb	Hemoglobin
HH	Household
HIV	Human Immunodeficiency Virus
HPLC	High-performance Liquid Chromatography
IFA	Iron folic acid
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IMCI	Integrated Management of Childhood Illness
INDDEX	International Dietary Data Expansion Project
IYCF	Infant and Young Child Feeding
LGAs	Local Government Areas
LSMS	Living Standards Measurement Survey
MNCHW	Maternal Neonatal and Child Health Weeks
MNDC	National Micronutrient Deficiency Control
MOS	Measure of Size
MRDR	Modified Relative Dose Response
NBS	National Bureau of Statistics
NC	North Central
NCD	Non-Communicable Diseases
NDHS	Nigeria Demographic and Health Survey
NE	North East
NFCMS	National Food Consumption and Micronutrient Survey
NFPN	National Policy on Food and Nutrition
NHREC	National Health Research Ethics Committee of Nigeria
NPC	National Population Commission
NPHCDA	National Primary Health Care Development Agency
NW	North West
OFSP	Orange Flesh Sweet Potato
OPM	Oxford Policy Management

ORS	Oral Rehydration Salt
PPS	Probability Proportional to Size
PSEM-CF	Portion size estimation methods conversion factors
PSEMs	Portion size estimation methods
PSUs	Primary Sampling Units
RDT	Rapid Diagnostic Test Kit
SC	Steering Committee
SCD	Sickle Cell Disease
SE	South East
SES	Socioeconomic Status
SMAFS	State Ministry of Agriculture and Food Security
SPHCDA	State Primary Health Care Development Agency
SS	South South
SW	South West
TAC	Technical Advisory Committee
ToT	Training of Trainers
UNICEF	United Nations Children's Fund
USA	United States of America
USAID	United States Agency for International Development
VA	Vitamin A
VAD	Vitamin A deficiency
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WRA	Women of Reproductive Age

Foreword

Malnutrition has been identified as one of the greatest obstacles to development. The proportion of individuals and households that are both malnourished and food insecure has increased in Nigeria, with children, women, adolescent girls, and the elderly being the most affected.

The Federal Government of Nigeria, in collaboration with other stakeholders, has implemented the National Food Consumption and Micronutrient Survey (NFCMS) as one of the key steps in addressing malnutrition and its consequences and ensuring the availability of highly reliable data for decision making.

The lack of data on food consumption and nutrition poses a major challenge in answering questions that policymakers need to address in the fight against malnutrition, micronutrient deficiencies, overweight and obesity, and diet-related chronic non-communicable diseases (DR-NCDs) and in improving food systems to provide healthy diets to the population. Some data are available from a variety of sources to help identify dietary trends among adults, infants, young children, women, and households affected by poverty. However, the picture is fragmented and incomplete, making it difficult for policymakers to make an informed decision to tackle malnutrition in the country.

The National Food Consumption and Micronutrient Survey (2021), the third nationally representative survey of its kind in Nigeria, was conducted to assess the micronutrient status and dietary intake of women of reproductive age (15-49 years), including pregnant and lactating women and children aged 6-59 months. The study also examined the micronutrient status of non-pregnant adolescent girls aged 10–14 years and identified key factors associated with poor nutrition in these populations. The information obtained will provide a basis for formulating evidence-based policies and programmes and monitoring progress in the future. The results of the survey will enhance the outcomes of the National Multisectoral Plan of Action for Food and Nutrition (NMPFAN 2021 - 2025) as well as the priority actions identified in the Nigeria Food Systems Transformation Pathways. Both are in line with the policy direction of the current administration as enshrined in the National Development Plan (2021–2025) and the Nigeria Agenda (2050).

A highly consultative process was used in conducting the study. All stakeholders in the food and nutrition sector, including representatives of government, the organised private sector, civil society organisations, academia, local non-governmental organisations, development partners, and international donor agencies were involved in its implementation. This report presents the findings of the NFCMS 2021 and includes the socioeconomic and demographic characteristics of the sample households, dietary questionnaire, 24-hour dietary recall, anthropometrics, biomarker questionnaires, food sample analysis, and biomarker indices analysed in the country and internationally.

Nebeolisa Anako
Permanent Secretary, Federal Ministry of Budget and Economic Planning

Preface

Nigeria is experiencing rapid urbanization with a fast-growing population. Nigeria continues to struggle with high rates of chronic malnutrition, micronutrient deficiencies, overweight and obesity and associated diet-related non-communicable diseases (also known as the triple burden of malnutrition). The number of diet-related non-communicable diseases (NCDs) and the prevalence of overweight and obesity and type 2 diabetes in adults is increasing significantly. The Global Panel estimates that the number of people with type 2 diabetes in the country will double by 2030. The complexity of food systems (e.g., due to urbanization) means that any attempt to improve the multiple burden of malnutrition requires a systemic approach to identify risk factors and develop evidence-based strategies and interventions that consider spatial and socio-cultural aspects.

Defining and understanding the scope and scale of food and nutrition problems and their causes requires high-quality, up-to-date and complete data. In addition, reliable data are needed to examine the use and targeting of resources and to determine the impact and cost-effectiveness of intervention programmes. Nutrition data can be used to strengthen social accountability and are necessary to assess progress towards national and global nutrition goals. The lack of up-to-date food consumption and micronutrient data from a representative sample remains a major obstacle to understanding nutrient and dietary gaps in Nigeria. The 2021 National Food Consumption and Micronutrient Survey (NFCMS) is the third nationally representative survey of its kind in Nigeria, following the 1968 and 2001 surveys, and provides up-to-date information on micronutrient status, anthropometrics and dietary intake indicators.

The NFCMS 2021 is a cross-sectional population-based survey with the sample stratified by geopolitical zones. Sampling within each zone was based on a two-stage random selection strategy, with enumeration areas (EAs) serving as sampling units in the first stage. A total of 390 EAs were selected with probability proportional to size (PPS) using systematic sampling. In the second phase, a complete listing of households was conducted in each of the 390 selected EAs, followed by a listing of all eligible respondents per target group in each selected EA. The target groups were women of reproductive age (WRA) aged 15-49 years, children (aged 6-59 months), pregnant women and non-pregnant adolescent girls (aged 10-14 years). A representative sample of 14,820 respondents was selected for the survey. The NFCMS 2021 collected information on type and amount of food consumed in the last 24 hours, height/length, weight, age and biological samples, specifically blood, urine and stool, and analysed them locally and internationally for haemoglobin genotype, HbA1c, iron and inflammation status, vitamin A, folic acid, zinc, iodine, vitamin B1, vitamin B2, vitamin B12, malaria, H. pylori, haemoglobin, plasma glucose and helminths. The report includes not only national estimates, but also estimates of key indicators for rural and urban areas and for the country’s six geopolitical zones.

The NFCMS 2021 is unique in several respects. For the first time, the survey was conducted using computer-assisted personal interviewing (CAPI), which enables data to be provided more quickly than in previous surveys. The survey instruments and design used can serve as a model for the application’s use in food consumption surveys in other African countries, particularly the INDDEX24 mobile application used to collect data on food intake. Nigeria is the first country to use this innovative tool to assess dietary intake in a large-scale survey. Some of the dietary data of interest include the use of fortified foods to assess the impact of large-scale fortification programmes, as well as the consumption of biofortified crops used to measure the impact of these programmes.

Various databases have also been created (food, recipe and ingredient list database; conversion factor database; recipe and yield factor database). This is an important resource for Nigeria in food intake assessment, especially when using the novel mobile application INDDEX24. The Nigerian Food Composition Database, which documents all commonly consumed foods and beverages with their nutritional values, has also been revised after 26 years. It should serve as a reference and also be adopted by other African countries, particularly in West Africa. The national food composition table/database is a resource that every country needs to assess dietary intake for strategic interventions.

The International Institute of Tropical Agriculture (IITA) is a non-profit organisation that generates agricultural innovations to address Africa's most pressing challenges such as hunger, malnutrition, poverty, and natural resource degradation. Working with diverse partners in sub-Saharan Africa, IITA improves livelihoods, increases food and nutrition security, boosts employment, and preserves the integrity of natural resources. IITA is a member of CGIAR, a global agricultural research partnership for a food secure future. We believe that with this data and knowledge, Nigeria will be in a better position to improve the nutritional status of its people, especially women and children.

The quality, scope, and diversity of the data collected through the NFCMNS will set Nigeria apart on the African continent and globally, as it will drive a global discussion on how to invest in agriculture, nutrition, and food systems to ensure a future where all children are provided with the quality food they need to thrive, not just survive. And it's not just talk. Dialogue between like-minded investors will lead to action, and action will bring results and impact.

Dr Simeon Ehui
Director General, International Institute of Tropical Agriculture

Acknowledgments

The Federal Ministry of Health and Social Welfare (FMoHSW) and the Federal Ministry of Agriculture and Food Security (FMAFS) on behalf of the Federal Government of Nigeria, wishes to thank the Federal Ministry of Budget and Economic Planning (FMBEP), other Ministries, Departments, Agencies and Organizations that contributed immensely to the success of the survey conducted from January to September 2021.

The FMoHSW and FMAFS acknowledges the contributions of the lead implementing agency, the International Institute of Tropical Agriculture (IITA), which oversaw the technical and implementing aspect of the survey, under the lead investigator (Dr. Bussie Maziya Dixon), the biomarker lead (Dr. Mercy Lung'aho), the dietary intake lead (Dr. Tolu Eyinla), database manager (Mr. Samuel Ofodile) and consultant statisticians (Dr. Isiaka Olarewaju) and (Dr. Kolapo Usman), the co-investigators Prof. Rasaki Sanusi of University of Ibadan and Prof. Henrietta Ene-Obong of University of Calabar. The FMoHSW and FMAFS also commend Dr. Jonathan Gorstein of Bill & Melinda Gates Foundation (BMGF) and Dr. Adeyinka Onabolu of Global Alliance for Improved Nutrition (GAIN) for their valuable contributions.

Special appreciation goes to the following for their financial and technical support: FMAFS, the World Bank, through FMOHSW Nutrition Department Accelerated Nutrition Result in Nigeria (ANRIN) project, the BMGF, United Nations Children's Fund (UNICEF), GAIN, Foreign Commonwealth & Development Office (FCDO), United States Agency for International Development (USAID) and Nutrition International (NI).

Worthy of note is the immense technical contributions and support from UNICEF as the financial custodian of the survey, and World Health Organization (WHO) for their support in shipping and clearing of samples to China. USAID and BMGF for providing support for the independent verification of data sets.

The FMoHSW and FMAFS also appreciates the technical advisors for the survey namely, Centre for Disease Control (CDC) Atlanta, (USA), who provided technical support in the design and planning of the survey until December 2020, FHI 360 Solutions-Intake Center for Dietary Assessment, Tufts University, Cornell University, University of Wisconsin, Food and Agricultural Organization (FAO) of the United Nation, National Bureau of Statistics (NBS), National Population Commission (NPC), Oxford Policy Management (OPM), the zonal coordinators, assistant zonal coordinators, supervisors, interviewers and the respondents.

Special appreciation goes to the Honourable Minister of Budget and Economic Planning Sen Abubakar Atiku Bagudu. Similarly, we appreciate the Permanent Secretaries of FMOHSW (Daju Kachollom S. mni), FMAFS (Temitope Fashedemi, fnim) and FMBEP (Nebeolisa Anako) as well as the indefatigable effort of the team, Director and Head of Nutrition Department (Mrs. Ladidi K. Bako-Aiyegbusi, mni), Director and Head Youth and Social Development (Dr. Faniran Sanjo), Director and Head Nutrition and Food Safety (Mrs. Sugra Mahmood), Director and Head Department of Health Planning Research Statistics (Dr. Christopher Isokpunwu), Director and Head Family Health Department (Dr. Binyerem Ukaire) and Deputy Director (Mrs. Nelson Chito), towards the successful implementation of the survey.

Mohammed Ali Pate, CON
Coordinating Minister for Health
and Social Welfare

Senator Abubakar Kyari, CON
Honourable Minister of Agriculture
and Food Security

Members of the NFCMS Steering Committee (SC)

S/N	Institution	Name
1	Federal Ministry of Budget, and Economic Planning	Dr. Sanjo Faniran
2	Federal Ministry of Budget, and Economic Planning	Mrs. Nelson Chito
3	Federal Ministry of Health and Social Welfare	Dr. Salma Anas Kolo
4	Federal Ministry of Health and Social Welfare	Dr. Boladale Alonge
5	Federal Ministry of Health and Social Welfare	Dr. Binyerem Ukaire
6	Federal Ministry of Health and Social Wefare	Mrs. Ladidi K. Bako-Aiyegbusi, mni
7	Federal Ministry of Agriculture and Food Security	Mrs. Sugra Mahmood
8	Federal Ministry of Agriculture and Food Security	Dr. Rasaq Oyeleke
9	International Institute of Tropical Agriculture	Dr. Isiaka Olarewaju
10	National Bureau of Statistics	Mr. Imeh Udoabah
11	International Institute of Tropical Agriculture	Mr. Kolapo Usman
12	National Population Commission	Mrs. Titilayo Tawa
13	Bill & Melinda Gates Foundation	Dr. Caroline Jehu-Appiah
14	Bill & Melinda Gates Foundation	Dr. Jonathan Gorstein
15	Dangote Foundation	Dr. Francis Aminu
16	European Union	Dr. Anthony Ayeke
17	World Bank	Dr. Ritgak Asabe Sarah Dimka
18	World Bank	Mr. Eubert Rufurunesu Vushoma
19	World Bank	Mr. Kamal Adamu Ibrahim
20	United States Agency for International Development	Dr. Laurel Rushton
21	United States Agency for International Development	Mr. Ebenezer Oluloto
22	Foreign, Commonwealth & Development Office	Mr. Diego Moroso
23	International Institute of Tropical Agriculture	Dr. Kenton Dashiell
24	United Nations Children's Fund	Ms. Nemat Hajeebhoy
25	United Nations Children's Fund	Mr. Edward Kutondo
26	Global Alliance for Improved Nutrition	Dr. Michael Ojo
27	Global Alliance for Improved Nutrition	Dr. Adeyinka Onabolu

Members of the NFCMS Technical Advisory Committee (TAC)

S/N	Institution	Name
1	National Population Commission	Mrs. Titilayo Tawa
2	Federal Ministry of Health and Social Welfare	Mrs. Ladidi K. Bako-Aiyegbusi, mni
3	Federal Ministry of Health and Social Welfare	Dr Binyerem Ukaire
4	Federal Ministry of Health and Social Welfare	Dr. Maria Odey Bisong
5	Federal Ministry of Agriculture and Food Security	Mrs Sugra Mahmood
6	Federal Ministry of Agriculture & Food Security	Dr Rasaq Oyeleke
7	Federal Ministry of Budget, and Economic Planning	Dr Sanjo Faniran
8	Federal Ministry of Budget, and Economic Planning	Mrs. Nelson Chito
9	University of Calabar	Prof. Henrietta Ene-Obong
10	University of Ibadan	Prof. Rasaki Ajani Sanusi
11	Ahmadu Bello University	Dr. Muyiwa Owolabi
12	Usman Danfodiyo University, Sokoto	Dr. Shafa'atu Giwa Ibrahim
13	Usman Danfodiyo University, Sokoto	Prof. Rabi'u Umar Aliyu
14	Dangote Foundation	Dr. Francis Aminu
14	Bill & Melinda Gates Foundation	Dr. Jonathan Gorstein
15	World Bank	Dr. Ritgak Asabe Sarah Dimka
16	World Bank	Eubert Rufurunesu Vushoma
17	World Bank	Mr Kamal Adamu Ibrahim
18	FHI 360-*Intake* Center for Dietary Assessment	Dr. Megan Deitchler
19	FHI 360-*Intake* Center for Dietary Assessment	Dr. Marieke Vossenaar
20	FHI 360-*Intake* Center for Dietary Assessment	Dr. Joanne Arsenault
21	United Nations Children's Fund	Mrs Hanifa Namusoke
22	United Nations Children's Fund	Mr Edward Kutondo
23	Foreign, Commonwealth & Development Office	Mr. Diego Morosso
24	International Institute of Tropical Agriculture	Dr. Busie Maziya-Dixon
25	International Institute of Tropical Agriculture	Mr. Kolapo Usman
26	International Institute of Tropical Agriculture	Dr. Mercy Gloria Lungaho
27	International Institute of Tropical Agriculture	Dr. Isiaka Olarewaju
28	International Institute of Tropical Agriculture	Mr. Samuel Ofodile
29	Nutrition International	Mrs. Titilola Abolade
30	National Bureau of Statistics	Mr. Imeh Udoabah
31	Oxford Policy Management	Femi Adegoke
32	Oxford Policy Management	Babatunde Akano
33	Global Alliance for Improved Nutrition	Dr Adeyinka Onabolu

Members of the NFCMS Implementation Working Group (IWG)

S/N	Institution	Name
1	National Population Commission	Mrs. Titilayo Tawa
2	Federal Ministry of Health and Social Welfare	Mrs. Ladidi K. Bako-Aiyegbusi, mni
3	Federal Ministry of Health and Social Welfare	Dr. Binyerem Ukaire
4	Federal Ministry of Health and Social Welfare	Dr. Maria Odey Bisong
5	Federal Ministry of Agriculture and Food Security	Mrs. Sugra Mahmood
6	Federal Ministry of Budget, and Economic Planning	Mrs. Nelson Chito
7	University of Calabar	Prof. Henrietta Ene-Obong
8	University of Ibadan	Prof. Rasaki Ajani Sanusi
9	Bill & Melinda Gates Foundation	Dr. Jonathan Gorstein
10	World Bank	Dr. Ritgak Asabe Sarah Dimka
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13	FHI 360-*Intake* Center for Dietary Assessment	Dr. Mario Chen
14	FHI 360-*Intake* Center for Dietary Assessment	Dr. Marieke Vossenaar
15	FHI 360-*Intake* Center for Dietary Assessment	Dr. Joanne Arsenault
16	United Nations Children's Fund	Dr. Hanifa Namusoke
17	United Nations Children's Fund	Mr. Edward Kutondo
18	International Institute of Tropical Agriculture	Dr. Busie Maziya-Dixon
19	International Institute of Tropical Agriculture	Dr. Tolu Eyinla
20	International Institute of Tropical Agriculture	Dr. Mercy Gloria Lungaho
21	International Institute of Tropical Agriculture	Mr. Samuel Ofodile
22	International Institute of Tropical Agriculture	Dr. Isiaka Olarewaju
23	International Institute of Tropical Agriculture	Dr. Kolapo Usman
24	Nutrition International	Titilola Abolade
25	National Bureau of Statistics	Mr. Imeh Udoabah
26	Oxford Policy Management (OPM)	Dr. Femi Adegoke
27	Oxford Policy Management (OPM)	Mr. Babatunde Akano
28	Global Alliance for Improved Nutrition	Dr. Adeyinka Onabolu

Key Survey Personnel

Lead Implementing Agency

International Institute of Tropical Agriculture

Institution	Name	Role
IITA	Dr. Busie Maziya-Dixon	Principal Investigator and Overall Survey Coordinator
	Dr. Mercy Lung'aho	Anthropometry & Biomarker Lead
	Dr. Tolu Eyinla	Dietary Intake Lead Consultant
	Dr. Isiaka Olarewaju	Statistician Consultant
	Dr. Usman Kolapo	Statistician Consultant
	Mr. Sam Ofodile	Database Manager
University of Ibadan	Prof. Rasaki Ajani Sanusi	Co-Principal Investigator
University of Calabar	Prof. Henrietta Ene-Obong	Co-Principal Investigator
OPM	Dr. Femi Adegoke	Project Manager
	Mr. Babatunde Akano	Database Manager
FHI 360-*Intake* Center for Dietary Assessment	Dr. Megan Deitchler	Technical Advisor-Dietary Intake
	Dr. Marieke Vossenaar	Technical Advisor-Dietary Intake
	Dr. Joanne Arsenault	Technical Advisor-Dietary Intake
	Dr. Mario Chen	Technical Advisor-Dietary Intake
Tufts University- INDDEX	Dr. Jennifer Coates	Technical Advisor-Dietary Intake
	Dr. Jerome Some	Technical Advisor-Dietary Intake
	Dr. Winnie Fay Bell	Technical Advisor-Dietary Intake
	Dr. Sarah Wafa	Technical Advisor-Dietary Intake
University of Wisconsin-Madison	Prof. Sherry Tanumihardjo	Technical Advisor-Biomarker
Cornell University	Prof. Saurabh Mehta	Technical Advisor-Biomarker
National Bureau of Statistics (NBS)	Mr. Udoabah Imeh	Technical Advisor-Survey Design
	Mrs. Florence Oke	Technical Advisor-Survey Design
National Population Commission (NPC)	Mrs. Titilayo Ahmed	Sensitization and mobilization
Ahmadu Bello University, Zaria	Dr. Muyiwa Owolabi	Zonal Coordinator (NW)
Federal University of Agriculture-Abeokuta	Dr. Catherine Oladoyinbo	Zonal Coordinator (SW)
University of Uyo	Dr. Yetunde Alozie	Zonal Coordinator (SS)
Michael Okpara University of Agriculture	Dr. Patricia Ukegbu	Zonal Coordinator (SE)
Independent Consultants	Mrs. Ladi Williams	Zonal Coordinator (NE)
	Dr. Dolapo Duro	Zonal Coordinator (NC)
Federal Ministry of Health and Social Welfare	Mr. Gabriel Odugbo Ikwulono	Assistant Zonal Coordinator (NC)
Kano State Ministry of Health and Social Welfare	Mr. Abdullahi Yusuf Koki	Assistant Zonal Coordinator (NE)
Jigawa State Ministry of Health and Social Welfare	Mr. Shafi'u Dahiru Gumel	Assistant Zonal Coordinator (NW)
Federal Medical Centre, Abia State	Mr. Ejiofor Agbo	Assistant Zonal Coordinator (SE)
Rivers State University	Dr. Holy Brown	Assistant Zonal Coordinator (SS)
University College Hospital, Ibadan	Dr. Fisayo Ogah	Assistant Zonal Coordinator (SW)

Executive Summary

The National Food Consumption and Micronutrient Survey (NFCMS) is a population-based cross-sectional survey. The main objective of the survey is to determine the micronutrient status, anthropometrics, and dietary intake of women of reproductive age (WRA) aged 15-49 years, including pregnant and lactating women, and children (aged 6-59 months) and micronutrient status of non-pregnant adolescent girls (aged 10-14 years) and to identify key factors associated with poor nutrition in these populations. The information obtained will form a basis for the formulation of evidence-based policies and programmes. In the short to medium term, the information will provide a baseline from which changes can be monitored over time.

The NFCMS 2021 collected information on four different components: (1) socioeconomic and demographic information on the households in the sample; (2) dietary intake – type and amount of food consumed in the last 24 hours; (3) anthropometrics – height/length, weight, age; and

(4) micronutrient status using a set of biomarkers. The analyses of the biological samples were conducted in both local and international laboratories that perform strict quality controls. For dietary intake, results are presented separately for children aged 6-23 and 24-59 months at the national level and by location. For WRA, including pregnant women, data have been disaggregated at the national level by geopolitical zone and by location. In addition, breastfeeding women are presented separately due to their higher energy and nutrient requirements.

This report presents the findings of the 2021 NFCMS and supersedes the preliminary report published and launched by the Vice President, Prof. Yemi Osinbajo, in October 2022. The final report covers the socio-economic and demographic characteristics of the respondents' households, including information collected from the household listing, dietary questionnaire, 24-hour dietary recall, anthropometry, biomarker questionnaire, food sample analysis, and biomarker indices.

The results indicates that overall, 62 percent of households have access to an improved source of drinking water (67.4 percent in urban and 58.7 percent in rural); and the most common main source of drinking water is the tubewell/borehole (42.6 percent of households) and prevalent in urban (46.3 percent) than rural (39.9 percent) areas. In addition, 55 percent of households used an improved toilet facility (26.5 percent not shared, and 28.5 percent shared with at least one other household). Sharing of improved toilets was higher in the urban areas (44 percent) than in the rural areas (18 percent).

Nationally, 79 percent of the sample households were food insecure (57 percent were moderately food insecure and 22 percent were severely food insecure), and 41.5 percent of households did not have enough food or money to buy food in the past seven days before the survey. Reliance on less preferred and less expensive foods; food borrowing or relying on help from friends or relatives; limiting portion size at mealtimes; restriction on consumption by adult members of the household; and reduction in the number of meals eaten in a day were used as coping strategies.

Production of animal source foods was low as 11 percent of households were engaged in the production of animal source foods and differ by residence at 13.9 percent in rural and 7.5 percent in urban areas. Overall, 3 out of 10 households indicated that they have land for vegetable gardening. The proportion was higher in rural areas (38 percent) compared to urban areas (16 percent). Nationally, 31 percent of households in the sample have trees or bushes that produce fruits and were more in the South East (56 percent) followed by South South (44 percent), and North Central (39 percent).

The results show that only 10 percent of non-breastfed children 6-23 months had minimum milk feeding frequency which was lower in rural (3.9 percent) compared to urban (19.6 percent). The proportion of children that received the minimum number of milk feeds was 9 percent, 17 percent, and 8 percent for children aged 6-11, 12-17, and 18-23 months, respectively. One-third (35 percent) of children aged 6-23 months consumed egg and/or flesh foods the previous day. Nationally, 24 percent of children aged 6-23 months consumed sweet beverages the previous day with spatial differences (33 percent in urban and 20 percent in rural areas). Overall, two in five (41.4 percent) children aged 6-23 months consumed a minimum acceptable diet. The proportion of children with a minimum acceptable diet was 42 percent for 6-11 months, 53 percent for 12-17 months, and 28 percent for 18-23 months.

The survey also indicates a high prevalence of folate inadequacy among pregnant and non-pregnant WRA. Additionally , more than half of the women have inadequate intake of essential nutrients like calcium (90 percent for lactating women and 95 percent for non-pregnant non-lactating women) and spatial differences observed (89 percent for South East and 100 percent in North East), vitamin C (53 percent among non-lactating women to a high of 87 percent among lactating women) (45 percent in South East and 68 percent in North West), B1 (65 percent of non-lactating women and 67 percent of non-pregnant women) have a risk of inadequate thiamine intake which increased if the woman was lactating (77 percent) or pregnant (87 percent); B2 (80 percent of the women, 95 percent in North-East and 59 percent in South-West); Folate more than 90 percent across all categories of women with the highest prevalence of inadequacy among pregnant women is 99.9 percent (89 percent in South West and 99 percent in North East); and vitamin B12 (54 percent of non-pregnant women) have inadequate intake of vitamin B12 (88 percent in North West and 8 percent in South South), with moderate inadequacies in iron (45 percent of non-pregnant non-lactating women and 16 percent of lactating women); it ranged from (58.9 percent in North Central to a low of 30.7 percent in the North West), zinc (26 percent in non-pregnant and 25 percent in non-lactating women); lactating women (31 percent) and pregnant women (46 percent); North East (49 percent) and South-South (4 percent), and vitamin A (20 percent in non-pregnant non-lactating women, 58 percent in lactating women; 48 percent in North West and 1 percent in South-East)

The proportion of non-pregnant women whose protein intake was below requirements was 35 percent. This proportion was similar among non-pregnant and non-lactating women (29 percent) but higher in proportion among lactating women (66 percent) while about 58 percent of pregnant women had inadequate protein intake. Irrespective of pregnancy status, women living in rural areas were at higher risk of inadequacy compared to urban dwellers. Inadequacy was comparatively higher in the North compared to zones in the South and generally decreased with an increase in wealth status. The percentage of children whose intake was below requirements was only two percent.

Irrespective of pregnancy status, women living in urban areas were at higher risk of inadequacy compared to rural dwellers and inadequacy generally increased with an increase in wealth status. The percentage of children whose intake was below requirements was about one-fifth of the population (18 percent) with a slightly higher proportion among urban dwellers.

A high proportion of households of sampled non- pregnant women of reproductive age consumed fortifiable food vehicles as follows: vegetable oil (90 percent), sugar (88 percent), salt (99 percent), and bouillon (99 percent) in any form. Fewer households of sampled non-pregnant women of reproductive age consumed flours in any form (57 percent for maize flour, 29 percent for semolina flour, and 28 percent for wheat flour).

Diet quality among women of reproductive age is suboptimal as the Mean Minimum Dietary Diversity score of Women (MDD-W) in Nigeria is 3.6 out of a possible score of 10. Only a fifth of non-pregnant and a third of pregnant women achieved minimum dietary diversity (consumed at least 5 from 10 food groups). Dietary diversity is still low for sustaining micronutrient adequacy in women.

Although some progress has been made in reducing stunting, nationally, stunting is very high (33.8 percent) in children 6-59 months, and differs by age category (lowest in the 6-11-months (16.8 percent) and more than double at 39.8 percent in the 24-35-months, residence (rural is 40.0 percent and 20.8 percent in urban areas), zones (14.2 percent in the South East and 48.6 percent North West zone), wealth (47.9 percent among poor and 13.2 percent among wealthy), and level of education completed by caregiver (45.6 percent with none and 14.6 percent with post-secondary education). In addition, one in five (21.7 percent) adolescent girls aged 10-14 years are stunted and differs by residence (25.8 percent in rural areas and 14.5 percent in urban areas), and wealth (33.2 percent among poor and 9.6 percent among rich).

Key insights from the survey revealed that 11.5 percent of children aged 6-59 months are wasted (defined as low weight-for-height and it often indicates recent and severe weight loss, although it can also persist for a long time) nationwide, with notable age, regional, and wealth disparities. One in every four children 6-11 months and 5.1 percent in 36-47 months are wasted, 17.1 percent in North East and 6.8 percent in South West, and 14.3 percent among the poor and 8.6 percent among rich. One in four children aged 6-59 months (25.5 percent) is underweight, and differs by sex (27.3 percent among males and 23.7 percent among females), residence (29.4 percent in rural and 17.4 percent in urban areas), zone (35.8 percent in North West and 9.6 percent in South East), wealth (36.8 percent among poor and 13.9 percent among rich) and level of education completed by caregiver (33.3 percent with no education and 13.5 percent with post-secondary education). These spatial estimates are crucial for targeted interventions to reduce inequalities and prevent malnutrition.

Overall, 8.1 percent women of reproductive age are obese and differ by age categories (15.6 percent among 40- 49 years and 1.6 percent among 15-19 years), residence (12.5 percent in urban and 5.2 percent in rural areas), zones (15.4 percent in South East and 3.6 percent in North West), wealth (15.9 percent among rich and 2.2 percent among poor), and level of education completed (16.3 percent among those with post-secondary and 4 percent among those with no education). The prevalence of overweight is in the double digits among women of reproductive age nationally and in certain zones. Nationally, 15 percent are overweight and differs by age (24 percent among 20-49 years and 4.2 percent among 15-19 years), residence (17.9 percent in urban and 13.1 percent in rural areas), zones (21.2 percent in South East and 9.7 percent in North West), wealth (21.4 percent among rich and 8.1 percent among poor), and level of educational completed (24 percent among those with post-secondary and 10.7 percent among those with none).

Combining the prevalence of overweight and obese shows that 23 percent of women of reproductive age are above their ideal weight. The data shows that overweight and obesity are critical and emerging problems in Nigeria. Comprehensive plans need to be developed to address both under- and over- nutrition across vulnerable age groups and geopolitical zones.

Overall, 31 percent of children (6-59 months old) had any anaemia and differences in the prevalence of any anaemia were observed for age (42 percent in 6-11 months and 22 percent in 48-59 months), residence (36 percent in rural and 21 percent in urban), zones (42 percent in North West and 23 percent in North Central), wealth (38 percent among poor and 18 percent among rich), and level of education completed by caregivers (36 percent among those with no education and 16 percent among those with tertiary education). It was present in 20 percent of adolescent girls nationally and differed by age (28 percent in 12 year old and 11 percent in 11 year old) and wealth (27 percent among poor and 15 percent among rich). The prevalence of any anaemia was 23 percent in women of reproductive age and differences were observed for age (aged 15-49 years) by age (21 percent among 15-19 years and 27 percent among 40-49 years), residence (28 percent in rural and 18 percent in urban), zones (26 percent in North West, South East, South South and 17 percent in South West), wealth (30 percent among poor and 20 percent among rich) and level of education completed (27 percent among those with no education and 17 percent among those with post-secondary education). Any anaemia was present in 32 percent of pregnant women nationally and differed by residence (37 percent in rural and 21 percent in urban).

Nationally, the unadjusted prevalence of iron deficiency in children (aged 6-59 months) was 10 percent, while the adjusted prevalence was 21 percent and significantly different by age (36 percent in 12-23 months and 8 percent in 48-59 months), zone (28 percent in North East and 9 percent in South South), and level of education completed by caregiver (27 percent among those with no education and 18 percent among those with tertiary education). There was a statistically significant difference in the percentage of children (aged 6-59 months) with iron deficiency anemia by age (17 percent among 12-23 months and 1 percent among 48-59 months), zone (13 percent in North West and 4 percent in South South), and wealth (11 percent among poor and 6 percent among rich).

Overall, the unadjusted prevalence of vitamin A deficiency in children (aged 6-59 months) was 54 percent, while the adjusted prevalence was 31 percent. Differences were observed based on serum retinol for age (34 percent among 36-47 months and 24 percent among 6-11 months), sex (34 percent among males and 29 percent among females), residence (34 percent in rural and 26 percent in urban), zone (51 percent in North West and 6 percent in South East), wealth (40 percent among poor and 21 percent among rich) and level of education completed by caregiver (37 percent among those with no education and 22 percent among those with tertiary education). In addition, there was a difference in the percentage of children (aged 6-59 months) with vitamin A deficiency based on MRDR by age (3 percent among 24-35 months and 0.2 percent among 48-59 months) and residence (1.8 percent in rural and 0.1 percent in urban

The results indicate that nationally, zinc deficiency in children (aged 6-59 months) was 35.8 percent. There were differences by residence (41 percent in rural and 24 percent in urban), zone (57 percent in North West and 12 percent in South East), wealth (45 percent among poor and 23 percent among rich), and level of education completed by caregiver (42 percent among those with no education and 20 percent among those with tertiary education).

The prevalence of folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 86 percent, while serum folate deficiency (risk of elevated homocysteine) was 44 percent and serum folate deficiency (risk of megaloblastic anemia) was 20 percent in pregnant women. There were differences in the percentage of pregnant women with serum folate deficiency at risk of elevated homocysteine by residence (47 percent in rural and 38 percent in urban).

Similarly, there were differences in the percentage of pregnant women at risk of megaloblastic anaemia by residence (23 percent in rural and 15 percent in urban). In addition, there was a difference in the percentage of pregnant women (aged 15-49 years) with RBC folate deficiency by residence (89 percent in rural and 77 percent in urban), wealth (93 percent among poor and 70 percent among rich), and level of education completed (95 percent among those with no formal education and 61 percent among those who completed post-secondary education).

The prevalence of vitamin B12 deficiency (risk of megaloblastic anemia and defined as serum B12 concentration <148 pmol/L) in children 6-59 months was low (3 percent) and differed by age category (8 percent among 6-11 months and 1 percent among 36-47 months), residence (4 percent in rural and 0.1 percent in urban), zone (5 percent in North West and 0 percent in South West), wealth (6 percent among poor and 0.2 percent among rich), and level of education completed by caregiver (4 percent among those with no education and 0.5 percent among those with tertiary education). Vitamin B12 insufficiency (<220 pmol/L) was 12.6 percent nationally, and differed by age (23 percent among 6-11 months and 9 percent among 36-47 months), residence (17 percent in rural and 4 percent in urban), zone (19 percent in North West, North East and 1 percent in South South), wealth (24 percent among poor and 2 percent among rich) and level of education completed by caregiver (19 percent among those with no education and 5 percent among those with tertiary education).

The prevalence of vitamin B12 deficiency was low (2 percent) among younger adolescent girls 10-14 years and differed and by residence (3 percent in rural and 0.3 percent in urban). Vitamin B12 insufficiency was 7.3 percent and differed by residence (11 percent rural and 2 percent urban) and wealth (13 percent among poor and 2 percent among rich).

For women of reproductive age 15-49 years, prevalence of vitamin B12 deficiency was low (2 percent) nationally. There was a significant difference between residence (2 percent in rural and 0.6 percent in urban), zone (4 percent in North East and 0 percent in South West), wealth (4 percent among poor and 02 percent among rich), and level of education completed (4 percent among those with no education and 0.2 percent among those with post-secondary education). In addition, vitamin B12 insufficiency was 9.1 percent overall and significant differences were observed between residence (14 percent rural and 3 percent urban), zone (21 percent in the North East and 0.5 percent in South West), wealth (19 percent among poor and 1 percent among rich), level of education completed (19 percent among those with no education and 2 percent among those with post-secondary education),

The prevalence of vitamin B12 deficiency among pregnant women was 12 percent and differed for age (18 percent among 30-39 years and 4 percent among 40-49 years), residence (16 percent in rural and 4 percent in urban), wealth (24 percent among poor and 2 percent among rich), and level of education completed (23 percent among those with no education and 2 percent among those with post-secondary education). Overall, vitamin B12 insufficiency was 32.1 percent and differed between age categories (46 percent in 15-19 years and 5 percent in 40-49 years), residence (40 percent in rural and 17 percent in urban), wealth (52 percent among poor and 10 percent among rich), and level of education completed 47 percent among those with no education and 10 percent among those with post-secondary education).

The percentage of women of reproductive age (aged 15-49 years) at high risk of vitamin B1 deficiency was 2 percent nationally. There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) who are at low risk and moderate risk of vitamin B1 deficiency by the level of education completed (75 percent among those with no education and 83 percent among those who completed post- secondary education for low risk), and those at moderate risk (23 percent among those with no education and 16 percent among those who completed post-secondary education for moderate risk).

The prevalence of vitamin B2 deficiency was 79 percent. There was a statistically significant difference in the prevalence of vitamin B2 deficiency among women of reproductive age (aged 15-49 years) between residence (82 percent in rural and 74 percent in urban), and level of education completed (85 percent among those with no education and 67 percent among those who completed post-secondary education).

Overall the iodine intake was fine (100-300 ug/L) or high (> 300 ug/L) in some strata, the median urinary iodine was 292.7 μg/L and differed by age (337 μg/L among 15-19 years and 263 μg/L among 40-49 years), residence (258 μg/L in rural and 332 μg/L in urban), zone (423 μg/L in South West and 248 μg/L in North West), wealth (234 μg/L among poor and 345 μg/L among rich), and level of education completed (240 μg/L among those with no education and 316 μg/L among those who completed post-secondary education).

The overall median level of urinary iodine among lactating women of reproductive age (aged 15-49 years) was 217.6 μg/L. There were differences in the urinary iodine concentrations of lactating women of reproductive age (aged 15-49 years) by age (279 μg/L among 15-19 years and 190 μg/L among 40-49 years), residence (260 μg/L in urban and 202 μg/L in rural), zone (163 μg/L in North West and 372 μg/L in South West), wealth (180 μg/L among poor and 281 μg/L among rich), and level of education completed (182 μg/L among those with no education and 314 μg/L among those with post-secondary education). The overall median level of urinary iodine among pregnant women was 237.5 μg/L, which is evidence of appropriate iodine intake. There was a significant difference in the urinary iodine concentrations of pregnant women (aged 15-49 years) by wealth (277 μg/L among the rich and 185 μg/L among the poor).

The results indicate that three in every five (59 percent) children 6-59 months had both CRP and α-1AGP elevated and differed by age (62 percent among 12-23 months and 53 percent among 48-59 months), residence (67 percent in rural and 45 percent in urban), zones (66 percent in North West and 48 percent in South East), wealth (68 percent among poor and 44 percent among rich) and 310 level of education completed by caregiver (67 percent among those with no education and 41 percent among those with post-secondary. In adolescent girls 10-14 years, overall, 21 percent had both CRP and α-1AGP elevated and differed by residence (22 percent in rural and 20 percent in urban) and wealth (27 percent among poor and 16 percent among rich); for women of reproductive age, 22 percent had both CRP and α-1AGP elevated nationally, and differed by residence (23 percent in rural and 21 percent in urban), zone (28 percent in North West and 17 percent in North Central), wealth (25 percent among poor and 19 percent among rich) and level of education completed (25 percent among those with no education and 17 percent among those with post-secondary). Overall, 35 percent of pregnant women had both CRP and AGP elevated. There were no spatial differences among pregnant women.

Micronutrient deficiencies, infections, inflammation, and genetic blood disorders were identified as significant factors associated with an increased probability of anaemia across all population groups, with iron deficiency being a notable cause. Vitamin A, zinc, and folate deficiencies were also associated with a higher prevalence of anaemia in WRA and vitamin B12, while zinc deficiencies in preschool children were linked to higher anaemia prevalence. The prevalence of acute and chronic inflammation and malaria were statistically higher among WRA, preschool children and adolescent girls with anemia. While H pylori emerged as a driver of anemia among pregnant women. Having sickle cell disease was associated with anemia among both WRA and preschool children, while having a Hb trait as a genetic blood disorder was also linked to anemia.

HbA1c reflects the average blood glucose (sugar) level for the last two to three months. It is used to help diagnose type 2 diabetes and monitor blood glucose control in people who have diabetes. The national prevalence of elevated HbA1c ((glycated haemoglobin > 5.6%) among women of reproductive age was 16 percent and differed by age (22 percent among 40-49 years and 13 percent among 20-29 years), residence (21 percent in urban and 13 percent in rural areas), wealth (21 percent among rich and 9 percent among poor), and anthropometry status (34 percent among obese and 13 percent among thin).

The result reveals that one in four children (25 percent) received a vitamin A capsule in the last 6 months nationally, and differed by age (32.6 percent in 6-11 months and 20.1 percent in 36-47 months), residence (36.1 in urban and 19.3 percent in rural), zones (41.9 percent in North Central and 8.0 in North West), wealth (41.7 percent among rich and 12.8 percent among poor) and level of education completed by caregiver (41.7 percent with post-secondary and 18.5 percent with no education). In addition, use of iron/micronutrient powder is low (7.1 percent) nationally and differs by zone (10.4 percent in South West and 2 percent in South East. Deworming treatment was 27.5 percent nationally and differs by age 33 percent among 48-59 months and 16.9 percent among 6-11 months), residence (41.2 percent in urban and 20.3 percent in rural areas), zone (60.2 percent South South and 7.5 percent in North West), wealth (51.7 among rich and 13 percent among poor), and level of education completed by caregiver (46.2 percent with post-secondary and 17.9 percent with no education).

The use of iron or iron/folic acid tablets in the past six months by women of reproductive age was low. Overall, 14 percent took iron or iron/folic acid tablets in the past six months and differs by age (17.9 percent among 40-49 years and 8.6 percent among 15-19 years), residence (18.1 percent in urban and 11.5 percent in rural areas), zone (31.9 percent in South West and 2.2 percent in North West), wealth (18.9 percent among rich and 7.7 percent among poor) and level of education completed (21 percent among those with post-secondary and 8 percent among those with no education). Among those who used multivitamins and iron or iron/folic acid tablets in the past seven days, 26 percent reported taking multivitamins and 32 percent took iron/folic acid tablets for the entire seven days.

In conclusion, the NFCMS 2021 offers valuable insights into household characteristics, dietary pattern and nutritional status of key demographics in Nigeria, highlighting the urgent need for targeted nutrition interventions and policy measures to address the diverse nutritional challenges the population faces across the health, food and social protection systems.

Key Messages

- The prevalence of stunting affects at least one-third of children in the country, while wasting affects one of every ten children in the country. Concurrently, overweight and obesity in both children and women is a co-existing public health problem within the same population.
- Dietary diversity is low among children and women and is a major cause of protein and micronutrient inadequacy (low intake) in their diet. The most affected micronutrients are calcium, folate, zinc and vitamin A, and their inadequacies or low intake were highest among low-income households. Innovations in the food system are needed to increase the production and affordability of nutrient-rich foods, as well as dietary animal sources of protein.
- The prevalence of micronutrient deficiencies is high, especially for red blood cell folate, serum retinol (vitamin A) and serum zinc. While folate deficiency is common in all areas of the country, Zinc and Vitamin A deficiencies are twice as high among poorer households as wealthier households.
- In addition to the deficiencies in the dietary intake and biomarker levels that are ubiquitous across all target groups, the survey results show that dietary patterns of children are suggestive of being unhealthy and obesogenic among those living in urban areas. Food environment policies that can incentivize and sustain healthy consumption patterns are needed.
- Fortified staple foods (wheat and maize flours) that could improve the nutrient density of diets are less utilized than fortified foods that serve as ingredients (vegetable oil, sugar, and bouillon). Also, the utilization of vegetable oil, wheat flour, semolina flour, and sugar increased with wealth while maize flour utilization decreased with household wealth. Existing policies on mandatory fortification can be implemented at scale with a focus on strengthening the coverage, especially with staple foods to ensure the overall efficacy of Nigeria's fortification policy.
- The presence of iron deficiency, inflammation, and malaria is associated with an increased likelihood of anaemia in all age groups. Vitamin A deficiency in pregnant women and women of reproductive age (WRA), and zinc deficiency in WRA and preschool children- were also associated with anaemia. The contribution of each risk factor needs to be known to better inform the design of anaemia prevention and control programs.
- The coverage of food and nutritional intervention programs such as supplementation, fortification, biofortification, optimal IYCF, etc.) which are known to improve diet quality and micronutrient intake, need to be implemented at scale, especially in high disease burden areas. A better understanding of implementation bottlenecks is also needed to improve the coverage, quality, and the impact of these nutrition interventions.

Background

The last National Food Consumption and Micronutrient Survey (NFCMS) was undertaken about 20 years ago in 2001 (Maziya-Dixon, et al., 2004; Nigeria Food Consumption and Nutrition Survey 2001- 2003, IITA, https://hdl.handle.net/10568/100010). The findings of that study likely no longer represent the current micronutrient status or dietary consumption patterns of the Nigerian population. This lack of recent and reliable information presents several challenges, both in terms of reviewing ongoing programmes and in informing the development of new guidance and policies. Updated information on the population's micronutrient status and dietary intakes is required for informed, evidenced-based decisions about current and future food, nutrition, and agriculture programming and policy making in Nigeria.

During a high-level national nutrition data stakeholder workshop in Abuja in July 2017, stakeholders agreed that a national survey to collect information on dietary intake and micronutrient status was needed. Subsequently, in January 2018, a NFCMS methodology workshop was held in Abuja, during which agreements were reached on the scope and level of representativeness for the survey, and key decisions pertaining to the survey governance structure. In this light, UNICEF was nominated as the fund management agency for the survey, and IITA as the lead implementing agency.

Introduction

The 2021 NFCMS is the third nationally representative survey of its kind conducted in Nigeria, following those implemented in 1968 and 2001. The Federal Government of Nigeria, in collaboration with the International Institute of Tropical Agriculture (IITA), and other stakeholders, implemented this survey. Data collection took place from 17 February to 16 June 2021 for household (HH) listing and HH questionnaire with a one-week break for Easter holidays; and 8 March 2021 to 4 July 2021 for dietary intake, anthropometry, and biomarker, excluding that of the Modified Relative Dose Response (MRDR) with a four-week break during Ramadan. Data collection for MRDR commenced on 17 August 2021 to 17 September 2021. Funding for NFCMS 2021 was provided by the Federal Ministry of Health and Social Welfare, Gates Foundation, World Bank Group, Foreign, Commonwealth & Development Office, United Nations Children's Fund, and Nutrition International. Technical assistance was provided by the National Population Commission, Nigeria (NPC), National Bureau of Statistics, Nigeria (NBS), Tufts University- International Dietary Data Expansion Project (INDDEX), FHI360 Solutions-Intake Center for Dietary Assessment, University of Wisconsin-Madison, USA and Cornell University, USA.

This report presents findings from the NFCMS 2021 and covers respondents' household socioeconomic and demographic characteristics, diet questionnaire, anthropometry, biomarker questionnaire, food sample analysis, and biomarker indices.

Objectives

The primary objective of the survey is to assess the micronutrient status and dietary intake of women of reproductive age (WRA) (aged15-49 years), including pregnant and lactating women and children (aged 6-59 months). The study also assessed the micronutrient status of younger non- pregnant adolescent girls (aged 10-14 years) and identified key factors associated with poor nutrition in these populations. The information generated will provide a foundation for the formulation of evidence- informed policies and programmes. In the short- to medium-term, the information will provide a baseline from which to monitor changes over time.

The specific objectives of the survey include:

1. assess the food consumption of children (aged 6-59 months), excluding breastmilk, and WRA to determine their intakes of energy, protein, fat, and selected micronutrients, as well as the amounts of specific nutrient-dense foods relevant for food-related nutrition policies and programmes;
2. determine the adequacy of nutrient intake in children (aged 24-59 months) and WRA to identify populations at risk of inadequate intake;
3. assess infant and young child feeding (IYCF) practices among children (aged 6-23 months) and compare the nutrient density of their complementary feeding diets with recommendations;
4. assess the prevalence, severity, and distribution of specific micronutrient deficiencies and other forms of malnutrition (e.g. stunting, wasting, overweight/obesity) among WRA, younger adolescent girls, and children (aged 6-59 months);
5. identify key factors (e.g. infection, blood disorders, supplement use) associated with anaemia in WRA and children (aged 6-59 months) to inform strategies to prevent and treat anaemia in these populations;
6. measure the coverage of national interventions to improve micronutrient status and dietary intake in WRA and children (aged 6–59 months), including iron folic acid (IFA) supplements, IYCF counselling, vitamin A supplementation (VAS), biofortification, and food fortification programmes; and
7. assess the prevalence of food insecurity and identify other key factors at individual and HH level (e.g. education, SES) that are associated with micronutrient status and dietary intake in WRA and children (aged 6–59 months), and the micronutrient status in younger adolescent girls.

Survey Design

Study area

The country's 2006 Population and Housing Census, which placed its population at 140 431 790, served as the sampling frame. Nigeria is the most populous black nation in the world. Nigeria is comprised of 36 states and the Federal Capital Territory (FCT) (**Figure 1**) with 774 Local Government Areas (LGAs) and 662 529 enumeration areas (EAs) categorized into six geopolitical zones (North West, North East, North Central, South West, South East and South South). Nigeria has more than 500 ethnic groups with the most populous being Hausa, Yoruba, and Igbo.

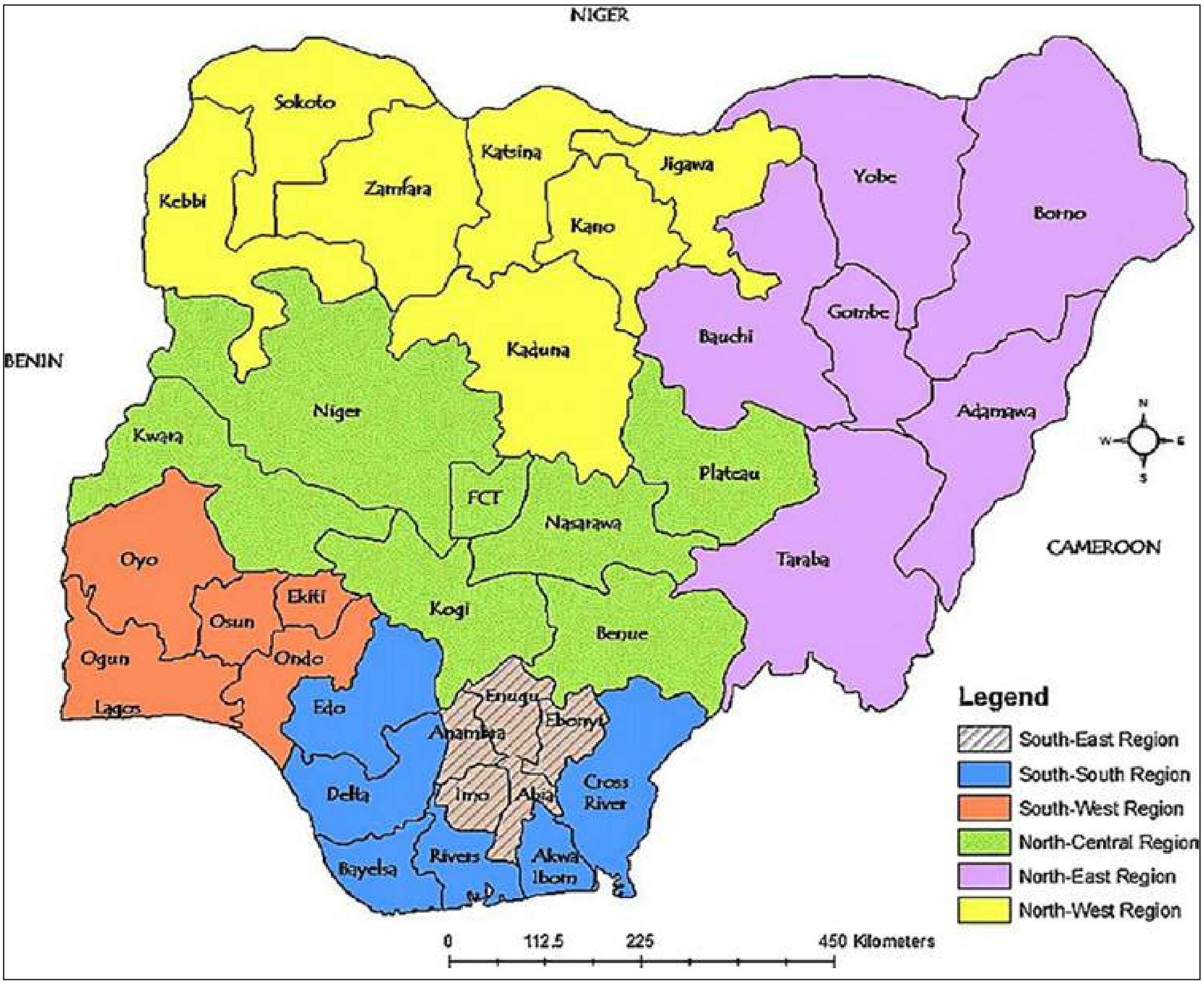


Figure 1. Geopolitical zones in Nigeria

Survey design, target populations, and reporting domains

The NFCMS is a cross-sectional population-based survey that collects data on dietary intake, micronutrient status, and anthropometry. The following demographic groups are the focus for the survey: (1) children aged 6-59 months; (2) non-pregnant WRA (aged 15-49 years), including lactating women; (3) pregnant women (aged 15-49 years); and (4) non-pregnant adolescent girls (aged 10-14 years). No dietary data was collected for adolescent girls aged 10-14 years. **Table 1** shows the sampling target groups for which data is collected for specific survey components.

Table 1. Sampling target groups by survey components

Sampling target groups	Micronutrient biomarker/ anthropometry	Dietary intake
Non-pregnant WRA (15-49 years old)	√	√
Children (6-59 months old)	√	√
Pregnant women (15-49 years old)	√	√
Non-pregnant adolescent girls (10-14 years old)	√	Not collected

The survey was successfully carried out in 364 Primary Sampling Units (PSU) referred to as EAs, after 26 EAs with security challenges during fieldwork were dropped. These areas were in Lagos (1 cluster), Ogun (1 cluster), Sokoto (2 clusters), Kebbi (1 cluster), Zamfara (1 cluster), Yobe (2 clusters), Borno (8 clusters), Anambra (1 cluster), Cross River (1 cluster), and Rivers (2 clusters). More clusters were lost in the NE zone (10) followed by NC (6), NW (4), SS (3), SW (2), and SE (1).

The reporting domains and level of disaggregation are presented in **Table 2**. For dietary intake, the results are presented separately for children aged 6-23 versus 24-59 months at the national level and by location (urban and rural). For WRA, including pregnant women, data was disaggregated by geopolitical zone and by location (urban and rural) at the national level. In addition, lactating women, with higher energy and nutrient requirements are presented separately. For biomarker and anthropometry, results are presented at the national level, geopolitical zone, and by location (urban and rural) for WRA and children (aged 6-59 months); and at national level and by location (urban and rural) for pregnant women (15-49 years old) and non-pregnant adolescent girls (10-14 years old).

Table 2. Reporting domain by target groups and survey components

	Sampling target groups			
	Non-pregnant WRA (aged 15-49 years old)	Children (aged 6-59 months old)*	Pregnant women (aged 15-49 years old)	Non-pregnant adolescent girls (aged 10-14 years old)
Reporting domain for dietary intake	National & geopolitical region	National	National	No data collected
Reporting domain for micronutrient biomarker/ anthropometry	National & geopolitical region	National & geopolitical region	National	National
Outcomes disaggregated by urban and rural areas	National	National	National	National

*Dietary data is presented separately for infants and young children aged 6–23 months and children aged 24–59 months.

Sampling method

The NFCMS is a cross-sectional population-based survey with the sample stratified by geopolitical zone. Sampling within each region follows a two-stage random selection strategy. In the first stage, EAs were selected adopting principles of Probability Proportional to Size (PPS) using systematic sampling. Sixty-five (65) EAs within each region were selected. In the second stage, eligible respondents were randomly selected within the sampled EAs.

The sample size estimates for non-pregnant WRA (15-49 years old) and children (6-59 months old) were calculated for key micronutrient biomarker indicators. The sample size calculations for these two sampling groups were based on the combination of an estimated prevalence, required absolute precision (margin of error), and a 95 percent level of confidence, for producing estimates at the geopolitical level, using the following formula:

$$n = \frac{z^2 * p(1-p)(deff)}{d^2}$$

Where:

n is the calculated sample size

z is the statistic that defines the level of confidence required

p is an estimate of the key indicator to be measured by the survey in the population group of interest, for example, the prevalence of iron deficiency among WRA, expressed as a proportion of that population

d is the desired level of precision, or the margin of error to be obtained. Margin of error for a geopolitical region used is ± x 5 percentage points.

As statistically computed, z = 1.96, which is the z-statistic for the 95 percent confidence level.

If the expected estimate of the key indicator (p) was unknown, the value of 0.5 (or 50 percent) was used because it produces the largest sample size (for a given value of d). For all estimates of sample size, a design effect of 2 was used to account for the sample design, which is the value often used when there is little information from which to make a more informed decision. The calculated sample sizes were further inflated to account for non-response rate by 20 percent (**Table 3**).

To interpret retinol concentrations, the MRDR test was conducted on a sub-sample of respondents. This required the collection of a second venous blood sample – pregnant WRA (aged 15-49 years). A second dietary recall sample and MRDR were randomly selected from respondents of the first dietary recall and biomarker with the numbers varying by population groups. A second 24-hour recall was collected on a non-consecutive day for a randomly selected sub-sample of respondents who completed the first 24-hour dietary recall. The number of repeats corresponded to 38 percent of the sample of children (aged 6-59 months), 25 percent of the sample of non-pregnant WRA, and 33 percent of the sample of pregnant WRA. These data are needed to remove the within-person variation from the data and simulate "usual" intake distributions for the sample.

Table 3. Adjusted sample size per EA, geopolitical zone, and at national level by sampling target group[1]

Sampling target population	Respondents selected per EA	Sample size per geopolitical zone	Total sample size at national level
Non-pregnant WRA (15-49 years old)	16	1040	6240
Children (6-59 months old)	16	1040	6240
Pregnant women (15–49 years old)	3	195	1170
Non-pregnant adolescent girls (10-14 years old)	3	195	1170
Total	38	2470	14 820

Questionnaires and sample collection

Five questionnaires, excluding the Household Listing Form, were developed for the NFCMS 2021: (1) household questionnaire; (2) non-pregnant WRA; (3) pregnant WRA; (4) children aged 6–59 months; and (5) adolescent girls aged 10–14 yrs. To help guide the development of questionnaires, the tools and protocols used for the standard Demographic and Health Survey (DHS-7) were adopted. The review process for the questionnaires involved: identifying and justifying information required; defining the priority indicator; providing rationale for why this survey is the right place to measure the indicator; what questions will elicit the information needed for the indicator; and how will the information be reported. For the selection of indicators and questions, the following principles were used as a guide:

- if there is no clearly defined indicator, we cannot include questions in the survey;
- indicator definitions and questions should be consistent with national and global standard definitions and questions;
- use standard procedures, questions, and response questions whenever possible;
- indicators and questions already used in Nigeria survey reports, such as the NDHS and LSMS surveys, should be included, where possible;
- from global guidance or tools such as IYCF revised in 2021; and
- expert advice.

Comments were solicited from a group of key stakeholders and development partners after which these were presented to the Technical Advisory Committee (TAC) and Steering Committee (SC) for approval before applying for the ethical clearance. After all questionnaires were finalized in English, they were translated into Hausa, Yoruba, and Igbo; and translated back to English. The survey protocol was reviewed and approved by the National Health Research Ethics Committee of Nigeria (NHREC). At implementation, the questionnaires were disaggregated to three based on the components of the NFCMS: HH Questionnaire, Diet Questionnaire, and Anthropometry/Biomarker Questionnaire.

Household Listing Form: The HH Listing Form (Annex 1) listed all members and visitors of the sample HHs. They are those who live in the HH and/or guests who stayed there last night. Information on relationship to head of HH, sex, and age was collected on each person listed. For children (aged 6-59 months) and WRA, additional information was collected (i.e., date of birth, birth certificate, source of birth certificate for children 6-59 months, and pregnant status for WRA). Data on age and pregnant status were used to identify WRA, adolescent girls, and children (aged 6-59 months) who were eligible for individual interviews.

Household questionnaire: The HH Questionnaire collected information on general characteristics of the head of HH (i.e., ethnicity, religion, education, and employment) (Annex 2). It also collected information on the HHs dwelling unit (source of drinking water; type of toilet facilities; materials used for flooring, external walls, and roofing; ownership of various animals and durable goods; area where members of the HH often wash their hands; main way of refuse disposal, presence of a vegetable garden and fruit trees; HH food insecurity; and HH coping strategies).

Diet Questionnaire: The Diet Questionnaire collected information on respondents' identity confirmation (name, age, date of birth, completion of HH Questionnaire), socio-demographic characteristics, consumption of biofortified foods (yellow cassava, OFSP, and orange maize), and fortification coverage for selected food vehicles (vegetable oil, wheat flour, maize flour, semolina, sugar, salt, and bouillon) for children (aged 6-59 months) and WRA. In addition, pregnancy and lactation data were collected among WRA and selected IYCF practices among children (aged 6-59 months only) (Annex 3). The Diet Questionnaire was followed by a quantitative interactive 24-hour (i24-hr) dietary recall interview collected using the INDDEX24 mobile application. In addition, fortifiable food samples were collected in a 25 percent sub-sample of WRA during the repeat i24-hr dietary recall and tested for levels of fortification (i.e., iodine in salt, vitamin A in edible oil, vitamin A in sugar, and iron in flours). No dietary data was collected for adolescent girls (aged 10-14 years) as this was not planned during survey designing.

Biomarker Questionnaire: The biomarker questionnaire had two components (biomarker and anthropometry). Questions regarding intervention coverage, health status, and anemia risk factors were included in the biomarker and anthropometry questionnaire (Annex 4). A set of questions was asked to mothers/caregivers of children (aged 6-59 months). Adolescent girls (aged 10-14 years) and women of reproductive age (aged 15-49 years) were asked the same set of questions. Pregnant women (aged 15-49 years) were asked a different set of questions.

Anthropometry: Anthropometry was assessed in children (aged 6-59 months), adolescent girls (aged 10-14 years) and women of reproductive age (aged 15-49 years). Using the anthropometry questionnaire (Annex 4), age and anthropometric measurements (length or height, and weight) were collected from all consenting participants at a central location. In some instances where respondents were unable to go to the central site, the team went door-to-door to conduct the survey.

Standard procedures, standardized techniques and equipment using the World Health Organization (WHO) methodology were employed (WHO, 2006; Cashin and Oot, 2018; WHO, 2019). Computer-assisted personal interviewing (CAPI) on the CommCare data collection application was utilized to facilitate the data collection for the survey.

Length/ height: The survey team utilized a portable height board (brand name: ShorrBoard) to measure height to the nearest 0.1 cm. The recumbent length of infants aged 6 to 24 months was measured using a length board. All length/height measurements were taken with participants not wearing shoes.

If a child younger than 2 years old was unable to lie down, the child's standing height was measured and converted to length by adding 0.7 cm. If a child aged 2 or older was unable to stand, their recumbent length was measured and converted to height by subtracting 0.7 cm.

Weight: The survey team used calibrated digital scales (brand name: SECA) to measure weight to the nearest 0.1 kg. Tared weighing was done for young children who were not yet able to stand on their own. They were weighed while being held by an adult (typically their mother/ caregiver). All weight measurements were taken with minimal clothing and with participants not wearing shoes.

To ensure data quality, the scales were calibrated daily using known weights. Brand new batteries were placed in the scales before calibration. Moreover, the anthropometry module of CommCare was designed with a number of automatic data validations and consistency checks. These were designed to help interviewers identify inconsistencies or flag outliers in real-time so that course corrections could be made before continuing the interview. The data on outliers was derived from FANTA and WHO recommendations for anthropometric outlier values. In addition, each respondent was required to have at least two non-consecutive length/ height and weight measurements taken. When the difference between the first and second measurements exceeded |0.1|, a third measurement was taken.

The Read Repeat Review (RRR) method was utilized to ensure accurate data entry. The lead anthropometrist read the output of the anthropometry measurement out loud to the interviewer, who then repeated the measurement out loud to confirm it, before entering it into CommCare. After all measurements for a respondent were taken, the lead anthropometrist reviewed the data entered to verify that the information was accurate.

Age: Date of birth for children and age for adolescent girls and women of reproductive age was collected during the household listing exercise at the onset of the survey and confirmed during the dietary intake interview. Date of birth was subtracted from the date of the anthropometry interview to determine the child's age in days, months, and years. The WHO macro utilized age in days to compute age-appropriate z-scores (e.g., length/height-for-age and weight-for-age). When feasible, the date of birth was verified using a birth certificate or vaccination card. At the conclusion of the survey, a data verification exercise was conducted to validate some child ages that were either incomplete or based on memory recall. After completing the verification process, the validated data were added to the dataset.

Throughout the duration of the survey, remote surveillance and supervision were conducted via daily data reviews and team and individual performance evaluations. A dashboard was created and administered to monitor key indicators including: respondent completion rate, sex ratio, completeness of age, source of age, age heaping, completeness of height measurement, completeness of weight measurement, position of measurement, digit preferences of height and weight measurents, and cases out of range. Routine field visits and spot inspections were also conducted by the survey technical team and anthropometry monitors to provide field support to lead anthropometrists, on-site retraining as needed, and quality assurance.

Human specimen collection and processing: The micronutrient survey was supported by six labs. A mobile field laboratory; Synlab - a local accredited laboratory in Lagos, Nigeria; and four foreign

accredited labs in the Centers for Disease Control and Prevention (CDC) Vital-External Quality Assurance program (VITAL-EQA) – (i) Nutritional Biomarker Laboratory at the University of Cambridge in the United Kingdom (UK), (ii) VitMin Lab in Germany, (iii) The Vitamin A Assessment Laboratory at the University of Wisconsin-Madison in the United States of America (USA), and (iv) Peking University Laboratory in China. Information on the laboratory analysis conducted on the biomarker samples by these labs for each target group is presented in **Table 4**.

Furthermore, the survey successfully designed and implemented a cold-chain system across all survey enumeration areas by using Ministry of Health cold stores as temporary collation sites and the International Institute for Tropical Agriculture (IITA) Food and Nutrition Sciences Lab in Ibadan as a central collation site and for long-term storage.

Phlebotomists and laboratory technicians were stationed in the mobile field laboratory at a central location in each enumeration area (EA). Each of the six zones had three field labs staffed by local well trained and highly experienced phlebotomists and laboratory technicians. In some instances where respondents were unable to go to the central site, the team conducted the survey and collected biological samples house-to-house. Urine, stool and whole venous blood were collected for the micronutrient survey.

Urine collection and processing: Casual collection method of urine (single sample, not 24-hour collection) was used to obtain ~5 mL of sample in sterile urine collection cups from eligible and consenting women of reproductive age (aged 15-49 years) and pregnant women (aged 15-49 years). An aliquot (2 mL) of urine was transferred into two iodine-free storage vials. One vial was sent to Peking University Laboratory (China) for testing of urinary iodine and the backup vial stored at the IITA Human Nutrition Lab cold room (minus 83° C).

Stool collection and processing: Fresh stool sample was obtained in sterile stool collection cups from eligible and consenting children (aged 6-59 months), women of reproductive age (aged 15-49 years), and pregnant women (aged 15-49 years). A pea size of the sample was processed using the Mini Parasep® SF faecal parasite concentrator. For each sample, clearly labeled microscope slides were made, microscopically examined, and results documented. The slides were preserved in the appropriate storage boxes, and archived at the IITA Food and Nutrition Sciences Lab.

Blood collection and processing: Three blood samples were taken during the main survey, which took place between March and July 2021: i) Blue top vacutainer, Purple top vacutainer 1, and

Purple top vacutainer 2. One blood sample was taken during the Modified Relative Dose Response (MRDR) survey, which took place in August 2021.

Blue top vacutainer: Whole blood samples (4-6 mL) were collected from eligible and consenting children (aged 6-59 months), adolescent girls (10-14 years), women of reproductive age (aged 15-49 years), and pregnant women (aged 15-49 years) in barcode- labelled trace element free Royal blue top vacutainers (**Figure 2**). Serum extracted from blood samples was stored in up to four vials at minus 20°C for a maximum of 25 days, then transferred to IITA for storage at minus 83°C, before transportation to overseas labs.

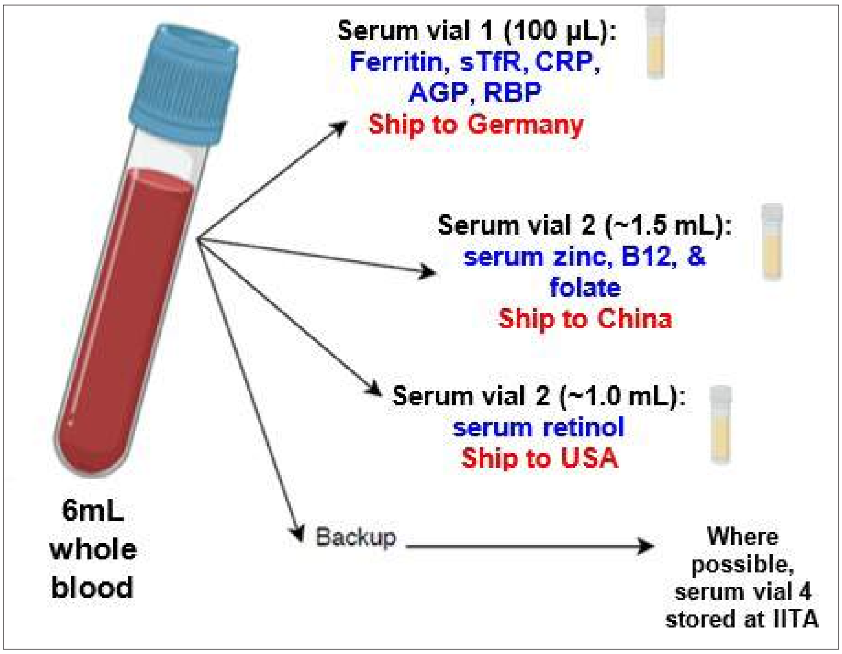


Figure 2. Specimen volume and testing- blue top vacutainer

Purple top vacutainer 1: Whole blood samples (1 mL and 2 mL, respectively) were collected in barcode labeled EDTA purple top vacutainers from eligible and consenting children (aged 6-59 months) and women of reproductive age (aged 15-49 years). Blood was stored at 2°C to 8°C and transported to a Synlab in Lagos within 48 hours after collection to be tested for haemoglobin genotype for children and women of reproductive age, as well as glycated haemoglobin (HbA1c) for women of reproductive age.

Purple top vacutainer 2: Whole blood samples (1-2 mL) were collected from eligible and consenting children (aged 6-59 months), adolescent girls (10-14 years), women of reproductive age (aged 15-49 years), and pregnant women (aged 15-49 years) in barcode labelled EDTA purple top vacutainers (**Figure 3**). In the field, blood was tested for malaria, Helicobacter pylori, and haemoglobin in all four target groups, as well as plasma glucose for women of reproductive age. Whole blood lysate was processed for the measurement of Red Blood Cells (RBC) folate in adolescent girls, women of reproductive age, and pregnant women. Furthermore, for a subset of women of reproductive age (20%), a sample of saline washed Red Blood Cells (RBC) was processed for assessment of vitamin B1 (thiamine) and B2 (riboflavin) status. Backup plasma from women of reproductive age was kept at the IITA Human Nutrition Lab cold room (minus 83° C).

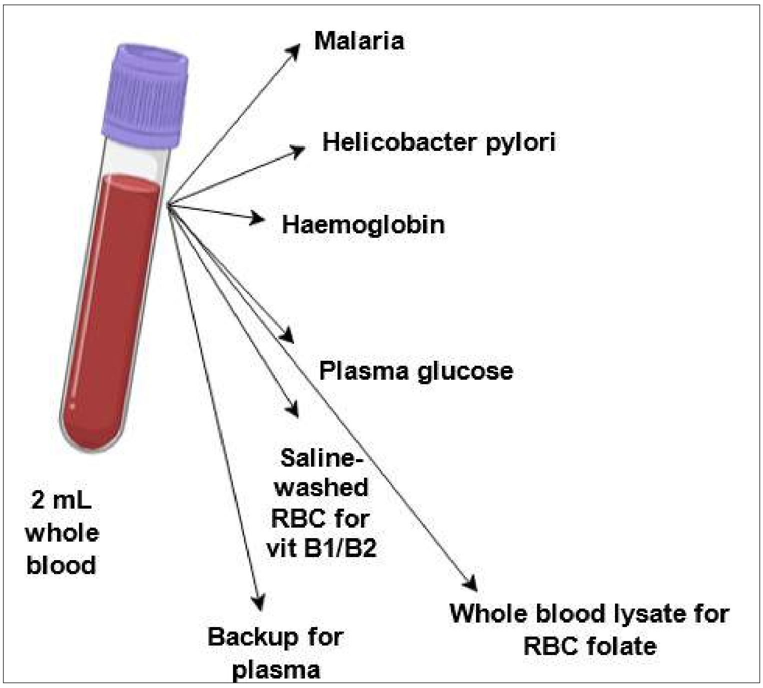


Figure 3. Specimen volume and testing- purple top vacutainer

MRDR sample: The gold standard to determine vitamin A status is liver biopsy. However, access to this tissue is limited, except under special circumstances. The MRDR test has been validated in animals as a function of liver vitamin A reserves and can be used in infants, children, and women. The MRDR test involves first giving the respondent a single oral dose of vitamin A2 dissolved in an oil and then taking a single blood sample four to six hours later for vitamin A analysis. It is a good indicator of vitamin A liver stores and is less affected by inflammation than serum retinol concentrations.

Following the MRDR methodology, whole blood samples (6 mL) were collected in barcode labelled trace element free Royal blue top vacutainers from a 20 percent sub-sample of eligible and consenting children (aged 6-59 months) and women of reproductive age (aged 15-49 years). Serum collected from blood samples was kept in two vials at -20°C for up to 25 days. One vial was dispatched to the Vitamin A Assessment Laboratory in the United States, while the backup was kept in the IITA Human Nutrition Lab cold room (-83° C).
Table 4 shows the laboratory analysis performed on the biomarker samples for each target group.

Table 4. Biomarker measurements and analysis method/matrix by target group

Biomarker measurement/ status	Analysis method/ matrix	Children (6-59 months)	Adolescents (10-14 years)	Pregnant women (15-49 years)	Non-Pregnant women (15-49 years)
Malaria	Presence of Plasmodium falciparum malaria parasitemia in venous whole blood sample detected using a rapid diagnostic test kit (RDT)	✓	✓	✓	✓
Helicobacter pylori	Presence of IgG antibodies specific to *Helicobacter pylori* (H. pylori) in venous whole blood sample detected using a rapid qualitative immune assay test RDT	✓	✓	✓	✓
Helminths	Presence of helminth eggs in stool samples detected using microscopy	✓	x	✓	✓
Plasma glucose	Whole venous blood glucose concentration measured using a HemoCue (Hb-201+)instrument. Results converted to equivalent plasma values using a constant factor of 1.11.	x	x	x	✓
Glycated haemoglobin (HbA1c)	Whole venous blood sample assessed using a Bio-Rad D10 auto-analyzer	x	x	x	✓
Haemoglobin genotype (blood disorders)	Whole venous blood assessed using high-performance liquid chromatography (HPLC) in a laboratory setting	✓	x	x	✓
Haemoglobin	Anaemia measured from whole venous blood sample using a HemoCue (Hb-301) instrument	✓	✓	✓	✓
Iron status and markers of inflammation	Sandwich Elisa assay for Ferritin, serum transferrin receptors (sTfR), c-reactive protein (CRP), α1-acid glycoprotein (AGP) in serum	✓	✓	✓	✓
	Sandwich Elisa assay for RBP in serum	✓	✓	✓	✓
Vitamin A	Serum retinol and MRDR in serum samples analyzed using HPLC and a standardized method for 3,4-didehydroretinol and retinol	✓ (20% sub-sample)	x	x	✓ (20% sub-sample)
Folate	Microbiological assay for serum folate and Red Blood Cells (RBC) folate from whole venous blood lysate	x	✓	✓	✓
Vitamin B 12	Serum B 12 assessed using Roche E-170 Vitamin B12 “ECLIA”	✓	✓	✓	✓
Vitamin B1	Erythrocyte transketolase (ETK) activity assay of saline- washed Red Blood Cells (RBC)	x	x	x	✓ (20% sub-sample)
Vitamin B2		x	x	x	✓ (20% sub-sample)
Zinc	Serum zinc assessed using Atomic Absorption Spectroscopy (AAS)	✓	✓	x	✓
Iodine	Urinary iodine using ammonium persulfate	x	x	✓	✓

Waste Management

The guidelines on waste management developed by the Medical Laboratory Science Council of Nigeria were used during fieldwork for the management of waste to minimize the adverse effects of improper waste management. During data collection, provision for biohazard bags and sharp containers were supplied to teams. The biohazard bags were three different colours: Red, Yellow, and Black. The waste generated in the field labs was segregated into the right colour bag, the infectious materials were placed in the red biohazard bags, while the yellow biohazard bags were used for placing used swabs, hand gloves, and lab coats. The black bags were used for nonmedical waste. The sharp containers were mainly for the safe disposal of sharps such as needles, lancets, and used cuvettes. Each day, all biohazard wastes and sharp were submitted to the logistics officer, who delivered them to a Waste Management Expert at a nearby Health Facility for disposal using appropriate disposal method.

Survey Implementation (Pre-field Activities)

Pre-survey activities and Adaptation of INDDEX24 Mobile Application

In preparation for the collection of the quantitative interactive 24-hour (i24-hour) dietary recall data (Gibson and Ferguson 2018), extensive pre-survey work was required to develop the dietary input data required for the INDDEX24 mobile application (Coates et Al., 2017). These methods are well established, validated, and recommended for collecting detailed individual-level food information in the context of national surveys (EFSA, 2014). The INDDEX24 mobile application was selected for the survey as it was specifically developed for use in large surveys in low income developing countries. It offers the following advantages over paper questionnaire: guides enumerators and respondents through a i24-hour dietary recall interview in a structured manner; contains modifiable instructions to allow adjustments to the interview process; allows for real time data monitoring and checking by on-site supervisors and remote data managers; and provides instant calorie count for foods consumed as a quick data quality check among others.

Advanced preparation for the collection of dietary data were conducted through several workshops. Each training workshop was followed by field work. The following resources were developed and used in the development and adaptation of the INDDEX24 mobile application for Nigeria: (1) a list of foods, recipes, and ingredients (FRIL) that are consumed and are likely to be encountered during i24-hr recalls were collected from WRA and young children in urban and rural areas of each of the six geopolitical zones. Details of their energy and nutrient content for the target nutrients of the survey were also compiled from existing data sources and laboratory analysis or were calculated. Data quality checks as prescribed by INFOODS were applied in the compilation; (2) a database of standard recipes for selected mixed dishes listed for each geopolitical zone, including ingredients and their proportions. In most cases standard recipes were collected from across the country while some were compiled from existing recipe books or prepared in the laboratory; (3) standardized portion size estimation methods (PSEMs) for estimating portion sizes of each item listed in the FRIL; (4) a database on PSEM Conversion Factors (PSEM-CF and edible portion that will translate the quantity of each reported item using the assigned PSEM to the equivalent gram weight for the edible portion; (5) a table of tags and descriptors of items in the FRIL for detailed description needed for improved matching in the INDDEX24 mobile application.

In addition, the following pre-survey activities were conducted for the biomarker and anthropometry component: (a) identification of suitable cold stores and engagement of officials from the State Primary Health Care Development Agency (SPHCDA) (b) assessment of cold stores across the 36 states and the Federal Capital Territory, (c) assessment of local laboratories for biomarker analysis; and (d) development of tools for field data management.

Following the completion of the pre-survey activities, a Training of Trainers (ToT) Workshop for zonal coordinators on dietary intake was conducted, this was soon followed by the training of potential field data collectors for all the components (HH listing and questionnaire, dietary intake, anthropometry, and biomarker). In addition, a training was conducted on how to mobilize and sensitize selected communities and respondents about the survey to enhance response. After the training of field teams, a pilot was conducted followed by a debriefing meeting. All data collection tools and procedures were fine-tuned after the pilot, which set the stage for the commencement of training of potential interviewers and supervisors.

Eligibility Criteria, Recruitment of Respondents, and Consent Procedures

Inclusion in the survey was based on being apparently healthy (showing no signs of illness), aged 15- 49 years and pregnant women, children (aged 6-59 months), non-pregnant adolescent girls aged (10- 14 years), willing to participate by giving consent, and residing in the EA. Pregnant girls aged (10-14 years old) were excluded (pregnancy status was based on self-report). The exclusion criteria included difficulty standing (unsteady or chair-bound) for anthropometry, but interviews and specimen collection were included. Individuals who refuse to participate or are unable to give informed consent or assent were excluded.

Participation was voluntary and participants were not paid for being respondents in the survey. Nevertheless, they were given a gift as an incentive. Incentives were given at different occasions during data collection, for example, plates and bowls were given during the pre-training of respondents for the collection of dietary data, results for Hb, H. pylori, malaria, and referral to a primary health care center; and a plastic bowl after the visit from the biomarker/anthropometry team. In addition, soap was given after the diet interview and again after the repeat interview. Fortified vegetable oil was added as an incentive, and was given by the biomarker field teams. Respondents that declined to participate were excluded and not replaced. Participants were informed that all personal information they provide will remain confidential and will only be used to provide for the intended objective.

Upon first contact with the respondent (HH head, non-pregnant WRA, pregnant WRA, or caregiver of minors), a general written consent for all survey procedures for all components of the survey was obtained by the HH team. Additional written consent/assent was obtained for each component of the survey (i.e., biomarker, or anthropometry). Adolescent girls (aged 10-14 years) were asked to agree to the anthropometry and biomarker components after permission was granted by their parent or guardian.

Interviewers used tablets with an electronic informed consent form to collect consents from potential survey participants. All potential participants were given a printed copy of the consent form. If the respondent is illiterate, a witness was requested by the respondent to sign on behalf of the respondent. Consent was recorded by making a mark on the consent form on the tablet and on a printed copy retained by the participant. Consent processes were conducted in different stages. Written consent to participate in the survey was obtained from each respondent. Several consent forms were used for the survey.

Recruitment, training, and selection of field teams

All the field teams for dietary intake, biomarker, and anthropometry, except that of HH listing and HH questionnaire, were recruited using the following process: (1) a job description was developed based on roles and responsibilities agreed upon as indicated in the protocol; (2) advertised in print media and IITA website for a period of two weeks, and applications were received by the Human Resource Office; and (3) a committee was drawn from collaborators and partners in the survey (University of Ibadan, University of Calabar, Oxford Policy Management (OPM), and FMOHSW, and FMAFS) to shortlist suitable candidates that were invited to the training workshops. This process was followed for the zonal coordinators, supervisors, interviewers, anthropometrists, laboratorians, and phlebotomists. A total of 540 field staff (295 males and 245 females) were recruited. For the listing and HH questionnaire, and social mobilization field teams, existing personnel of NBS, NPC, FMAFS, and FMOHSW were recruited.

A ToT workshop on Dietary Intake Component of the NFCMS was conducted in Abuja on 7-18 December 2020. The overall objective was to train potential zonal coordinators and IITA survey team on data collection using specific survey tools (diet questionnaire and i24-hr dietary recall using the INDDEX24 mobile application) to enable them to co-facilitate the training of supervisors and interviewers. The following topics were covered during the training: interviewing techniques/ skills; i24- hr dietary recall methodology; how to collect dietary data using the INDDEX24 mobile application, how to administer the diet questionnaire; standard procedures for field data collection; coordination of field teams; field quality checks and supervision; Field Planning & Monitoring Application (Planfeld); and communication, among others.

Classroom practices were given priority during training after completion of each substantial topic. Participants made two field visits to different communities around Abuja. Each visit was followed by detailed feedback on what went well and what the trainees need to be re-trained on. A total of 18 participants (12 from the zones and 6 Research Associates from IITA) were trained. At the end of the training, based on field and classroom performance, six zonal coordinators were selected, the other six were taken as supervisors, and the remaining six Research Associates became field personnel assisting the zonal coordinator during training of field teams and data collection.

A training workshop on dietary intake assessment for potential field teams was held on 11-29 January 2021 in Abuja. A total of 214 participants (47 supervisors and 167 interviewers) composed of 86 males and 128 females, were pre-selected from all over the country and trained. Seven subject matter experts sourced locally and internationally (Tufts University- International Dietary Data Expansion Project (INDDEX) and FHI 360-Intake Center for Dietary Assessment) were used as facilitators at the training (physically or virtually). All training sessions were live-streamed and adherence to COVID-19 safety guidelines was enforced. The training methods used included demonstrations, role play, practice time working in pairs, and the provision of daily feedback with corrections. In terms of content, all the aspects of dietary intake data collection, ranging from technical and operational to logistics with field coordination, were adequately covered during the training.

Technically, dietary interviews included the collection of interactive 24-hr data and a series of questions related to diet (e.g. infant, and young child feeding practices, consumption of fortified and biofortified foods). Intake and INDDEX prepared training guides/handouts based on their expertise, with inputs from IITA. Alongside training guides, the supportive materials provided included PowerPoint presentations delivered live or pre-recorded, demonstration videos/training guides/handouts on dietary pre-training, use of INDDEX24 mobile Application, interactive 24-hr dietary recall interview, PSEMs and testing dietary scales, and monitoring of playdough density. The playdough is one of the PSEMs used during data collection.

At the end of the training exercise, the participants who were to collect data were selected based on classroom performance, completion of the diet questionnaire, and 24-hr recall using INDDEX24 mobile application.

A 10-day training workshop for field supervisors, laboratorians, and phlebotomist for the biomarker and anthropometry component was conducted on 20-30 January 2021 in Abuja. The anthropometrists and interviewers were trained for five days, and the field supervisors, laboratorians, and phlebotomist for 10 days. A total of 224 participants (148 trainers, field supervisors, laboratorians, and phlebotomists; 21 anthropometrists; and 55 interviewers) were trained. Topics covered during the workshop were: introduction to NFCMS; overview of survey field team members' roles and responsibilities; what samples are collected and why; laboratory safety and Good Laboratory Practice (GLP); consent, assent, and confidentiality; urine sample collection and handling; stool sample collection and procedure for helminth assessment; venous blood collection and handling of plasma, serum and RBC; laboratory procedures for rapid malaria, Hb, H. pyroli, and plasma glucose; labeling of samples; biohazard waste management; transfer of field forms to the digital platform Computer- Assisted Personal Interviews (CAPI)I and CommCare (an open-source mobile data collection platform that enables non-programmers to build mobile applications for data collection in low-resource communities); field forms, results, and referrals; sample custody and tracking; field anthropometry and biomarker setup, and quality assurance.

For anthropometry, the following topics were covered: introduction to NFCMS; overview of roles and responsibilities; anthropometric data collection; components of anthropometry measurements (age, sex, height/length, and weight); procedure and protocols for anthropometric measurements; interview techniques; obtaining consent; introduction to CAPI and how to complete the questionnaire; and security and COVID-19.

A nine-day training program for interviewers in the HH Listing and Socio-economic status component of the NFCMS, followed by a pilot study and debriefing meeting, was held in Abuja. Meanwhile, field practice demonstration sessions were held at designated locations within the FCT. The objective of the workshop was to train interviewers (mappers and listers) for the conduct of mapping, listing, and the administration of HH socio-economic questionnaires. The training exercise was held from 18 to 22 January 2021 and was subsequently followed by field practice demonstration exercises held from 23 to 27 January 2021. A total of 124 participants (78 males and 46 females) drawn from members of staff of NBS and NPC were trained.

The information covered during the training included: the importance of HH listing; survey design and methodology, mapping, and HH listing; reading of enumeration area maps and tracing of enumeration area boundaries; listing procedure; how to complete the HH questionnaire; HH food insecurity and coping strategies; data quality control measures; how to synchronize and send completed data to the central server; and roles and responsibilities of field personnel. Trainees were subjected to two short quizzes and an examination to test their knowledge and understanding on the modules taught them during the classroom training sessions. Mock interviews, demonstrations, role playing, discussions, comments, and question and answer sessions were used during the training workshop. A debriefing meeting on the outcome of the pilot survey was also held, which led to some modifications to already- developed questionnaires and menu on the CAPI device.

A two-day ToT Workshop on Mobilization and Sensitization for State Officers from the State Ministry of Health (SFMOH), NPC, and State Ministry of Agriculture and Rural Development (SMARD) was held from 27 to 28 January 2021 in Abuja. Participants were nutrition desk officers (focal persons) from SMARD, State Nutrition Officers from the Ministry of Health, and State Mobilization (SM) Officers from NPC. Resource persons were from NPC. Participants were trained on the following topics: community mobilization essentials; preparing community mobilizers (CM); effective mobilization; community entry; introduction to CM tools, IEC material and other documents; community mobilization reporting tools; and reporting CM activities, among others. Three participants were drawn from each state, plus the FCT. A total of 107 persons (55 males and 51 females) participated in the training workshop. Training of mobilizers and sensitizers from each of the selected EAs per state were trained by those trained during the ToT.

A three-day MRDR Survey Training, Planning Meeting and Pilot for selected biomarker component coordinators (6), field supervisors (6), laboratorians (18), and phlebotomists (18) for the NFCMS was held from 2 to 8 August 2021 in Abuja. A total of 48 persons participated in the MRDR training. Participants were trained on the use of CommCare and MRDR Apps; how to conduct the MRDR survey; and age verification. An interactive session was held to discuss the appropriate oily snack, and foods to avoid on the day of dosing. Review of movement plans, logistics plans, and distribution of field supplies was done zone by zone. Practical demonstrations were also carried out to acquaint trainees with installing the MRDR application, updating their tablets, dosing methodology for MRDR survey, etc. Pilot studies were undertaken within the FCT. The challenges encountered during the pilot were deliberated upon during the debriefing session and noted for improvement of the MRDR survey.

Pilot Survey

After training all field teams, a pilot survey was conducted that included gathering informed consent, data collection and management, and biomarker sample collection in 18 EAs. Through the latter, the intended number of respondents in each target group per EA were selected, resulting in 671 total respondents. Participants were accordingly informed that they were participating in a pilot survey. The pilot was conducted in selected urban and rural communities (18 EAs) close to the training location and surrounding Abuja. This pilot was conducted mainly to test the tools and implementation, including tablets, communications, social mobilization, forms, interview techniques, questionnaires, quality control tools, anthropometry, phlebotomy, lab techniques, etc. Data collected from these respondents were not included in the survey. Information gathered from the pilot survey was used to modify survey collection instruments and field procedures. All changes in the questionnaire after the pilot were agreed upon by the stakeholders and approved by the TAC and SC before approval by the ethics committee.

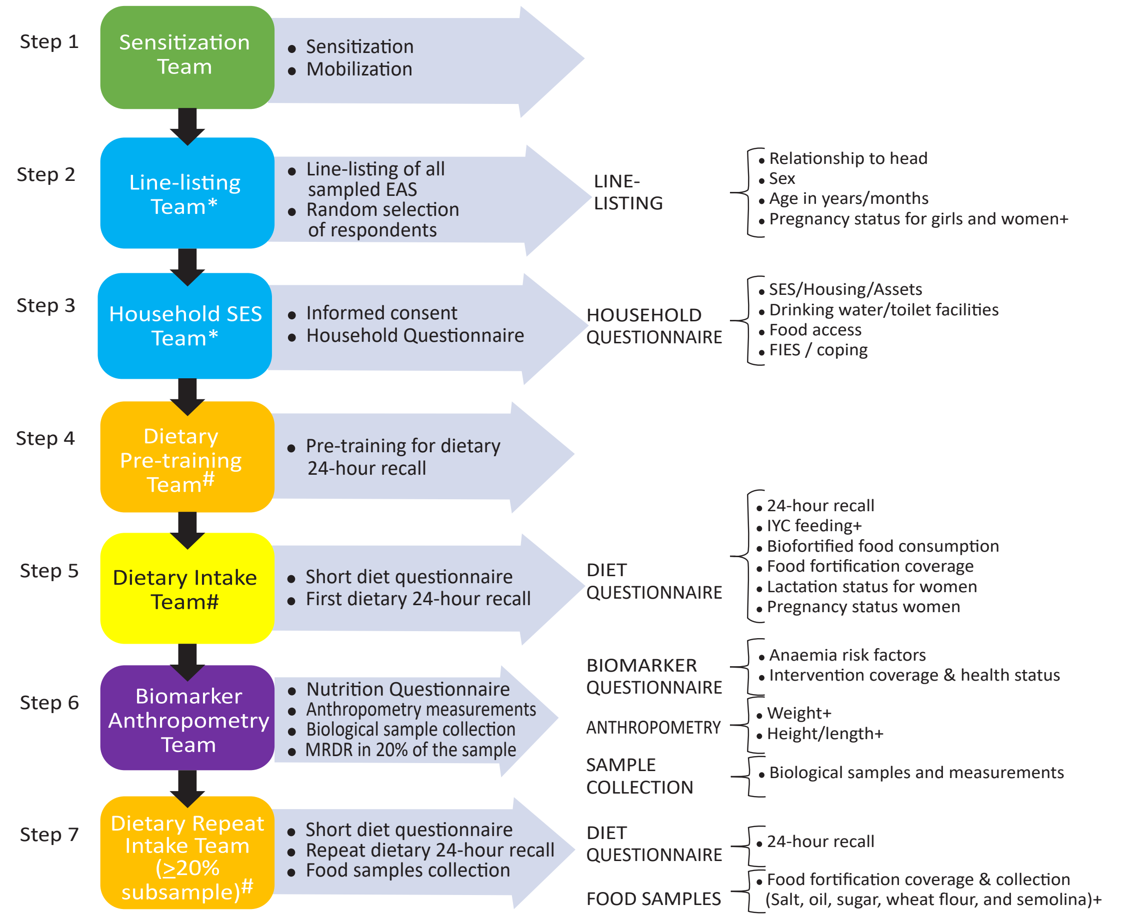
Survey implementation (Field Work)

Sensitization

Social mobilization and sensitization in the areas surveyed was led in each state by a State Mobilizer from the NPC, and assisted by a state subject matter specialist from FMOHSW and FMAFS. The SM worked with the CM in each of the selected EAs. The CM were selected from the Departments of Health and Agriculture in each LGA.

Survey components, order of field operations, and information collected by each component

Given the highly technical nature of the survey, the skills required for the different survey components differ markedly. And as such, separate field teams were recruited to undertake the HH listing, dietary assessment, anthropometry, and the collection and handling of biomarker samples. While there were different teams with specialized proficiency and training dedicated to the different survey components, the different forms were linked by HH ID (from the HH line-listing) enabling subsequent alignment and linking of components during analysis of indicators across the different enumeration tools/components. There was also a higher-level supervision and coordination across these teams that provided oversight for the entire survey data collection process. The field teams, the survey component they are responsible for, and information collected by each component during their visit is summarized in **Figure 4**.



* The line-listing and household SES teams are the same interviewers.
# The dietary pre-training and dietary repeat intake teams are the same interviewers.
+ Only collected for relevant respondents.

Figure 4. Survey components, order of field operations, and information collected by each component

Deployment of field teams and administration of survey questionnaire to selected respondents

Five questionnaires were used to collect information on: (1) HH; (2) non-pregnant and lactating WRA; (3) pregnant WRA; (4) children (aged 6-59 months); and (5) adolescent girls (aged 10-14 years). Each sampled respondent received a minimum of two visits and a maximum of up to five visits. For each component, a maximum of three visits were made if the respondent was not available for the first visit. The teams deployed to the field at different times. The mother or caretaker of adolescent girls (aged 10-14 years) and children (aged 6-59 months) were present during all interviews and sample collections. After the completion of the diet questionnaire, the respondent was invited by the biomarker interviewers to complete the biomarker interview.

Sensitization teams: The sensitization team was deployed on 10 February 2021, a week before the HH listing team. Sensitization was conducted a week before the team entered the community. In addition, a jingle was played via the widely listened radio stations in each of the states a week before the teams commenced data collection and until data collection was completed in the state. The jingle was translated to Hausa, Yoruba, and Igbo and to other languages, as needed. Local guides were also available to the teams in each community.

Line listing teams: The line listing teams was deployed on 17 February 21 and continued after a one- week break during Easter holidays. The teams listed all building structures in the selected EAs and all members of a HH. The listing data was then transmitted to a central server for sampling of respondents. The list of sampled respondents was then sent to the HH teams.

Household SES teams: The HH listing teams also administered the HH questionnaire after sampling of respondents. The teams deployed on 17 February 21 and continued after a one-week break during Easter holidays. The teams collected information on general characteristics of the head of HHs (i.e., ethnicity, religion, education, and employment). The HH in sample questionnaire also collected information on the HHs' dwelling unit (i.e., source of drinking water; type of toilet facilities; materials used for flooring, external walls, and roofing; ownership of various animals and durable goods; area where members of the HH often wash their hands; main way of refuse disposal, presence of a vegetable garden and fruit trees; HH food insecurity; and HH coping strategies).

Dietary pre-training: After the completion of the HH questionnaire, the sampled respondent was invited to participate in a group dietary pre-training. The interviewers trained the sampled respondents on the process of data collection for the 24-hr dietary recall interview. They also provided all selected respondents with bowls and plates and requested them to serve all foods/ drinks for the selected participant (i.e., either the WRA, or child, or pregnant woman).

Dietary intake teams: The day after the training was observed as a reference day. The following day, the diet teams conducted the diet interview using the short diet questionnaire and first 24-hour dietary recall. For example, if the training of respondents is conducted on Monday, then Tuesday is observed as the reference day, and the diet interview is conducted on Wednesday.

Biomarker and anthropometry teams: The biomarker and anthropometry teams moved together in the same EA with the dietary intake team. Immediately after the dietary interview, the respondent is referred to the biomarker and anthropometry teams. The biomarker team administered the biomarker questionnaire and collected anthropometry measurements, blood, and urine samples.

Dietary repeat intake teams: A random sample (25 percent) of non-pregnant WRA and children (6- 59 months old) from respondents who completed the 24-hour dietary recall was visited for a repeat 24- hour dietary recall interview and collection of food samples on non-consecutive days.

Phase 1 data collection commenced on 17 February 2021 for the HH listing and questionnaire field teams, while the dietary intake and biomarker/anthropometry field teams commenced on the week of 8-12 March 2021. The total number of personnel involved in each component during data collection are presented in Table 5 below.

Table 5. Number of personnel per component used for data collection.

Component/section	Number of team members
NBS-ICT sampling of respondents	36
NBS/NPC HH listing and questionnaire	145
NPC/FMAFS/FMOHSW sensitization and mobilization	485
Anthropometry and Biomarker	156
Dietary intake	184
Total	1006

At the end of Phase 1, a total of 162 EAs were listed, respondents sampled, and HH interviews conducted in 144 EAs. Three of the zones had collected data on dietary intake and biomarker from 27 EAs each.

Challenges encountered during Phase 1 data collection included: (1) size of randomly selected EAs resulting in not meeting required number of respondents; (2) coverage rate of less than 80 percent; (3) poor mobilization in sensitization especially, in urban areas; (4) feedback from reviewers of the dietary interviews was not stepped down to the supervisors and interviewers, resulting in same mistakes occurring through the period; and (5) security-related issues.

To address the observed challenges, the following steps were undertaken: (1) sample uptake was increased for the remaining EAs in each zone (**Table 6**) – children (aged 6-59 months) increased by 5, adolescent (aged 10-14 years) increased by 1, WRA increased by 4, and pregnant women increased by (1); (2) revisited EAs where possible; (3) local mobilizers, supervisors and interviewers were re- trained; (4) scheduled appointments; (5) aimed for maximum visits to each respondent (3x); (6) improved incentives for respondents (sachet fortified vegetable oil); (7) played the jingle once a week before the team enters the state and continue until end of data collection in the state; (8) conducted targeted mobilization; and (9) made sure that local guides were from the community. In addition, refresher training after the Ramadan break was conducted focusing on observed mistakes during data collection.

Table 6. Adjusted sample size per EA for Phase 2 data collection.

Sampling target population	Respondents selected per EA in Phase 1	Respondents selected per EA in Phase 2	Total sample size at national level
Non-pregnant WRA (15-49 years old)	16	20	6240
Children (6-59 months old)	16	21	6240
Pregnant women (15-49 years old)	3	4	1170
Non-pregnant adolescent girls (10-14 years old)	3	4	1170
Total	38	49	14 820

Phase 2 data collection commenced immediately after Easter holidays (12 April 2021 for the HH listing and questionnaire field teams and ended 24 June 2021, while the dietary intake and biomarker/anthropometry field teams commenced 17 May 2021 and ended 04 July 2021). At the end of Phase 2 data collection period, the anthropometry and biomarker component had collected data and biological samples from 12 410 individuals (5469 WRA, 5061 children aged 6-59 months, 880 pregnant women, and 1000 adolescent girls). For dietary intake, a total of 11 713 were interviewed (5435 WRA, 5016 children aged 6-59 months, and 893 pregnant women). In addition, a total of 1152 salt samples, 398 sugar, 340 vegetable oil, 91 semolina flour, and 48 wheat were collected.

For biomarker samples, at the end of field work, 5961 urine samples were collected indicating a coverage rate of 86 percent, 10 295 stool samples representing a coverage rate of 75.4 percent, and 11 957 blood samples representing 80.7 percent coverage. More blood samples were collected in the North West zone compared to South East. For the dietary component, from the 364 EAs covered, a total of 11 344 respondents were completely interviewed, which is equivalent to 89 percent national coverage. The North West had the highest coverage at 2081, followed by South West at 1967, SS at 1918, North East at 1857, North Central at 1783, and South East at 1738. No zone had less than 92 percent coverage in complete questionnaire administration based on the number of EAs covered.

For food samples collected from the 20 percent sub-samples of non-pregnant WRA at the dietary intake repeat interview, 2031 food samples were collected nationwide (1153 salt, 338 vegetable oil, 400 sugar, 89 semolina flour, and 51 wheat flour).

A total of 364 EAs were covered out of the 390 samples. Twenty-six (26) EAs were lost to insecurity. Although total coverage was higher for dietary intake compared to biomarker, the minimum coverage rate of 80 percent was met for all survey components, except for the stool sample.

Data quality, management and processing

Given the magnitude and complexity of the survey, daily monitoring of data collection was undertaken. Key indicators that were measured daily included:

- completion rates;
- refusals and revisits; and
- data inconsistencies such as:
  - duplicate IDs;
  - out-of-range dates and times;
  - outliers for key continuous variables, etc.; and
  - data mismatch (e.g. some biomarker data did not have the corresponding household data). A dashboard was designed and used to monitor data quality indicators, enumerator performance, completion rate for the various components and tracking the average frequency of revisits.

Household in Sample

Out of 86 314 persons listed, 34 469 were the target population in 9107 households (HHs). Hence, total number of HH questionnaires completed was 9107. All the HHs gave consent to the survey, thereby, yielding a response rate of 100 percent. The HHs in sample data were mainly processed and analyzed using SPSS statistical software (version 21). A section of the analysis (food security) was done using "R" statistical package. Various NFCMS indicators were produced and cross-tabulated with nominal variables such as place of residence (urban/rural), type of HH (sex of HH head), level of education of HH head, as well as the wealth quintile group of the HH. In all cases, reports are provided at national level and at geopolitical zonal level (**Table 7**).

Table 7. Reporting domain and disaggregation level of household in sample component

National	Residence	Household type	Education of household head	Geopolitical zone	Wealth quintile
	Rural	Male-headed	None	North Central	Poor
	Urban	Female-headed	Primary	North East	Second
			Secondary	North West	Middle
			Technical / Vocational cert.	South East	Fourth
			Higher / University/ College	South South	Richest
			Others (Specify)	South West	
			Missing		

Relative poverty refers to living standards that are lower than those of other people in the population and can be assessed by dividing or categorising the population into equal quintiles. A quintile is a fifth (20%) of the population. The first quintile therefore represents the lowest fifth of the data; the second quintile represents the second fifth while the last quintile represents the topmost fifth of the data. The 20% with the highest scores would be categorized as the 'wealthiest quintile'.

The Wealth Index, presented as quintiles, was constructed using the asset approach, as well as condition of living, whereby all household possessions and access to household facilities are included as much as possible. The wealth quintiles were derived from a series of variables among which were household construction materials (flooring, walls/house, roof, flooring, walls/house, and roof), water sources and sanitation access, household Assets owned by household members (e.g., television, refrigerator, electricity, cooking fuel etc). The wealth index scores were then derived and used to rank individuals in the target population by wealth status, namely; poorest, second, middle, fourth and richest quintiles

Dietary intake

To ensure data quality control for the dietary intake component, the following actions were undertaken: (1) crosschecking of selected respondents to make sure there are no duplicates or oversampling; (2) summarizing respondents selected in each EA to highlight EAs where there were too few sampled respondents for discussion with the listers; (3) daily monitoring and review of collected data and feedback to zonal coordinators; (4) daily discussion of errors noticed immediately with the supervisors and interviewers; (5) testing of tablets, weighing scales, and play doughs; (6) tracking of interviewers with respect to the time taken to complete an interview since the time taken varies with the number of food items consumed; and (7) conducting random review of collected data in CommCare.

Post-Field Data Processing: Of the 12 805 individuals sampled for the diet component, 11 713 completed the diet questionnaire. The final sample used for analysis is 11 255 respondents (5281 non-pregnant women aged 15-49 years, 1006 pregnant women aged 15-49 years, and 4968 children aged 6-59 months). Non-pregnant WRA were subdivided by lactation status, which was defined as having breastfed a child aged <12 months the previous day or night. Children aged 6-59 months were subdivided by age groups (6-23 months and 24-59 months) to account for potential breastfeeding in the younger children.

All diet data were analyzed using the SAS statistical software (v9.4). Frequencies and Chi- square tests were obtained using SAS Procedure Surveyfreq using the survey design variables for EA and geopolitical zone, with the final sample weights adjusted for non-response. For all target groups, data are presented by urbanicity (urban vs. rural). For non-pregnant women (aged 15-49 years), data are presented per geopolitical zone (North Central, North East, North West, South East, South South, South West) and by wealth quintile. For children (aged 6-23 and 24-59 months), data are presented by sex (male vs. female). The total number of respondents for each analysis used as the denominator for percentages are reported in the tables.

Statistical analyses were performed using SAS. Survey procedures (Proc Surveymeans, Proc Surveyfreq) were used that incorporate dietary survey weights and design variables (Stratum, PSU). The NOMCAR option was used to include observations with missing values in the variance estimates assuming that the missing was not completely at random. The option chisq (second order) was used to test overall differences among the comparison groups of interest (i.e., between residence and zone within each target group). This option provides the second- order Rao-Scott chi-square analysis, which is the design-adjusted version of the Pearson chi- square test.

For analyses of usual nutrient or food intake, the National Cancer Institute (NCI) method was used (Tooze 2010). The *Intake* Program for Usual Diet Assessment is a suite of SAS programs that implements the SAS macros provided by NCI to estimate usual food and nutrient intakes in an integrated way. The program uses survey weights to estimate population weighted intakes and 250 bootstrap samples that are created using the survey design variables (Stratum, PSU) to estimate variances (standard error and confidence intervals) of the nutrient or food intake estimates.

The NCI method implements statistical modelling using the information from those individuals with first and second recalls to estimate the within-person variation in food and nutrient intakes and estimates a distribution of intakes for the entire population or sub-population of interest that represents only the between-person variation.

The modelling strategies used in these analyses are described as follows. In most cases, each nutrient or food was modelled separately for each sub-population (or level of analysis). For example, five separate models were constructed for 24-59-month-old children: 1) national level, 2) urban, 3) rural, 4) boys, and 5) girls. In total, including all children and women models, 24 models were run for each nutrient or food. This strategy allows the distribution of usual intakes to use the within-person variation of the sub-population of interest. This strategy cannot be used when there are insufficient numbers of individuals with a non-zero intake of the food or nutrient, which occurred in some cases. In cases with inadequate sample size of non-zero consumers, sub-populations were pooled, and the same within-person variation was used to estimate separate distributions for each sub-population.

Another modeling strategy was the use of covariates. For all models, an indicator for weekend was included as a covariate and the number of weekend days per week was indicated to adjust the intakes to represent the actual distribution of weekend and non-weekend days in a week. For all models,an indicator for second recall was included to account for any differential reporting on first and second recalls. For the children's models, sex (except for models of boys and girls only) and age were included as covariates. For the non-pregnant women models, lactation status (except for the model for lactating women only) and age were included for covariates. For the pregnant women models, age was included as a covariate.

For some of the food models did not converge (biofortified foods, semolina, and maize flour), primarily due to insufficient number of individuals consuming or severe skewness. For these foods, the NCI method could not be used, and intakes were estimated using the first recall and the SAS survey analysis procedures were used.

Nutrient intake adequacy was estimated with the NCI method in the same modeling procedures that produce the usual intake distributions.

The Estimated Average Requirements (EAR) from the Institute of Medicine were used (IOM 2000). Usual intakes are presented as mean (95% CI) and as median (25th, 75th percentile), as the distributions of nutrient intakes tend to be skewed. The EARs for nutrient intakes obtained from the Institute of Medicine (www.nap.edu), representing the mean daily requirements for a population, are shown for comparison. For women, age group-specific EARs are presented for NPNL women, non- pregnant lactating women and pregnant women. Reference children 24-59 months of age in this survey overlap with two age groups used for presenting the EARs. Therefore, EARs for both children 1-3 years and 4-8 years of age are given. For the group of younger children, EARs are shown for non- breastfed children 1-3 years of age. The prevalence of reference women and children estimated to have intakes below the nutrient requirements are also presented.

One exception was zinc, which used the EAR for a mixed or unrefined plant-based diet from IZiNCG (IZiNCG 2004). The NCI method estimates the percentage of the population with intakes below the EAR (the EAR cutoff point method). The EAR cutoff point method was used for protein and micronutrients except iron. Iron was assessed using the probability approach because iron requirements are skewed for young children and non-pregnant non-lactating women. The iron module of the *Intake* Program for Usual Diet Assessment was used to estimate the usual intake distribution of iron and assign probabilities of inadequacy at each intake in the distribution, and then the average probability across all individuals was estimated, which is the prevalence of inadequate iron intakes. The IOM EAR for iron was first adjusted to an assumed 10% bioavailability, from the 18% bioavailability assumption of the IOM [IOM EAR*(0.18/0.10)]. In other words, the EAR for iron for Nigeria was set higher than the IOM EAR because less is assumed to be absorbed due to differences in the Nigerian diet, which consists of more unrefined cereals and less meat than a US diet. For pregnant and lactating women, the EAR cutpoint method was used, and for pregnant women, the EAR was not adjusted for bioavailability due to the increased efficiency of iron absorption during pregnancy. In addition, analyses for non-pregnant women were not conducted due to the inability to combine the EAR cutpoint method (for lactating women) and probability approach (for non-pregnant, non-lactating women).

Nutrient densities of complementary diets of children 6-23 months of age were assessed using the NCI method by simultaneously modelling the two components of the density – the nutrient and energy. Nutrient densities are expressed as the amount of the nutrient per 100 kcal energy from complementary foods. There are no average requirements for nutrient densities, but published desired nutrient densities are provided as a descriptive comparison to the usual intake distribution of nutrient densities (Dewey and Brown 2003).

Data processing was carried out on the diet questionnaire and the 24hr recall dataset and associated databases after data collection (fieldwork). It specifically included all steps that preceded the analysis of data.

Diet questionnaire*:* The software platform for the collection of the Diet Questionnaire data during the NFCMS fieldwork was the CommCare Application, developed by Dimagi Inc. CommCare is an open- source platform for survey data collection. The diet questionnaire contained two related modules mainly – questionnaire for women and children. Some of the questions asked was similar for both women and children, so same method was employed for cleaning the two. The following are the specific processing steps that are employed for post-data processing of Diet Questionnaire:

1. Downloading of Diet Questionnaire Dataset: The Data was downloaded from CommCare App to Excel worksheet to enable proper management and cleaning of the Diet Questionnaire Data.
2. Respondent Identifier Corrections and Editing: The first task performed was to look at the11-digit Identifiers for the Diet Questionnaire to be sure it conforms to standard. Duplicates were removed and the IDs greater or less than 11-digits were corrected.
3. Removing Redundant, Extraneous and Control Variables: The CommCare App creates a large number of control and extraneous variables during data collection. These variables were not part of the dataset and therefore needed to be excluded in the post-field data cleaning. These variables were looked at critically before removing and saving and preserving them in other files for references when needed.
4. Renaming of Variables: Most of the variables were renamed because during the creation of the source program in CommCare names corresponding to questions in the questionnaire were used as variable names. Eg. Bfw3: This was renamed to reflect the actual questions asked, and the new name became "Ate_Sweetpotatoes". This reflected the actual variable and users can easily relate to this.
5. Recoding of Variables: CommCare App in most cases converts most numeric entries into character thereby making it impossible to use these variables in arithmetic computations. The variables affected were consequently converted to numeric as part of post-filed cleaning. Most of the variables in the diet questionnaire dataset were recoded to create other variables used in the analysis. Some of the action was performed on the raw data prior to data analysis. Others were performed during the data analysis stage. For example, in the raw data, additional variables were created from one or more existing(collected) variables, e.g. TRIMESTER_V1 was created from two existing variables (Preg, and Age_pregnancy; if Preg = 1 for yes, and Age_pregnancy = 5 months, then Trimester_V1 = 2(2nd Trimester). Note that Trimester_V1

was not collected but created from existing variables to make it easier for data analysts to use this single variable in their analysis instead of having to compute it by themselves.

There were other variables similarly created in this way, for example, Respondent_Category which was created from the combination of codes of Age in years, Age in Months, and Lactation in Months. It resulted into new code for: 1= NON_PREG_LACT, 2= NON_PREG_NON_LACT,3=Pregnant, 4=Children 6-23 months, 5=Children 24-59 months. Most variables in the diet questionnaire were recorded in this way.

6. Formatting of Variables. A library of recoding and formatting was built. This is necessary to assist the data analysts during data analysis. The analysis just needed to use this library where all the formatting is contained, and this will assist him a great deal instead of having to do the recoding and formatting each time. E.g. For variable Region: 1=NC, 2=NE, 3=NW, 4=SE, 5=SS, 6=SW.

7. Harmonization of Open-ended Responses: The open-ended responses were checked for consistency of spelling and other anomalies, e.g., for variable "Food_brands" – there are entries like: "Unbranded/unbranded"; "Unknown/unknown"; "Others Specify/others (specify)". Similar variables were treated in this same way.

8. Missing Data: The missing data observed during the data cleaning and recoding was cross-check to be sure it is missing right from the field or during transmission of downloading or otherwise. All missing data was verified. Log files were reviewed constantly if missing values were observed**.** Missing and non-feasible values were taken care of prior to data analysis of diet questionnaire. All missing values were investigated to determine the nature as there could be 'genuine' missing values because of topographical errors. The missing values that occurred because of topographical errors were identified and corrected instantly. When other missing values were identified, action was taken during the data analysis stage. Some missing values were completely excluded during the analysis stage while others were treated as non-response which were taken care of by sampling weights adjustment. No data imputation was made to replace missing values. Also, all observations with missing values or non-positive values for sampling weights were excluded during data analysis. Observations were also excluded from the analysis with missing values for STRATA(Zones), or CLUSTER(EA codes). E.g. The cluster goes from 1-65 for each level of Strata, so any cluster greater than 65 was excluded as not feasible or where Strata is greater than 6 also treated as not feasible and excluded after serious checking to be sure it was not topographical error. Final operation on missing values was carried out during data analysis by employing SAS Software procedure PROC SURVEYFREQ which enables the efficient handling of missing values in survey datasets. The NOMCAR option of PROC SURVEYFREQ was used to take care of missing values for both dependent and independent variables in the variance estimation.

9. Linking to GAIN datasets: A lot of food brands were reported and collected during the survey from the households of the sampled respondents. Fortification status was recorded (fortified or not fortified) based on micronutrient contents from lab analysis and secondary data obtained from Global Alliance for Improved Nutrition (GAIN) databases. The process of linking followed these steps: The list of food brands was obtained from the diet questionnaire, cleaned/verified, harmonized, and sorted for the 7 food vehicles (Vegetable oil, Wheat flour, Maize flour, Semolina, Salt, Sugar, Bouillon cubes) obtained from the survey households. This was sent to GAIN to go through and identified those that match what was in their own database. GAIN concluded this process and sent back the files attached with new columns (Fortified, and not fortified). There were some brands not found in the GAIN database. GAIN sent back what they were able

to merge with their database in excel. There was a challenge to link this GAIN identified food brands back to the survey database (diet questionnaire file) because there was no primary key to link them and it was impossible to link with the brand names since in NFCMS database thesebrands were not texts but codes (1, 2 ,3, …..m) . The first step was to assign the appropriate codes to each brand in excel and then export to SAS for the linking and analysis. With these steps the food brands as cleaned and checked was successfully linked and integrated to the NFCMS database files. These food brands were from the households of women of reproductive age (15- 49 years old), Pregnant women (15-49 years old), and Children 6-24 months old households.

24-hr recall dataset*:* After data collection, various data processing steps were carried out on the 24- hour dietary recall data hosted on CommCare and prior to data analysis. These steps were carried out with guidance provided by *Intake*.

1. Processing of new foods and ingredients that were reported by respondents during the survey, which are referred to as Non-Standard Food Items (NSFIs), and updating the Food, Recipe, and Ingredient List (FRIL) domiciled on the Global Food Matters Database. The following steps were carried out: 1) Identified and compiled a list of all NSFIs in the 24-hour dietary recall dataset as recorded by the interviewers; 2) Harmonized NSFIs food names across all 6 zones; 3) Assigned new food codes to NSFIs based on their food groups in line with the requirements of the Global Food Matters Database; and 4) updated the FRIL, that is the Food Composition Table (a compilation of foods and nutrient composition per 100g), Portion Conversion Factor (a list of conversion factors for using portion size estimation methods like playdough and dry rice) and Tags worksheets (a listing of metadata to support the probing of foods during the recall interview) ,with the new food codes along with all corresponding dietary inputs for each NSFI. The updated FRIL worksheet was then uploaded to the Global Food Matters Database.
2. Editing the 24-hour dietary recall dataset by assigning the new food codes to all NSFIs entries using the bulk update feature included the processing of interviewer comments (general pass comments, 2nd pass comments, and 3rd pass comments) in the 24-hour dietary recall dataset by identifying and reviewing all comments. The comments were grouped into 5 categories; fortifiable foods, edible portion, alternative Portion Size Estimation Method (PSEM), edit to Standard Recipe and others depending on the comment. Suggestions were then made for editing the FRIL and/or the dataset. The steps followed included: 1) reviewed suggested edits to determine food items and recipes to be added to the FRIL; 2) harmonized suggested edits across all 6 zones per category to facilitate making edits to the FRIL and/or the recall data, and 3) updated the FRIL with new food items, recipes, recipe variants, and/or conversion factor data based on suggested edits from comment review. See Processing Non-Standard Recipes (NSR) below for details on Standard Recipe collection, identified recalls in the dataset with comments in edible portion, edit to standard recipe and other category requiring edits. New food codes or recipe codes were assigned to the recalls in the dataset in these categories based on the suggested edits using the CommCare bulk update feature. Comments in fortified foods category were left as is since attempts to re-classify foods was not feasible due to conflicting information on fortification claims and status. Suggested edits in alternative PSEM category were addressed outside CommCare.
3. Processing Non-Standard Recipes (NSRs) reported in the 24-hour dietary recall dataset: An inventory of all NSRs in the dataset was created, clearly indicating NSRs with ingredient information (category 1) and NSRs without ingredient information (category 2). NSR names

were then harmonized across the 6 zones per category. The frequency of occurrence of each NSR was determined. Processing the gaps in NSR information followed these steps: (1) A set of NSRs without ingredient information, that is category 2 NSRs, that already exists as standard recipes on the FRIL were determined and recoded to standard recipes; (2) Another set of category 2 NSRs that were identical to category 1 NSRs in the dataset were also determined. In this case, average recipes were created from category 1 NSRs data to provide recipe information for the matched category 2 NSRs.

4. The recipe worksheet of the FRIL was updated with average recipes created from category 1 NSRs in the dataset. Cooking sessions were conducted to collect recipe information for the remaining set of category 2 NSRs that could not be matched with existing data in the FRIL or dataset. Standard recipe information was also collected based on suggested edits from comment review. The newly collected standard recipes along with recipe density data were added to the FRIL and the updated FRIL was uploaded on to the Global Food Matters Database. All category 2 NSRs in the dataset were assigned recipe codes using the CommCare bulk update feature. All NSRs were checked for quality by checking the proportions of individual ingredients and the sum of proportions. Errors were corrected by replacing the NSR with a standard recipe.

5. Determination of Portion Size Estimation Methods - Conversion Factor (PSEM - CF) of foods and recipes with placeholders on the FRIL and NSFIs reported during data collection – Updated Portion Conversion Factor worksheet of the FRIL with all placeholders replaced with accurate data and collected needed food density and edible portion factors for ingredients, single foods and recipes.

6. Reviewed the Food Composition Table (FCT) for correctness and reliability using a designated Standard Operating Procedure as a guide. The guide was developed with the INFOODS data quality checks serving as a basis. The guide is available as an additional documentation accompanying the FRIL through Global Food Matters Database.

7. Adjusting for Nutrient losses using Nutrient Retention Factors: this was done by compiling cooking methods as applied on ingredients used in recipes, identifying foods and sources of NRF, assigning factors from source tables to each food/cooking method in the FRIL. Nutrient retention factors were from USDA Table of Nutrient Retention Factors (Release 6, 2007) and FAO/INFOODS Food Composition Table for Western Africa (2019). Peculiar adjustments for pro- vitamin A retention (especially in red and bleached palm oil) was applied in this survey. For fortificants levels in fortified branded items, the survey relied on results of laboratory analysis.

8. Processing review notes (log files) used for data quality monitoring as created by Intake/ INDDEX during NFCMS data collection: The log files were reviewed to identify dataset entries that required edits. Log file entries requiring edits were categorized and documented based on edits to be addressed within CommCare and edits to be addressed outside CommCare. Edits to be addressed within CommCare were done by assigning food codes or recipe codes to recall data using the bulk update feature.

9. Addressing gaps in the dataset and outliers using the analytical report feature: Some food codes were assigned to food items in the dataset using inappropriate base term food codes and needed to be recoded to the correct food code. Gaps reports from CommCare were reviewed to identify missing conversion factors and references to items in the FCT. NSRs having standard recipes were assigned standard recipe codes in CommCare. Outlier portion estimates and measurement amounts in the dataset were identified outside of CommCare using SAS programs. Values were replaced with average estimates obtained by averaging portions specific to the food and target group.

Infant and Young Child Feeding (IYCF) indicators: The work of creating additional variables/ indicators for assessing IYCF practices was carried out with the aid of guidance documents from the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), 2021: Indicators for Assessing IYCF Practices: definitions and measurement methods. The FRIL, which includes all foods and ingredients reported in the survey, was used to create the variables needed for the IYCF indicators analysis. Variables were coded for each of the foods or beverages that are components of the IYCF indicators, assigning dummy codes (1=yes, 0=no). For example, 'eggs' is a variable with code of 1 if the food item falls in this group or 0 if not. For each of the indicators, no minimal amount was applied to the food, and a food was defined as any food or ingredient of a mixed dish. This information was merged with the dietary recall data from the first diet recall only. New variables were created using SAS programs to construct the indicators.

The following are the IYCF indicators for children 6 – 23 months:

i.) **Minimum Dietary Diversity (MDD):** The percentage of children 6-23 months of age who consumed food and beverages from at least 5 out of 8 defined food groups during the previous day. The 8 food groups are:

- Breast milk
- Grains, roots, tubers and plantains
- Pulses (beans, peas, lentils), nuts and seeds
- Dairy products (milk, infant formula, yogurt, cheese)
- Flesh foods (meat, fish, poultry, organ meats)
- Eggs
- Vitamin-A rich fruits and vegetables
- Other fruits and vegetables

ii.) **Minimum Meal Frequency (MMF):** Percentage of children 6-23 months of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of times during the previous day. The minimum number of times is defined as:

- two feedings of solid, semi-solid or soft foods for breast-fed infants aged 6-8 months.
- three feedings of solid, semi-solid or soft foods for breastfed children aged 9-23 months;
- four feedings of solid, semi-solid or soft foods or milk feeds for non-breastfed children aged 6-23 months whereby at least one of the four feeds must be a solid, semi-solid or soft feed.

iii.) **Minimum Milk Feeding Frequency for Non-Breastfed Children**: Percentage of non-breastfed children 6-23 months of age who received at least two milk feeds during the previous day.

iv.) **Minimal acceptable diet:** Percentage of children 6-23 months of age who consumed a minimum acceptable diet during the previous day. The minimum acceptable diet is defined as:

- for breastfed children: receiving at least the minimum dietary diversity (MDD) and minimum meal frequency for their age during the previous day
- for non-breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds.

v.) **Egg/or Flesh Food Consumption**: Percentage of children 6–23 months of age who consumed egg and/or flesh food during the previous day.

vi.) **Sweet Beverage Consumption**: Percentage of children who consumed a sweet beverage during the previous day. This includes soda, fruit-flavoured drinks, chocolate-flavoured milk, and 100% fruit juice, or any drink with sweeteners added.

vii.) **Unhealthy Food Consumption**: Percentage of children who consumed selected sentinel unhealthy foods during the previous day. This includes candy, baked or fried pastries, biscuits, frozen treats, and salty fried snacks.

viii.) **Zero Vegetable or Fruit Consumption**: Percentage of children who did not consume any vegetables or fruits during the previous day.

Coding for diet quality metrics for women: All food and ingredients listed in the NFCMS FRIL were classified into corresponding food groups to allow the tabulation of several diet quality metrics, namely the Minimum Dietary Diversity for Women (MDD-W), Global Dietary Quality Score (GDQS) and Global Dietary Recommendation (GDR) for women. All mixed dishes were disaggregated into ingredients for this analysis.

The following guidance documents were used to guide decisions regarding classification of foods and ingredients into the corresponding food groups.

For the MDD-W: FAO. 2021. Minimum dietary diversity for women. Rome. https://doi.org/10.4060/cb3434en

For the GDQS: The Global Diet Quality Score: Data Collection Options and Tabulation Guidelines. Available at: https://www.intake.org/resource/global-diet-quality-score-data- collection-options-and-tabulation-guidelines.
For the GDR: The DQQ Indicator guide available at www.dietquality.org

Minimum Dietary Diversity for Women (MDD-W)*:* The MDD-W is achieved when women 15-49 years have consumed at least 5 out of 10 defined food groups the previous day. The indicator is expressed as the proportion of women who consume a minimum dietary diversity. MDD-W is a proxy indicator for higher micronutrient adequacy, which is one dimension of diet quality.

The MDD-W includes 10 food groups, and an unclassified group:

1. Grains, white roots and tubers, and plantains
2. Pulses (beans, beans and lentils)
3. Nuts and seeds
4. Milk and milk products
5. Meat, poultry and fish
6. Eggs
7. Dark green leafy vegetables
8. Other vitamin A-rich fruits and vegetables
9. Other vegetables
10. Other fruits

A minimum quantity of 15 g is applied to each food or ingredient to count as having consumed the food.

Global Dietary Quality Score (GDQS): The *GDQS* is a food-based metric of diet quality for assessing nutrient adequacy and risk factors for non-communicable diseases (NCDs) which has been validated against health outcomes among WRA and men. Respondents are assigned points for each GDQS food group consumed according to the ranges of consumption for a 24-hour reference period.

Consumption data were derived from the first 24-hour dietary recall data interview (not using the repeat interview). The GDQS (overall, GDQS+ and GDQS-) is expressed as mean at the group level. The cut-offs for risk of poor diet quality outcomes are, GDQS < 15 (high risk of poor diet quality outcomes:), GDQS ≥15 and <23 (moderate risk of poor diet quality outcomes:) and GDQS ≥ 23 (low risk of poor diet quality outcomes.

The GDQS has 25 food groups (all contributing to the GDQS tabulation). Some foods consumed cannot be classified to any of the GDQS foods groups (e.g., alcoholic drinks, insects). The groups are:

S/N	Healthy food groups	Unhealthy food groups	Unhealthy when consumed in excessive amounts
1.	Citrus fruits	Refined grains and baked goods	High fat dairy
2.	Deep orange fruits	White roots and tubers	Red meat
3.	Other fruits	Sweets and ice cream	
4.	Dark green leafy vegetables	Sugar-sweetened beverages	
5.	Deep orange vegetables	Juice	
6.	Cruciferous vegetables	Processed meats	
7.	Other vegetables	Purchased deep fried foods	
8.	Deep orange tubers		
9.	Nuts and seeds		
10.	Whole grains		
11.	Legumes		
12.	Eggs		
13.	Low fat dairy		
14.	Fish and shellfish		
15.	Poultry and game meat		
16.	Liquid oils		

Global Diet Recommendation Score (GDR Score): The GDR Score is an overall diet quality score that is calculated from 2 scores: the NCD-Protect and the NCD-Risk score. The NCD-Protect score is a score with a range from 0 to 9 which reflects adherence to global dietary recommendations on healthy components of the diet. The NCD-Protect score is based on food consumption from 9 healthy food groups during the past day and night (regardless of amount). A higher score indicates inclusion of more health-promoting foods in the diet, and correlates positively with meeting global dietary recommendations. The food groups included are:

1. Whole grains
2. Pulses
3. Nuts and seeds
4. Vitamin A-rich orange vegetables
5. Dark green leafy vegetables
6. Other vegetables
7. Vitamin A-rich fruits
8. Citrus
9. Other fruits

The NCD-Risk score is also a proxy for ultra-processed food intake and a higher NCD-Risk score is closely related to higher ultra-processed food consumption. The NCD-Risk score is a score with a range from 0 to 9 and reflects adherence to global dietary recommendations on components of the diet to limit or avoid. A higher score indicates higher consumption of foods and drinks to avoid or limit (regardless of amount), and correlates negatively with meeting global dietary recommendations. The NCD-Risk score is based on food consumption from 8 food groups to limit or avoid during the past day and night (one food group, processed meat, is double weighted). The food groups included are:

1. Soft drinks (sodas)
2. Baked / grain-based sweets
3. Other sweets
4. Processed meat
5. Unprocessed red meat (2 points)
6. Deep fried food
7. Fast food & Instant noodles
8. Packaged ultra-processed salty snacks

The GDR score is calculated: the NCD-Protect - NCD-Risk + 9. The GDR score ranges from 0- 18.

Anthropometry and Biomarker components

The scope of the anthropometry and biomarker components together with the measurements from the six laboratories (the field lab, Synlab, and the partner labs in the UK, Germany, USA, and China) is detailed in **Annex 5**. Data collection, cleaning, analysis, and reporting of these aspects of the survey adhered to international standards (WHO, 2019; CDC, 2020).

Anthropometry: The anthropometry data collected were used to calculate indices for evaluating nutritional status among children (aged 6-59 months), adolescent girls (aged 10-14 years), and women of reproductive age (aged 15-49 years). These were generated using the Stata Software (Version 14.0) “zanthro” command available from the World Health Organization (WHO; Vidmar et al., 2013).

Children (aged 6-59 months): Stunting (low length/height-for-age), wasting (low weight-for- length/height), underweight (low weight-for-age), overweight (weight-for-length/height), and obesity (weight-for-length/height) were classified using Z-scores (standard deviation units from the reference median) derived from the World Health Organization (WHO) growth standards (de Onis, 2019). Stunting was defined as height-for-age Z-score (HAZ) below −2SD (HAZ <−2SD) from the WHO Child Growth Standards median. Severe stunting was defined as HAZ <−3SD. Wasting was defined as weight-for-height Z-score (WHZ) <−2SD. Similarly, severe acute malnutrition (SAM) or severe wasting was defined as WHZ <−3SD. Underweight was defined as weight-for-age Z-score (WAZ) <−2SD, and severe underweight was defined as WAZ <−3SD.

Overweight was defined as weight-for-length/height Z-score (WHZ) above 2SD (WHZ > 2SD), while obesity was defined as WHZ >3SD. Following WHO and UNICEF guidelines (UNICEF, 2019), the following implausible values were removed from the analysis: HAZ larger than |6| SD, WHZ larger than |5| SD, and WAZ smaller than -6 and larger than 5 SD. The calculation of WAZ also excluded values of length outside of the ranges 45-110 cm and values of height outside the ranges 65-120 cm. Also, seven height measurements from children under nine months were excluded from the analysis.

Adolescent girls (aged 10-14 years): BMI-for-age z-scores and height-for-age z-scores were calculated using the respondents' height, weight, and age. Stunting or short stature among adolescent girls was defined as height-for-age Z-score (HAZ) <−2SD. Underweight/thinness was defined as a BMI-for-age Z-scores (BAZ) <-2SD. Normal weight was defined as (-2SD≤BAZ≤1). Overweight among adolescent girls was defined as 1SD<BAZ≤2SD. Obesity was defined as BAZ>2SD. BMI-for-age Z- scores outside |5| SD were considered implausible and excluded from the analysis (de Onis, 2007; Pullum, 2008).

Women of reproductive age (aged 15-49 years): Normal weight is defined as -2SD≤BAZ≤1 for WRA<20 years and 18.5≤BMI<25 kg/m2 for WRA ≥20 years. Thinness can be defined as a body mass index (BMI) of <18.5 kg/m2 for WRA ≥20 years and as BMI-for-age Z-scores (BAZ) <-2SD in WRA <20 years.

Overweight was defined as 25≤BMI<30 kg/m2, and obesity as a BMI ≥30 kg/ m2 for WRA≥20 years. For WRA<20 years old, overweight was defined as 1SD<BAZ≤2, and obesity as BAZ>2SD. BMI-for-age Z-scores outside |5| SD and BMI values <12 and >50 was considered implausible and excluded from the analysis.

Annex 6 contains the data quality assessment report template with results from WHO Anthro Survey Analyser (https://whonutrition.shinyapps.io/anthro/).

Biomarker questionnaire, field lab and Synlab results: Frequency tables and figures were generated in STATA/SE 17. Percentages reported are proportions multiplied by 100. All percentages listed and depicted in results from the biomarker questionnaire, anthropometry, and laboratory measurements were obtained using weights. The point estimate of a proportion utilizes a non-response adjusted design weight. Each proportion listed in a table is a combination of the row variable and the column variable. The weight is non-response adjusted, where non-response is defined by the column variable. Variance estimates for a proportion in a sub-population utilizes Taylor linearization as strata (zone) and cluster (enumeration area) are identifiable (Demnati and Rao, 2004). The confidence interval was obtained using the logit transform, resulting in endpoints between zero and one.

Tests of association between two dichotomous variables utilized the Rao and Thomas adjusted chi-squared test (Rao and Thomas, 1989). The degrees-of-freedom relies on the number of clusters and the number of strata in the entire sample. The p-values reported for chi-squared represent overall comparison between row and column variables (e.g., prevalence of stunting and wealth quintile) and not pairwise comparison (e.g., prevalence of stunting at the lowest wealth quintile compared to the prevalence of stunting at the highest wealth quintile).

Anaemia, inflammation, and micronutrients results: These were generated using BRINDA macros in R. Venn diagrams are used to describe the links between anemia and iron deficiency anemia (IDA) and used in comparing these conditions as depicted in the findings. For riboflavin and iodine, the interquartile range (IQR, the 25th and 75th percentiles) is indicated. To compute point estimates of percentiles, a non-response adjusted sampling weight was utilized.

Adjustment of haemoglobin values for anaemia: Anaemia was determined for all target groups by measuring haemoglobin levels (grams per liter) in whole venous blood with HemoCue (Hb-301). Individual haemoglobin values (g/L) presented in the results were adjusted in accordance with Sullivan et al.,2008 to account for:

- Pregnancy: first trimester (+1.0), second (+1.5), third (+1.0), trimester unknown (+1.0).
- Altitude: Hb adjustment = $-0.032 \times (\text{altitude} \times 0.0032808) + 0.022 \times (\text{altitude} \times 0.0032808)^2$;

- Ethnicity: African extraction (+1.0); and
- Cigarette smoking: smoker, amount unknown (- 0.3).

BRINDA adjustment for inflammation: Inflammation is an area of current research that affects micronutrient measures and new methods to adjust for inflammation are being explored. The BRINDA (Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia) project has been investigating approaches to adjust population estimates of iron, vitamin A, and zinc in the presence of inflammation. Only data for children (aged 6-59 months) and women of reproductive age (aged 15-49 months) was adjusted for inflammation in accordance with the guidance illustrated in **Figure 5**.

Micronutrient biomarkers	Preschool-age children	Women of reproductive Age	References
Retinol binding protein & serum retinol	AGP + CRP	No adjustment	Larson, Nutrients, 2018 (9) Namaste et al., AJCN, 2020 (8)
Serum ferritin	AGP + CRP	AGP + CRP	Namaste et al., AJCN, 2020 (8)
Soluble transferrin receptor	AGP	AGP	Rohner et al., AJCN, 2017 (10)
Serum zinc	AGP + CRP	No adjustment	McDonald et al., AJCN, 2020 (11)
Serum and RBC folate	No adjustment	No adjustment	Young et al., AJCN, 2020 (12)
Serum B-12	No adjustment	No adjustment	Young et al., AJCN, 2020 (12)
Vitamin D	No adjustment	No adjustment	Young et al., AJCN, 2022 (13)

Figure 5: Inflammation markers used to adjust micronutrient biomarkers among preschool-age children and women of reproductive age based on the latest publications.

Interpretation of results: The interpretation of tests, as well as cut-off values for defining insufficiency and deficiency, are as listed in Tables 8–11. In some cases, cut-offs may not be available for all population groups of interest.

Table 8. Interpretation of results from the field laboratory and Synlab

Measurement	Results
Malaria	Dichotomous result - positive or negative for malaria antibodies
H. pylori	Dichotomous result - positive or negative for H. pylori antigens
Helminths	Dichotomous result - positive or negative for Ascaris lumbricoides, Trichuris trichiura, Anclostoma duodenale, or Necator americanus
Elevated plasma glucose	Risk of diabetes was defined as elevated plasma glucose > 200 mmol/L or mg/dL
Elevated glycated haemoglobin (HbA1c)	Risk of diabetes or prediabetic was defined as elevated HbA1c > 5.7 %
Hemoglobin genotype	Genotypes or variations of hemoglobin

Individual level cut-offs used for single biomarkers.

Table 9. Individual level cut-offs used for single biomarkers.

Measurement/ Biomarker	Indicator	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Haemoglobin[1,2]	Non-anaemia	≥11.0 g/dL	10-11yrs: ≥11.5 g/dL 12-14yrs: ≥12.0 g/dL	≥12.0 g/dL	≥11.0 g/dL
	Any anaemia	<11.0 g/dL	10-11yrs: <11.5 g/dL 12-14yrs: <12.0 g/dL	<12.0 g/dL	<11.0 g/dL
	Mild anaemia	10.0-10.9 g/dL	10-11yrs: 11.0-11.4 g/dL 12-14yrs: 11.0-11.9 g/dL	11.0-11.9 g/dL	10.0-10.9 g/dL
	Moderate anaemia	7.0-9.9 g/dL	8.0-10.9 g/dL	8.0-10.9 g/dL	7.0-9.9 g/dL
	Severe anaemia	<7.0 g/dL	<8.0 g/dL	<8.0 g/dL	<7.0 g/dL
CRP[3]	Inflammation	>5 mg/L	>5 mg/L	>5 mg/L	>5 mg/L
AGP[3]	Inflammation	>1 mg/L	>1 mg/L	>1 mg/L	>1 mg/L
Serum ferritin[3,4,5]	Iron deficiency	<12 µg/L	<15 µg/L	<15 µg/L	<15 µg/L
	Moderate iron insufficiency	---	---	<20 µg/L	---
	Mild iron insufficiency	---	---	<25 µg/L	---
Serum retinol[6,7,8]	Vitamin A insufficiency	<1.05 µmol/L	<1.05 µmol/L	<1.05 µmol/L	<1.05 µmol/L
	Vitamin A deficiency	<0.70 µmol/L	<0.70 µmol/L	<0.70 µmol/L	<0.70 µmol/L
	Severe vitamin A deficiency	<0.35 µmol/L	<0.35 µmol/L	<0.35 µmol/L	<0.35 µmol/L
MRDR ratio[3]	Vitamin A deficiency	≥0.060*	≥0.060	≥0.060	≥0.060
ETKac[9]	High risk of vitamin B1 (thiamine) deficiency	---	---	>1.25*	---
	Moderate risk of vitamin B1 (thiamine) deficiency	---	---	1.15 – 1.25	---
	Low risk of vitamin B1 (thiamine) deficiency	---	---	<1.15	---
EGRac[10]	Risk of vitamin B2 (riboflavin) deficiency	---	---	>1.4*	---
Vitamin B12[11,12]	Insufficiency (vitamin B12 depletion, risk for B12 deficiency)	<220 pmol/L	<220 pmol/L	<220 pmol/L	<220 pmol/L
	Deficiency (vitamin B12 deficiency, risk of megaloblastic anaemia)	<148 pmol/L	<148 pmol/L	<148 pmol/L	<148 pmol/L

Measurement/ Biomarker	Indicator	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Serum zinc[13§]	Zinc deficiency	<65 µg/dL	10-14yrs: <66 µg/dL	<66 µg/dL	---
Serum folate[3,14∞]	Deficiency (risk of elevated homocysteine)	<14 nmol/L	<14 nmol/L	<14 nmol/L	<14 nmol/L
	Deficiency (risk of megaloblastic anaemia)	<6.8 nmol/L	<6.8 nmol/L	<6.8 nmol/L	<6.8 nmol/L
RBC folate[11]	Insufficiency (risk of neural tube defects)	---	---	<748 nmol/L	---
	Deficiency	---	<624 nmol/L	<624 nmol/L	<624 nmol/L

Abbreviations: CRP=C-reactive protein; AGP=Alpha 1-acid glycoprotein; MRDR=Modified Relative Dose Response; ETKac=Erythrocyte Transketolase Activity

Coefficient; EGRac=Erythrocyte Glutathione Reductase Activation Coefficient; RBC=Red Blood Cell.

Superscripts: * Unitless measures. § Morning, non-fasting. ∞ Folate was measured using microbiological assay.

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Population level cut-offs used for individual biomarkers.

Iodine is not used to determine deficiency at the individual level. It can, however, be used to evaluate deficiency in a population. This is done by comparing the median for that population to a cut-off.

Table 10. Population level median cut-offs used for urinary iodine concentration

Iodine status[1]	Women of reproductive age (aged 15-49 years)	Lactating women (aged 15-49 years)	Pregnant women (aged 15-49 years)
Severe iodine deficiency	<20 µg/L		
Moderate iodine deficiency	20-49 µg/L		
Mild iodine deficiency	50-99 µg/L		
Any iodine deficiency	<100 µg/L	<100 µg/L	<150 µg/L
Adequate iodine nutrition	100-199 µg/L	≥100 µg/L	150-249 µg/L
Above requirements	200-299 µg/L		250-499 µg/L
Risk of adverse health consequences	≥300 µg/L		≥500 µg/L

References:

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Individual level cut-offs used for combined biomarkers.

Table 11. Individual level cut-offs used for combined biomarkers.

Indicator	Measurements/ Biomarkers	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Iron deficiency anaemia	Haemoglobin[1]	<11.0 g/dL	10-11 years: <11.5 g/dL 12-14 years: <12.0 g/dL	<12.0 g/dL	<11.0 g/dL
	Low ferritin[2,3]	<12 µg/L	<15 µg/L	<15 µg/L	<15 µg/L

1 Haemoglobin adjusted for ethnicity, pregnancy, altitude, and cigarette smoking: Sullivan, Mei, Grummer- Strawn and Parvanta (2008) Haemoglobin adjustments to define anaemia. Tropical Medicine and International Health 13 (10) 1267-1271).

2 Corrected for inflammation: Thurnham, D. I., McCabe, L. D., Haldar, S., Wieringa, F. T., Northrop-Clewes, C. A., & McCabe, G. P. (2010). Adjusting plasma ferritin concentrations to remove the effects of subclinical inflammation in the assessment of iron deficiency: a meta-analysis. The American Journal of Clinical Nutrition, 92(3), 546-555.

3 Corrected for inflammation: Namaste, S. M., Ou, J., Williams, A. M., Young, M. F., Yu, E. X., & Suchdev, P. S. (2020). Adjusting iron and vitamin A status in settings of inflammation: A sensitivity analysis of the Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) approach. The American Journal of Clinical Nutrition, 112 (Supplement 1), 458S-467S.

Reading the tables: While the narrative and figures featured in each chapter highlight some of the important findings from the anthropometry and biomarker data tables, not all findings can be discussed or displayed graphically. The following steps highlighted using a sample table can guide on reading the tables.

Step 1: Read the title, which presents the topic and specific population group being described.

Step 2: Scan the column headings. They describe how the information is categorized.

Step 3: Scan the row headings. These show the different ways the data are stratified into categories based on population characteristics.

Step 4: Look at the row at the bottom of the table. These percentages represent the totals at national level.

Step 5: Look at the notes below the table. These present important information on the information in the table.

1 **Table 57. Prevalence of normal weight in adolescent girls (aged 10-14 years), Nigeria 2021**

3 Background characteristics	2 Normal (-2SD≤BAZ≤1)	
	N	% [95% CI]
Age category	(P = 0.104)	
10 years	261	82.3 [75.0, 87.8]
11 years	155	82.7 [75.2, 88.3]
12 years	193	82.8 [75.1, 88.5]
13 years	192	71.4 [62.6, 78.8]
14 years	194	82.5 [73.4, 89.0]
Residence	(P = 0.720)	
Urban	416	79.6 [74.5, 83.9]
Rural	579	80.8 [75.4, 85.3]
Wealth quintile	(P = 0.663)	
Poorest	179	81.3 [73.9, 87.0]
Second	161	84.8 [76.8, 90.3]
Middle	187	77.7 [65.0, 86.7]
Fourth	216	80.1 [72.7, 85.8]
Richest	248	77.9 [70.7, 83.8]
4 **National**	**995**	**80.4 [76.5, 83.7]**

5
Normal weight among adolescent girls is defined as (-2SD≤BAZ≤1).
Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).
Number of adolescent girls who responded nationally: (n=999).

Sampling weights and non-response adjustment

Sampling Weights

The frame used for the sampling of clusters for the survey was derived from the EA list that was developed and maintained by the NPC and used in the last census (2006) in Nigeria. It covers the entire geographic area of Nigeria, and the EA are mutually exclusive and exhaustive of the entire landmass of the country. It is the most comprehensive small area demarcation that guarantees every cluster of being included in a survey with a known probability of inclusion. The 65 EAs for each geographic zone were selected with PPS, using the estimated population of the individual EA as their Measure of Size (MOS).

The data collected was weighted appropriately for each target group to account for the probability of selection of the sample at each stage in the sampling process. The weights applied were adjusted for non-response by target group.

Base weights

Due to the non-proportional allocation of the samples across the six geopolitical zones and target groups, as well as differences in non-responses across sampling units (EA, listed target groups) and indicator level (i.e., anthropometry, malaria, haemoglobin, diet questionnaire etc.), sampling weights are needed for any analysis of the NFCMS data. This will ensure the representativeness of the survey results at the national and domain levels.

- The first stage of sampling probabilities for each selected PSU (EA) in the h-th stratum (geopolitical zone) are as follows:

Sampling Probability	1st stage
$\pi_{1h\alpha} =$	$a_h * \frac{MOS_{h\alpha}}{\sum MOS_{h\alpha}}$

MOShα = measure of size (MOS) of *α-th* EA (PSU) of the *h-th* geopolitical zone (stratum)
Estimated PSU population size from the 2006 census frame
ah = number of EAs (PSU) to be selected in the *h-th* geopolitical zone (stratum). These are given in **Table 5**.

$\sum MOSh\alpha$= total estimated population size of the *h-th* geopolitical zone (stratum)

The NPC provided the sampling frame with all the information needed to enable the calculation of the first stage sampling probabilities.

The second stage sampling probabilities was computed separately for each target group. For a target group (please note that another subscript to refer to the specific target group has not been added for simplicity), the probability of selection are as follows:

Sampling Probability	2nd stage
	$\frac{b_{h\alpha}}{N_{h\alpha}}$

$b_{h\alpha}$ = number of sampled individuals in the target group in the α-th EA (PSU) of the h-th geopolitical zone (stratum). This will be 16 for WRA and children (aged 6–59 months), and 3 for non-pregnant adolescent girls and pregnant women.
$N_{h\alpha}$ = total number of eligible individuals in the *α-th* EA (PSU) of the *h-th* geopolitical zone (stratum).

The final selection probability ($\pi_{h\alpha}$) for individuals within a target group in the *α-th* PSU (EA) of the *h-th* stratum (geopolitical zone) is given by multiplying the first and second stage selection probabilities

- $\pi_{1h\alpha}$ and $\pi_{2h\alpha}$ as follows:

$$\pi_{h\alpha} = \pi_{1h\alpha} \times \pi_{2h\alpha}$$

The final base sampling weight ($w_{h\alpha}$) is the inverse of the final selection probability, given by:

$$w_{h\alpha} = 1/\pi_{h\alpha}.$$

This weight was applied to each participant in a specific target population in the *α-th* PSU (EA) of *the h-th* stratum (geopolitical zone).

Based on this description, the following information needed to calculate the base weights were obtained:

1) First stage
   a. Number of PSU (EAs) selected in each zone
   b. Measure of size (MOS) (e.g., estimated population size of each selected EA)
   c. Total sum of MOS (i.e., the final cumulative MOS) for the entire population of EAs in each zone
2) Second stage
   a. Total number of eligible individuals per target group in each selected EA
   b. Number of eligible individuals selected in each target group per selected EA
   c. Number of selected individuals in each target group per EA completing the survey

The data obtained were carefully documented, maintained electronically, and retained for use at the time of data analysis. This includes sampling unit identifiers (zonal code, state code, EA code, and respondent ID) used for merging with the survey data.

Non-response adjustment

At the inception of the sampling design, the issue of insecurity and other matters that may hinder access to some clusters were taken into consideration. While the calculated design was to use 60 clusters per zone for the prevailing security and access issues, the number of clusters to be sampled was boosted to 65 from 60 for each zone. This will serve as the reporting domain. A total of 26 out of the 390 EAs (or 6.67 percent) were not accessed, and distributed as follows (NC-6, NE-10, NW-4, SE-1, SS-3, and SW- 2).

The highest inaccessible was from NE with 10 EAs; 8 of these are from Borno state and 2 from Yobe State. In NC zone, the six that were not accessed are three each from Benue and Niger states. In NW, four were not accessed (1 from Kebbi, 2 form Sokoto, and 1 from Zamfara states). SE has one EA not accessed (Anambra state). From SS, two EAs were not accessed (one from Rivers and one from Cross river states). The two EAs not covered in SW are one each from Ogun and Lagos states. All these EAs were not covered due to security concerns, except the one in Lagos where the local community refused to participate in the survey despite several advocacy from different stakeholders. The EA was abandoned after several advocacy visits.

It is noteworthy that that the cluster coverage rate in NE stood at 85 percent. Thus, 15 percent of the cluster were not covered and 80 percent of these uncovered are from Borno State only. Borno, by 2021 projected population, represent 20 percent of the population of the entire NE combined. The survey was designed to have the least level of analysis at zonal level; thus, the 85 percent coverage achieved could be a good representation of the zone. Moreover, from other similar studies, such as DHS, Borno is not known to exhibit high levels of differential from the other states in the zone. Only 5 out of 13 proportionally allocated to Borno by population size were covered and an attempt to make state level inferences using the covered clusters form Borno may yield to a high-level bias and low- level precision of such result.

The adjustment for the non-response at cluster level was done by state and urbanicity (rural or urban). For example, if in the design y, rural clusters were sampled in a state and only x was accessible, the cluster response rate is calculated as Cij, for the ith state and jth urbanicity.

Where Cij = Xw/Yw; Xw=sum of sampling weights of the x accessible clusters; and Yw= sum of sampling weights of all the sampled clusters (base Weight) for the ith state and jth urbanicity.

i = 1,2,337 and j = 1,2. The cluster non-response adjustment factor is the inverse of Cij (that is, 1/Cij).

The base weights were adjusted to account for non-response bias by using a weighting class adjustment. This was done by dividing the original sample into T mutually exclusive and non-overlapping subsets, called adjustment cells (indexed by T within which members are assumed to have similar values) for the response variable of interest and all response probabilities are presumed to be equal. The weighting class adjustment is done by computing the response rate for each adjustment cell and using it to adjust the base weights for participants in the cell.

The response rate for cell t is given by:

$$r_{ti} = \frac{\sum w_i \ (sum\ of\ base\ weights\ for\ actual\ respondents\ in\ the\ adjustment\ cell\ t)}{\sum w \ (sum\ of\ base\ weights\ for\ all\ selected\ participants\ in\ the\ adjustment\ cell\ t)}$$

The non-response adjustment factors are obtained as the inverse of these response rates,

$$f_{ti}^{NR} = \frac{1}{r_{ti}}$$

Finally, the non-response adjusted weight was then obtained by multiplying the base weight for each participant i in the weighting class t by the corresponding adjustment factor as follows:

$$w_{ti}^{NR} = w_{ti} f_{ti}^{NR}$$

Table 12 gives the response rates and corresponding adjustment factors calculated.

Table 12. Example of response rates, corresponding adjustment factors, and final non-response adjusted weight for each weighting class in years for WRA

Weighting class		Weighted response rate (%)	Adjustment factors (Inverse of weighted response rate)	Final non-response adjusted weight
Rural	15–24 y	84	1.19	99.96
	25–34 y	42	2.38	99.96
	35–49 y	90	1.11	99.90
Urban	15–24 y	92	1.09	100.28
	25–34 y	60	1.67	100.20
	35–49 y	75	1.33	99.75

Table 13 lists the variables to be considered for forming the adjustment cells for each target group.

Table 13. Variables to be considered for forming the adjustment cells for each target group.

Sampling target groups	Variables considered for forming adjustment cells	Categories
Non-pregnant WRA (aged 15-49 years)	Age Urbanicity	15-24, 25-34, 35-49 y Rural, urban
Children (aged 6-59 months)	Age Urbanicity	6-11, 12-23, 24-59 mo Rural, urban
Pregnant women (aged 15-49 years)	Age Urbanicity	15-24, 25-34, 35-49 y Rural, urban
Non-pregnant adolescent girls (aged 10-14 years)	Urbanicity	Rural, urban

It should be noted that further disaggregating the weighting classes used for the non-response adjustment by the reporting domain of the target groups (i.e., for WRA and children) was not conducted. This was discussed extensively, and it was generally agreed to uphold the calculation of non-response as indicated in the protocol (**Table 12**). This specifies that the adjustment should take into consideration urbanicity (rural/urban), age group for each of the target groups at the national level, and apply to each cell nationwide, assuming that each of the cell (e.g. children 6 to12 months, from rural or WRA-age-15-23-urban or WRA-age-24-34-rural) are likely to be more homogeneous even at the national level. The response rate was calculated and applied at the individual modules (i.e., malaria test, diet, genotype, etc.) as presented in **Annex 7**. Further breaking this to zonal level might be unstable. Although calibration of weights to population estimates is a standard step in weight calculation for population surveys, this was not conducted due to lack of projections of population estimates for the target groups.

There are four components of the dataset: Household, Dietary intake, Anthropometry, and Biomarker. Sampling weights and non-response adjustment factors were applied and merged with final survey data. The Household ID and Personal ID were the unique link to various data sets.

Households in Sample

Box 1. Key Findings on Household in Sample

Income-generating activities of household heads: Overall, 36.8 percent were involved in agriculture (54.8 percent rural and 10.7 percent urban).

Production of animal source foods: 11 percent of households were engaged in the production of animal source foods, very low between rural (13.9 percent) and urban areas (7.5 percent).

Land for vegetable gardening: Overall, 3 out of 10 households indicated that they have land for vegetable gardening. The proportion was higher in rural areas (38 percent) compared to urban areas (16 percent).

Production of fruits: Overall, 31 percent of households in the sample have trees or bushes that produce fruits and were more in the South East (56 percent) followed by South South (44 percent), and North Central (39 percent).

Drinking water: Overall, 62 percent of households have access to an improved source of drinking water (67.4 percent in urban and 58.7 percent in rural).

Availability of water: The most common main source of drinking water is the tubewell/borehole (42.6 percent of households) and prevalent in urban (46.3 percent) than rural (39.9 percent).

Sanitation: 55 percent of households used an improved toilet facility (26.5 percent not shared, and 28.5 percent shared with at least one other household). Sharing of improved toilets was higher in the urban areas (44 percent) than in the rural areas (18 percent).

Food security: Overall, 79 percent of the sample households were food insecure (57 percent were moderately food insecure and 22 percent were severely food insecure).

Resources to purchase food: Overall 41.5 percent of households did not have enough food or money to buy food in

Coping strategies: Reliance on less preferred and less expensive foods; food borrowing or relying on help from friends or relatives; limiting portion size at mealtimes; restriction on consumption by adult members of the household; and reduction in the number of meals eaten in a day were used.

Financial inclusion: Overall, 59 percent of households had at least one member with an account with a bank or other financial institution (81.5 percent in urban and 43.6 percent in rural.

Table 14 presents the number of HHs and persons listed by use of building structures. Other households listed were contained in building structures for both residential and commercial purposes. The results presented are for those households with sampled respondents. There was a comprehensive listing of all households in 390 clusters (EAs) to produce the sampling frame for the survey, which included children under five years, pregnant women, non-pregnant WRA, and non-pregnant adolescent girls.

The exercise involved listing all household members living in the residential building structures in the selected EAs. A total of 86,314 individuals were listed from 18,791 HHs. From this, a sample of 9,106 households was selected for inclusion in the sample and included a total of 34,469 individuals from the four target groups. The main respondents in each of the households gave consent to the survey, thereby yielding a response rate of 100 percent. The results are presented as frequency distribution tables or as means with confidence intervals (95 percent CI).

Table 14: Total number of households and persons listed in the selected EAs by type of building structure.

	Number of Households Listed		Number of Persons Listed	
	N	%	N	%
National	18,791	100.0	86,314	100.0
Residential only	17,675	94.1	81,628	94.6
Residential/commercial	1,026	5.5	4291	5.0
Residential/Religious	68	0.4	311	0.4
Residential/Institutional	22	0.1	84	0.1

The percentage of listed HHs in the urban areas varied from 27.3 percent in North West to 83.1 percent in the South West. For the target population, the percentage from urban areas varied from 38.6 percent (pregnant women) to 48.9 percent (non-pregnant WRA).

Distribution of Sampled children

Table 15 presents the distribution of the individual children (aged 6-59 months) in the sampled HHs. Notably, almost the same proportion of males and females were sampled across the children's age groups as male and female children constitute about 50 percent in each category.

Table 15. Distribution of children aged 6-59 months in listed households.

Characteristics	6-23 months		24-59 months		Total	
	N	%	N	%	N	%
National	3,527	100.0	7,019	100.0	10,546	100.0
Sex						
Male	1757	49.8	3527	50.2	5284	50.1
Female	1770	50.2	3492	49.8	5262	49.9
Residence (Urban/Rural)						
Urban	1406	39.9	2807	40.0	4213	39.9
Rural	2121	60.1	4212	60.0	6350	60.1
Geopolitical Zone						
North Central	517	14.7	1081	15.4	1,598	15.2
North East	889	25.2	1601	22.8	2,490	23.6
North West	850	24.1	1783	25.4	2,633	25.0
South East	327	9.3	711	10.1	1,038	9.8
South-South	482	13.7	964	13.7	1,446	13.7
South West	462	13.1	879	12.5	1,341	12.7

Distribution of sampled non-pregnant women and women of reproductive age

The distribution of non-pregnant women of reproductive age in listed HHs shows that a little above half of the sampled respondents were found in rural areas (Table 16). The distribution of sampled non-pregnant WRA was virtually close in all the geopolitical zones except South East. This may be attributed to the low population and size of the zone as it is the smallest. However, a more significant proportion of pregnant WRA was more noticed in rural areas.

Table 16: Distribution of non-pregnant WRA in listed households

Characteristics	Non-Pregnant WRA	
	N	%
National	18,781	100.0
Residence (Urban/Rural)		
Urban	9,185	48.9
Rural	9,596	51.1
Geopolitical Zone		
North Central	3,160	16.8
North East	3,604	19.2
North West	3,823	20.4
South East	2,177	11.6
South-South	3,065	16.3
South West	2,952	15.7

Characteristics	Pregnant WRA	
	N	%
National	2,040	100.0
Residence (Urban/Rural)		
Urban	787	38.6
Rural	1,253	61.4
Geopolitical Zone		
North Central	298	14.6
North East	483	23.7
North West	517	25.3
South East	191	9.4
South-South	293	14.4
South West	258	12.6

Distribution of Sampled Adolescents

Table 17 presents the distribution of the adolescents in the sample HHs. About 53 percent of the sampled adolescents were from rural areas. North West and North East have close to one-fourth of the sample adolescents. Generally, about 60 percent of the listed adolescents were in the northern geopolitical zones.

Table 17. Distribution of Adolescents

Characteristics	Adolescents	
	N	%
National	3,102	100.0
Residence (Urban/Rural)		
Urban	1,457	47.0
Rural	1,645	53.0
Geopolitical Zone		
North Central	461	14.9
North East	703	22.7
North West	702	22.6
South East	349	11.3
South-South	462	14.9
South West	425	13.7

Distribution of children aged 6-59 months

Table 18 presents the distribution of sampled children (aged 6-59 months). The table shows that the children were evenly distributed by sex.

Table 18. Distribution of sampled children (aged 6-59 months) in listed households

Characteristics	Children aged 6-59 Months	
	N	%
National	10,546	100.0
Sex		
Male	5,284	50.1
Female	5,262	49.9
Residence (Urban/Rural)		
Urban	4,213	39.9
Rural	6,333	60.1
Geopolitical Zone		
North Central	1,598	15.2
North East	2,490	23.6
North West	2,633	25.0
South East	1,038	9.8
South-South	1,446	13.7
South West	1,341	12.7

Sex Distribution of household heads

Table 19 presents the sex distribution of head of households . About 89 percent of the households were male headed. The result also showed that the proportion of male-headed households is higher in rural areas than in urban areas.

Table 19. Distribution of Households in Sample by Sex of Head of Household

Characteristics	Households in Sample	Male-headed	Female-headed
	N	%	%
National	9,106	89.4	10.6
Residence (Urban/Rural)			
Urban	3,990	88.2	11.8
Rural	5,116	90.3	9.7
Level of Education of Head			
None	1,569	86.8	13.2
Primary	2,496	85.2	14.8
Secondary	3,799	91.2	8.8
Post Secondary	1,193	92.4	7.6
Missing	49	97.8	2.2
Geopolitical Zone			
North Central	1,390	84.4	15.6
North East	1,458	92.8	7.2
North West	1,687	95.0	5.0
South East	1,327	84.3	15.7
South-South	1,591	85.0	15.0
South West	1,653	89.4	10.6

Female-headed households

Table 20 presents sex distribution of households in sample by level of education of head of household. The result reveals that more than half of female household heads had primary or no formal education.

Table 20. Distribution of Household in Sample by Level of Education of Head of Household

Level of school completed by household head	Households in Sample	Type of Household		
		Male-headed	Female-headed	All HHs
	N	%	%	%
None	1,569	18.8	24.2	19.3
Primary	2,496	27.0	33.9	27.7
Secondary	3,799	40.6	32.7	39.8
Post Secondary	1,193	13.0	9.1	12.6
Missing	49	0.6	0.1	0.5
Total	9,106	100.0	100.0	100.0

Table 21 presents distribution of households in sample by Wealth Index Quintile. The results show that about half (50.7 percent) of female-headed households were in the middle and fourth quintiles, unlike the male-headed households, which were almost evenly distributed.

Table 21. Percentage Distribution of Households by Wealth Index Quintile

Wealth Index Quintiles	Type of Household		
	Male-headed	Female-headed	Overall
	%	%	%
Poorest	20.4	15.0	20.0
Second	20.2	17.1	20.0
Middle	19.6	24.8	20.0
Fourth	19.5	25.9	20.0
Richest	20.2	17.2	20.0
Total	100.0	100.0	100.0

Income-generating activities of household heads

As reported by Carletto et al. (2007), income-generating activities include a full range of agricultural and non-agricultural activities carried out by rural households. This allows an understanding of the relationship between the various economic activities in the rural and urban spaces and their implications for economic growth, poverty reduction, and food security. About 94 percent of HH heads were engaged in various income-generating activities. The proportion of HH heads engaged was almost the same in urban (93.9 percent) and rural areas (94.1 percent). Male HH heads were more engaged compared with their female counterparts. Also, most households were into income-generating activities, irrespective of educational level. Except for SS, the proportion of household heads engaged was over 90 percent in all the geopolitical zones (**Table 22**).

Table 22. Percentage of heads of households with income-generating activities

Disaggregation	Total Households in Sample	
	(N)	%
National	9,106	94.0
Residence (Urban/Rural)		
Urban	3,990	93.8
Rural	5,116	94.1
Household Type		
Male-headed	8,089	94.9
Female-headed	1,017	85.9
Level of Education of Head		
None	1,569	91.0
Primary	2,496	94.3
Secondary	3,799	95.4
Post Secondary	1,193	93.8
Missing	49	84.4
Geopolitical Zone		
North Central	1,390	94.1
North East	1,458	98.1
North West	1,687	94.0
South East	1,327	90.4
South-South	1,591	88.4
South West	1,653	97.0

Tables 23a, b, and c presents the distribution of income-generating activities by type in the six geopolitical zones. Results obtained indicate that nationally, the agricultural sector took the lead with 36.8 percent, while sales and related activities followed with 16.3 percent (**Table 23a**). Service-related activities constituted 12.6 percent of the economic activities engaged in. The pattern of distribution was, however, different among the geopolitical zones. Engagement in the agricultural sector was higher in northern zones as compared to the south **(Table 23a)**.

Table 23a. Percentage distribution by main work of the head of household for income – national and by zone

Main work of household head for income	Geopolitical Zone						National
	North Central	North East	North West	South East	South South	South West	
Agricultural, Animal Husbandry, and Forestry Workers; Fishermen; and Hunters	48.8	52.9	42.0	29.1	28.7	19.9	36.8
Sales and Related Workers	6.9	14.2	22.9	19.4	14.5	16.0	16.3
Service Workers	10.2	12.5	8.9	13.6	15.4	16.7	12.6
Professional, Technical, and Related Workers	6.2	3.5	4.1	7.1	4.5	15.2	6.9
Not working and didn't work in last 12 months	5.9	1.9	5.7	9.4	11.3	3.0	5.8
Transportation and Material Moving Workers	3.7	2.3	4.7	6.9	6.2	7.1	5.2
Others (Specify)	6.7	1.9	1.2	4.1	5.4	10.4	4.9
Production, Construction, and Extraction Workers	3.2	2.2	1.8	4.7	5.3	4.5	3.4
Office and Administrative Support Workers	3.2	3.1	4.4	0.8	3.3	2.4	3.1
Administrative and Managerial Workers	3.7	4.1	2.8	1.8	2.3	1.2	2.6
Installations, Maintenance, and Repair Workers	1.6	1.4	1.3	2.9	2.7	3.6	2.2
Missing	0.0	0.0	0.4	0.1	0.3	0.1	0.2
Total	100	100	100	100	100	100	100

Expectedly, as shown in Table 23b and Table 23c, engagement in agricultural activities (54.8%) was more pronounced in the rural area than in the urban sector (10.7%). Conversely, sales and related jobs dominated activities engaged in by households heads in the urban (21%) (Table 23c) as compared to only 13% in the rural. Also higher proportions of heads of households were found to engage in service-related activities and professional works in urban (11.6%) than in rural (3.7%). See Table 23b and Table 23c.

Table 23b. Percentage distribution by main work of head of household for income - Rural and by zone

Main work of household head for income	Geo Political Zone						Rural
	North Central	North East	North West	South East	South South	South West	
Agricultural, Animal Husbandry and Forestry Workers, Fishermen and Hunters	60.0	73.9	53.7	37.4	43.8	60.1	54.8
Sales and Related Workers	4.7	9.9	20.4	15.7	11.1	6.2	12.9
Service Workers	7.4	2.7	7.0	12.2	11.9	8.8	7.9
Not working and didn't work in last 12 months	5.2	1.2	5.3	9.6	11.2	0.3	5.7
Transportation and Material Moving Workers	3.2	2.5	4.4	6.8	5.2	1.8	4.1
Professional, Technical and Related Workers	4.4	3.2	2.6	5.9	2.3	6.9	3.7
Others(Specify)	6.5	0.8	0.8	3.1	4.9	10.5	3.5
Production, Construction and Extractions Workers	2.9	1.5	1.7	5.1	4.2	3.2	2.8
Office and Administrative Support Workers	2.4	1.6	2.1	0.3	2.1	1.2	1.8
Administrative and Managerial Workers	2.1	1.6	1.0	1.3	1.5	0.0	1.3
Installations, Maintenance and Repair Workers	1.1	1.0	0.9	2.6	1.7	1.0	1.3
Don't know	0.0	0.0	0.3	0.1	0.2	0.0	0.1

Table 23c. Percentage distribution by main work of the head of household for income - Urban and by zone

Main work of household head for income	Geo Political Zone						Urban
	North Central	North East	North West	South East	South South	South West	
Sales and Related Workers	13.7	20.2	30.1	28.2	19.5	18.9	21.2
Service Workers	19.3	26.2	14.5	16.8	20.6	19.0	19.5
Professional, Technical and Related Workers	11.9	4.0	8.7	9.8	7.7	17.7	11.6
Agricultural, Animal Husbandry and Forestry Workers, Fishermen and Hunters	13.0	23.6	7.4	9.7	6.9	8.2	10.7
Others (Specify)	7.3	3.3	2.3	6.6	6.2	10.4	6.9
Transportation and Material Moving Workers	5.2	2.1	5.8	7.3	7.6	8.6	6.7
Not working and didn't work in last 12 months	7.9	2.8	6.7	9.0	11.4	3.7	6.0
Office and Administrative Support Workers	5.8	5.2	11.2	2.1	5.0	2.7	5.0
Administrative and Managerial Workers	8.7	7.5	8.4	2.8	3.5	1.5	4.5
Production, Construction and Extractions Workers	4.0	3.0	1.9	3.6	7.1	4.9	4.3
Installations, Maintenance and Repair Workers	3.2	1.9	2.5	3.7	4.1	4.3	3.5
Don't know	0.0	0.1	0.4	0.3	0.4	0.1	0.2

Wealth Index (Wealth Quintiles)

The Wealth Index, presented as quintiles, was constructed using the asset approach, whereby all household possessions are included as much as possible. These quintiles are derived from a series of questions about HH construction materials, water sources and sanitation access, and ownership of various items, which form a wealth index score. The wealth index quintiles divide the population into five equally large groups based on their wealth rank. The five broad categories are poor, second, middle, fourth, and richest quintiles.

Results shown in **Table 24** indicate that about two-third of the listed households in rural areas were in the poor and second quintile categories. However, about 64 percent of the households in urban area were in the fourth and richest quintile categories. Similarly, the North East and North West have higher proportions of households in poor quintile categories than households in the southern part of the country.

Table 24. Household Wealth Index

Disaggregation	Total HHs in Sample (N)	Percentage				
		Poor	Second	Middle	Fourth	Richest
National	9106	20.0	20.0	20.0	20.0	20.0
Residence (Urban/Rural)						
Urban	3,990	2.9	6.6	19.0	31.0	40.6
Rural	5,116	30.8	28.4	20.7	13.1	7.0
Level of Education of Head						
None	1,569	44.2	28.1	17.4	7.7	2.6
Primary	2,496	25.9	26.4	22.4	16.4	8.9
Secondary	3,799	7.4	15.3	22.2	27.6	27.5
Post Secondary	1,193	1.8	4.0	12.1	27.6	54.5
Missing	49	13.5	34.5	24.0	10.5	17.4
Geopolitical Zone						
North Central	1,390	17.0	22.7	23.4	21.2	15.7
North East	1,458	38.2	19.4	17.1	13.4	11.9
North West	1,687	29.0	31.4	19.4	11.2	8.9
South East	1,327	8.7	11.1	22.8	23.3	34.2
South-South	1,591	4.1	12.2	21.7	29.5	32.4
South West	1,653	5.3	8.7	18.4	32.5	35.1

Note: Weights were applied based on the number of households in the sample and household size.

Water

Households' drinking water from an improved water source.

Table 25 presents the proportion of households drinking water from water piped into dwelling unit or compound. Results show that nationally, 1.1 percent of households had water piped into dwelling unit or compound. The results indicate that the proportion for the urban areas (1.8 percent) was three times more than the HHs in the rural areas (0.6 percent). It is noteworthy that most of the households that had water piped into dwelling unit, compound or neighbor had HH heads with higher educational attainment. However, the proportion was ridiculously low in all the zones; as low as 0.2 percent in the South East zone. On the other hand, the ratio increased with wealth quintile groups, ranging from 0.2 percent for the poorest to 2.7 percent for the richest quintile.

Table 25. Percentage of household heads for which water was piped into the premises or neighbour

Disaggregation	Total Households in Sample	
	(N)	%
National	9,106	1.1
Residence (Urban/Rural)		
Urban	3,990	1.8
Rural	5,116	0.6
Household Type		
Male-headed	8,089	1.1
Female-headed	1,017	0.9
Level of Education of Head		
None	1,569	0.8
Primary	2,496	0.8
Secondary	3,799	0.9
Post Secondary	1,193	2.5
Missing	49	0.0
Geopolitical Zone		
North Central	1,390	1.1
North East	1,458	0.9
North West	1,687	1.7
South East	1,327	0.2
South-South	1,591	0.6
South West	1,653	1.1
Wealth Quintile		
Poor	1,517	0.1
Second	1,512	0.7
Middle	1,722	0.6
Fourth	2,066	0.9
Richest	2,289	2.8

Other Sources of water

Other sources of water explored in this study include water from improved sources for which collection time did not exceed 30 minutes for a round-trip (including queuing). Improved water sources include piped water, tube-well, borehole, rainwater collection, bottled water, protected spring, and protected well. Results show that education and wealth status have no major implication in the proportion of HHs that had access to such sources of water.

Households Drinking Water from Unimproved Water Sources

Unimproved water sources include unimproved well, unprotected spring, water kiosk, tanker truck, cart with water tank/drum, sachet/pure water, river, stream, pond, and lake.

The percentage of HHs that drank water from unimproved sources was smaller compared to those that drank from improved water sources. About 36 percent of HHs drank water from unimproved water sources in the country (**Table 26**). A greater proportion (40.2 percent) of HHs in rural area, as against 36.1 percent in urban area was affected. The proportion of female-headed HHs (34.7 percent) was close to that of male-headed HHs (36.1 percent). The percentage varied among the geopolitical zones, ranging from 28.3 percent in South East to 43.3 percent in the North East (**Table 26**). The practice of drinking water from unprotected sources was more pronounced among the HHs in the poor and second quintile categories of wealth.

Table 26. Percentage of houses that drank from water sources from other sources.

Disaggregation	Total Households in Sample (N)	Improved Water sources not exceeding 30 minutes	Water from unimproved water sources
National	9,106	63.6	36.0
Residence (Urban/Rural)			
Urban	3,990	69.4	29.8
Rural	5,116	59.6	40.2
Household Type			
Male-headed	8,089	63.5	36.1
Female-headed	1,017	64.4	34.7
Level of Education of HH Head			
None	1,569	56.1	43.8
Primary	2,496	64.3	35.7
Secondary	3,799	67.5	32.2
Post Secondary	1,193	68.0	30.4
Missing	49	65.3	33.7
Geopolitical Zone			
North Central	1,390	60.8	38.4
North East	1,458	56.7	43.3
North West	1,687	66.1	33.7
South East	1,327	71.3	28.5
South-South	1,591	65.8	33.7
South West	1,653	62.0	37.2
Wealth Quintile			
Poor	1,517	44.0	56.0
Second	1,512	58.6	41.4
Middle	1,722	73.7	26.2
Fourth	2,066	75.8	23.7
Richest	2,289	63.6	34.8

Improved water sources include piped water, tube-well, borehole, rainwater collection, bottled water, protected spring, and protected well. Improved water sources include piped water, tube-well, borehole, rainwater collection, bottled water, protected spring, and protected well.
Unimproved water sources include unimproved well, unprotected spring, water kiosk, tanker truck, cart with water tank/drum, sachet/pure water, river, stream, pond, and lake.

Distribution of households by the source of drinking water

Table 27 presents the distribution of households, based on the main sources of drinking water. The table reveals that the use of piped water was low in the country and across all geopolitical zones. Some degree of sourcing drinking water was observed with public pipe/standpipe (5 percent). Drinking water from this public tap was more common in urban (7.4 percent) than in rural areas (4.4 percent). Also, it is more common in the northern parts of Nigeria than in the southern zones.

The borehole (about 43 percent) is the most common main drinking water source. The use is prevalent in both rural and urban areas among male-headed and female-headed households and educated and non-educated households. However, it is more common in the southern zones of the country. The use of a protected well was also used among the HHs (12 percent). It was used by male and female-headed HHs and found among HHs with little or no education. Protected well was more prevalent in North Central, North West, and South West.

An unprotected well was the most common source of drinking water among the unprotected sources. About 12 percent of households practiced the use of unprotected wells for drinking water. Its use was more prevalent in rural (19.2 pet) than in urban areas (1.7 percent). Sachet water, known as *pure water* in Nigeria, was also commonly used. In the country, about 10.7 percent of households drink sachet water. Its prevalence was higher in urban (23.2 percent) than in rural areas (2.1 percent). It is also most common in the southern part of the country: South East (14 percent); South South (15 percent); and South West, the most prevalent zone (32 percent).

River, streams, ponds, and lakes constitute the other sources of drinking water. About 10 percent employed this source for drinking water in Nigeria. Households that used this source were mainly found in rural areas (17.1 percent). It was used by both male-headed and female-headed households with primary (14.6 percent) or no formal education (13.6 percent). Analysis by zones shows that the use of water from river, pond, and lake was more prevalent among HHs in North Central (23.6 percent) and in South South (15.8 percent).

Table 27. Percent distribution of household according to main source of drinking water

	Main Source of Drinking Water																	% using improved sources	% using unimproved sources	Total	No of households
	Improved sources									Unimproved sources											
	Piped water																				
	Into dwelling	Into yard/plot	To neighbour	Public tap/ stand-pipe	Tube-well/ borehole	Protected well	Protected spring	Rainwater collection	Bottled water	Unprotected well	Unprotected spring	Tanker truck	Cart with tank/ drum	Water Kiosk	Sachet/Pure water	River/ stream, pond/ lake/ dam/canal/ irrigation	Other				
	(01)	(02)	(03)	(04)	(05)	(06)	(08)	(10)	(14)	(07)	(09)	(11)	(12)	(13)	(15)	(16)	(98)				
Total	0.4	0.5	0.2	5.6	42.6	12.0	0.2	0.4	0.5	12.1	1.1	1.0	0.8	1.3	10.7	10.8	0.0	**62.3**	**37.7**	**100**	**9,106**
Residence																					
Urban	0.8	0.6	0.4	7.4	46.3	10.6	0.1	0.2	0.9	1.7	0.4	1.7	1.1	2.9	23.2	1.6	0.0	**67.4**	**32.6**	100	3,990
Rural	0.1	0.3	0.1	4.4	39.9	12.9	0.2	0.6	0.1	19.2	1.6	0.4	0.6	0.2	2.1	17.1	0.0	**58.7**	**41.3**	100	5,116
Household Type																					
Male-headed	0.4	0.5	0.2	5.7	42.4	12.0	0.2	0.5	0.4	12.9	1.1	0.9	0.8	1.3	10.5	10.3	0.0	**62.2**	**37.8**	100	8,089
Female-headed	0.0	0.5	0.4	4.9	44.2	11.9	0.1	0.3	0.9	4.6	1.5	1.5	0.7	1.3	12.5	14.8	0.0	**63.1**	**36.9**	100	1,017
Education of HH head																					
None	0.3	0.3	0.2	5.3	34.2	13.2	0.0	0.5	0.1	23.0	2.4	0.3	1.7	2.3	2.4	13.7	0.0	**54.2**	**45.8**	100	1,569
Primary	0.1	0.5	0.2	4.7	40.9	12.6	0.2	0.4	0.0	17.9	1.6	1.0	0.7	0.8	5.3	13.1	0.0	**59.7**	**40.3**	100	2,496
Secondary	0.4	0.2	0.3	6.1	46.5	11.8	0.2	0.3	0.5	5.6	0.5	1.2	0.4	1.1	15.1	9.8	0.0	**66.4**	**33.6**	100	3,799
Post Secondary	1.0	1.5	0.1	6.7	46.7	8.8	0.0	0.6	2.0	3.0	0.3	1.1	1.0	1.2	21.3	4.7	0.0	**67.3**	**32.7**	100	1,193
Missing	0.0	0.0	0.0	8.4	39.4	17.4	0.0	0.0	1.0	7.1	0.0	0.0	0.0	1.2	20.1	5.4	0.0	**66.3**	**33.7**	100	49

Percent distribution of household according to main source of drinking water (continued)

	Main Source of Drinking Water																	% using improved sources	% using unimproved sources	Total	No of households
	Improved sources									Unimproved sources											
	Piped water																				
	Into dwelling (01)	Into yard/plot (02)	To neighbor (03)	Public tap/ stand-pipe (04)	Tube-well/ borehole (05)	Protected well (06)	Protected spring (08)	Rainwater collection (10)	Bottled water (14)	Unprotected well (07)	Unprotected spring (09)	Tanker truck (11)	Cart with tank/ drum (12)	Water Kiosk (13)	Sachet/Pure water (15)	River/ stream, pond/ lake/ dam/canal/ irrigation (16)	Other (98)				
Total	0.4	0.5	0.2	5.6	42.6	12.0	0.2	0.4	0.5	12.1	1.1	1.0	0.8	1.3	10.7	10.8	0.0	**62.3**	**37.7**	**100**	**9,106**
Geopolitical Zone																					
North Central	0.5	0.3	0.2	5.0	33.9	19.0	0.4	0.1	0.8	8.0	2.0	0.6	0.6	0.0	4.8	23.6	0.0	**60.3**	**39.7**	100	1,390
North East	0.6	0.3	0.1	11.8	35.7	4.6	0.0	0.1	0.1	16.8	1.6	1.3	2.3	7.7	4.7	12.4	0.0	**53.1**	**46.9**	100	1,458
North West	0.4	1.1	0.2	6.9	40.5	14.4	0.1	0.0	0.2	29.4	0.5	1.2	1.3	0.5	2.3	0.9	0.0	**63.7**	**36.3**	100	1,687
South East	0.0	0.2	0.0	1.0	61.5	1.8	0.4	2.8	0.2	1.1	3.7	3.3	0.3	0.0	12.7	11.0	0.0	**67.9**	**32.1**	100	1,327
South South	0.1	0.3	0.2	3.8	58.1	2.6	0.0	0.6	0.5	3.2	0.4	0.0	0.0	0.0	14.3	15.8	0.0	**66.3**	**33.7**	100	1,591
South West	0.5	0.2	0.5	3.7	35.1	21.4	0.1	0.2	0.9	1.7	0.2	0.2	0.0	0.0	26.2	9.2	0.0	**62.5**	**37.5**	100	1,653
Wealth Quintile																					
Poor	0.1	0.0	0.0	4.4	27.1	10.9	0.0	0.5	0.0	29.5	2.6	0.0	1.1	0.5	0.1	22.9	0.0	**43.1**	**56.9**	100	1,517
Second	0.0	0.5	0.2	5.2	34.4	15.1	0.3	0.5	0.0	22.1	2.0	0.2	0.5	1.7	0.6	16.7	0.0	**56.1**	**43.9**	100	1,512
Middle	0.2	0.4	0.1	7.6	48.3	15.8	0.2	0.5	0.0	7.9	0.8	0.8	0.9	1.7	4.7	10.0	0.0	**73.1**	**26.9**	100	1,722
Fourth	0.3	0.2	0.3	6.0	54.8	10.8	0.2	0.5	0.4	3.3	0.4	1.8	1.0	1.2	13.1	5.6	0.0	**73.6**	**26.4**	100	2,066
Richest	1.1	1.2	0.5	4.9	45.8	7.8	0.1	0.2	1.7	0.7	0.0	1.7	0.5	1.1	31.7	1.0	0.0	**63.3**	**36.7**	100	2,289

Sanitation

Sanitation refers to public health conditions in relation to clean drinking water and treatment and disposal of human excreta and sewage. In this study, sanitation is measured by the proportions of households that did not share, share, or use unimproved toilets or were involved in open defecation.

At the national level, only about 26.5 percent of the households have improved private toilets, which were not shared with other households. About 35 percent of households were found in urban areas, while 20.6 percent in rural areas. The proportion was also higher in the male-headed households (26.8 percent) than that of female-headed HHs (23.3 percent) (**Table 28**). Expectedly, the proportion of HHs using unshared improved toilets increased with the household head's education level. Among the geopolitical zones, South East had the highest proportion (40.7 percent) while North West had the least (23.2 percent). It is also noteworthy that a greater percentage used private toilets in the North East (34%). Furthermore, the proportion of households using unshared improved toilets increased with the level of wealth quintile group of the households. It ranged from 9.1 percent among the poor to 49.1 percent among the richest quintile.

At the national level, 28.5 percent of the households used improved toilets that were shared with at least one other household. This was practiced more in urban (44 percent) than in rural areas (17.9 percent). It is more common in the South West (48.5 percent) and South South (43.2 percent) than in the other geopolitical zones. Notably, sharing improved toilets was prevalent among the fourth quintile group.

Using unimproved toilets and open defecation was more common in rural areas than in urban areas. The use of unimproved toilets and open defecation were pronounced among uneducated household heads. Usage of unimproved toilets was highest in North West (40.0 percent), while the use of open defecation was highest in North Central (44 percent). The practice of open defecation was more prevalent among the poor (52.5 percent) (**Table 28)**.

Table 28. Use of Sanitation Facilities

Disaggregation	Total Households in Sample (N)	% Households using Toilets not shared	% Households using shared Toilets	% Households using Unimproved toilets	% Households With no Toilet Facilities
National	9,106	26.5	28.5	21.0	23.5
Residence (Urban/Rural)					
Urban	3,990	35.0	44.0	12.9	7.4
Rural	5,116	20.6	17.9	26.5	34.5
Household Type					
Male-headed	8,089	26.8	28.2	21.3	23.0
Female-headed	1,017	23.3	31.4	17.7	27.0
Level of Education of HH Head					
None	1,569	18.5	17.2	25.7	38.3
Primary	2,496	21.5	22.3	27.6	28.0
Secondary	3,799	26.5	37.5	16.8	18.4
Post Secondary	1,193	50.1	30.9	12.5	6.0
Missing	49	16.5	34.6	8.7	37.6
Geopolitical Zone					
North Central	1,390	19.0	22.0	13.8	43.9
North East	1,458	33.5	18.4	20.9	27.1
North West	1,687	23.2	21.9	40.0	14.0
South East	1,327	40.7	21.9	8.5	28.6
South-South	1,591	30.5	33.2	20.6	15.1
South West	1,653	20.6	48.5	8.4	22.0
Wealth Quintile					
Poor	1,517	9.0	8.6	29.5	52.5
Second	1,512	16.5	13.9	34.7	34.4
Middle	1,722	24.0	30.9	21.7	23.1
Fourth	2,066	27.8	45.7	14.2	11.4
Richest	2,289	50.9	39.5	7.8	1.2

Food Insecurity

Food insecurity is a fundamental element of HHs' economic and social living conditions, contributing in a fundamental way to the overall well-being of the HHs' members. Food insecurity is a condition of limited or uncertain regular access to adequate food. A focus on HH food insecurity within the NFCMS is justified by the ample existing literature demonstrating that living in food insecure HHs increases the risk of some forms of malnutrition (i.e., stunting in children, micronutrient deficiencies or thinness in adults).

In this report, food insecurity is measured with Food Insecurity Experience Scale (FIES). It allows for estimating the probability that over the 12 months preceding the survey, members of the HH may have experienced various degrees of food insecurity. The measure is obtained by analyzing data on self-reported occurrence of conditions (i.e., members of the HH having to skip a meal or eat less than they thought they should, running out of food in the HH, feeling hungry but not able to eat because there was not enough money or other resources for food insufficient food quantity). Using the Rasch Model, the qualitative answers (yes or no) given to the questions included in the FIES module are first tested for validity and then converted into quantitative measures on a continuous scale of severity.

In reporting results, reference is typically made in two categories: moderate food insecurity and severe food insecurity. Moderate food insecurity is revealed by the reporting of experiences associated with reduced quality of food consumption and reduced quantity (e.g., portion sizes are reduced, or meals are skipped). Severe food insecurity is revealed by such experiences as feeling hungry but unable to procure food or not eating for an entire day due to a lack of money or other resources. Households having experienced moderate food insecurity have almost certainly compromised the quality of the food they eat and likely reduced the normal quantities of food consumed. Severe food insecurity implies having almost certainly reduced the quantity of food consumed and, occasionally, having run out of food in the HH, feeling hungry, and, at the most extreme, gone for entire days without eating.

Data Validation

Prior to the compilation of results, FIES data collected in the NFCMS has been subject to validation by testing their adherence to the restrictions imposed by the Rasch measurement model to confirm that they can be used to generate valid measures of the severity of food insecurity in the surveyed population. Results confirm that the eight questions included in the standard FIES module can be used to create a proper measurement scale in this application in Nigeria: All items reveal an infit statistics value lower than 1.2 (**Table 29**). Also, the residuals (obtained as the difference between the actual response given by each HH to each item and the response that would be expected given the estimated model's parameters) show no sign of a possible additional dimension being captured by the data (**Figure 6**). Furthermore, the resulting food insecurity measurement scale compares well with the global FIES reference scale, thus, allowing for robust calibration of classifications against the thresholds set up at the global level to define moderate and severe food insecurity (**Figure 7**).

Table 29. Results of estimating the Rasch Model on the FIES data collected in the NFCMS of Nigeria 2020

Item:	Severity	SE.	Infit
Worry_insuff_food	-2.18	0.06	0.99
Ate_unhealty_food	-2.27	0.06	1.02
Ate_few_food	-1.75	0.05	1.03
Skipped_meal	-0.27	0.04	0.92
Ate_less	-1.03	0.04	0.85
Ranout_food	1.50	0.04	0.98
Hungry	1.43	0.04	0.89
No_food_whole_day	4.56	0.06	1.03

Note: All infit values are below the threshold value of 1.2, indicating that all eight items can be used to form a valid measurement scale possessing desirable properties that ensure invariance measurement.

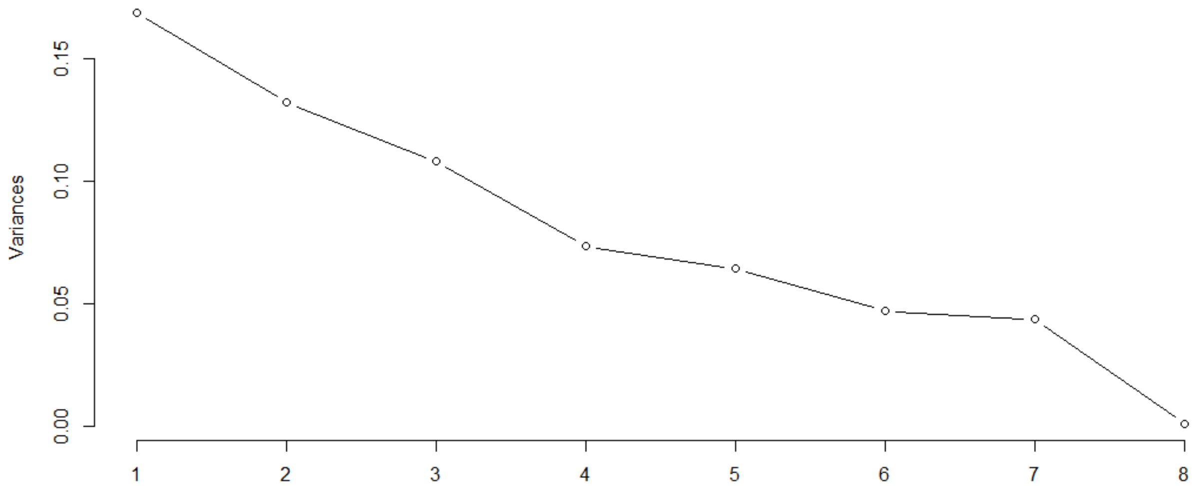

Figure 6. Screen plot of the principal components' analysis conducted on the residuals obtained after estimating the Rasch Model

Note: The chart shows the percentage of variance captured by the eight principal components obtained from the residuals, ranked in order of decreasing variance. The linear shape of the chart confirms that no principal components dominate in terms of explained variance and that no residual structure can be detected in the residuals. Therefore, the data contribute to the measurement of the single latent trait, interpreted as the severity of food insecurity.

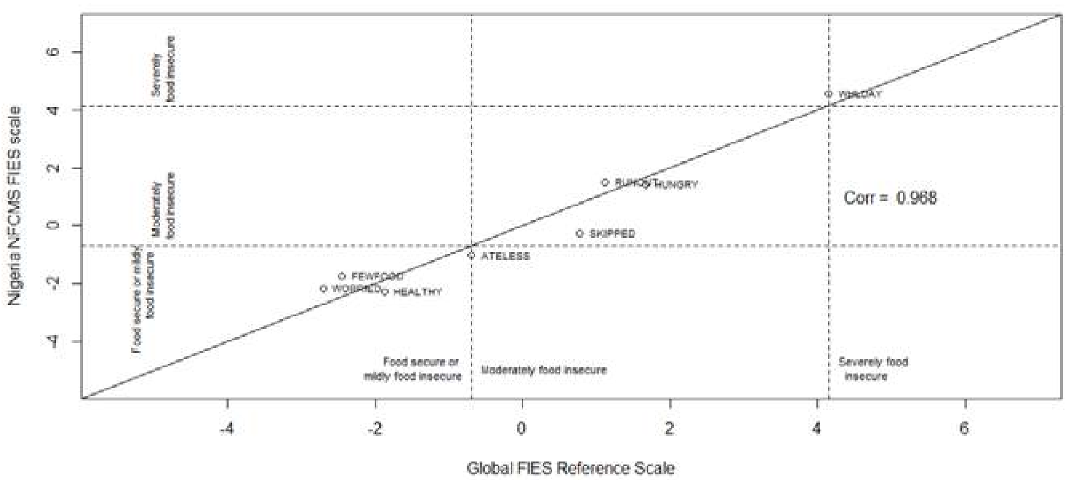

Figure 7. Calibration of the FIES measurement scale obtained with the data collected in the NFCMS, Nigeria, and the Global FIES Reference Scale

Note: The chart shows the alignment of the severity levels associated with the eight FIES items as obtained from the FIES data collected in Nigeria (vertical axis) against those of the Global FIES reference scale (horizontal axis). Using all eight items as anchoring points, the resulting correlation between the two scales is 96.8 percent.

Results of Moderate and Severe Food Insecurity

Table 30 presents estimates of the percentage of households that have experienced moderately or severely food insecurity. The estimate is obtained as the average of the probability of being classified as either "moderate" or "severe" food insecure, computed over the entire sample.

Table 30. Percentage of households in the sample experiencing Moderate and Severe Food Insecurity

	Total No of HH in sample	Moderate + severe			Severe		
		%	95% CI		%	95% CI	
National	9,106	78.7	78.3	79.1	22.2	21.9	22.5
Residence							
Urban	3,990	78.3	77.7	78.8	22.9	22.5	23.3
Rural	5,116	79.0	78.5	79.5	21.6	21.3	22.0
Household type							
Male-headed	8,089	78.4	78.0	78.8	22.0	21.7	22.3
Female-headed	1,017	81.0	79.9	82.0	23.8	23.0	24.6
Educ. of household head							
none	1,569	78.3	77.4	79.1	22.4	21.7	23.1
primary	2,496	83.0	82.4	83.7	24.3	23.7	24.8
secondary	3,799	79.5	79.0	80.1	22.2	21.8	22.6
post secondary	1,193	67.6	66.4	68.8	17.7	16.9	18.4
missing	49	74.7	69.8	79.6	17.2	13.7	20.7
Geopolitical zone							
North Central	1,390	73.2	72.1	74.2	19.6	18.9	20.2
North East	1,458	85.1	84.3	85.8	25.2	24.5	26.0
North West	1,687	67.5	66.5	68.5	18.1	17.5	18.7
South East	1,327	79.8	78.8	80.8	23.8	23.1	24.5
South South	1,591	85.5	84.8	86.2	22.3	21.7	22.9
South West	1,653	81.7	80.9	82.5	24.5	23.8	25.2
Wealth quintile							
Poor	1,517	81.8	81.0	82.6	23.6	22.9	24.2
Second	1,512	81.0	80.1	81.8	24.1	23.4	24.8
Middle	1,722	83.0	82.2	83.8	24.7	24.0	25.3
Fourth	2,066	82.0	81.3	82.8	23.7	23.1	24.2
Richest	2,289	68.8	68.0	69.7	16.8	16.3	17.3
Water Source							
Safe Water	5546	79.1	78.7	79.6	22.5	22.2	22.9
Unsafe Water	3560	78.0	77.4	78.6	21.7	21.2	22.1
Sanitation							
Improved Toilet	5203	76.5	76.0	77.0	21.6	21.2	22.0
Unimproved Toilet	3903	81.6	81.0	82.1	23.0	22.6	23.4

Results show that 79 percent of the sample households would be classified as either moderately or severely food insecure, whereas 22 percent of the households would be classified as strictly severely food insecure. There was a little difference in the proportions between the urban (78.3

percent) and rural areas (79.0 percent). Also, a little higher proportion was noticed among the female-headed HHs (81.0 percent) than the male-headed HHs (78.4.0 percent). H*owever*, the same cannot be said of the pattern with regard to the education of the head of household for which the proportion of food insecurity is reduced with higher education. The result shows that drinking water source had no influence on food insecurity. However, there was a correlation between type of toilet facility available in the household and food insecurity. Among the households using improved toilets, the percentage of moderately or severely food insecure households was 76.5 as against 81.6 for the households using unimproved toilets.

With regards to moderate and severe food insecurity, households in North West (67 percent) fared relatively better, while HHs in North East and South South were worst hit with 85.1 and 85.5 percent, respectively. Though the difference was not much, the percentage of HHs categorized as moderately or severely food insecure reduced with wealth quintile position with the richest, having the lowest with 69.1 percent.

The pattern of distribution of households that were severely food insecure was almost the same as those that were moderately or severely food insecure. Nationally, about 22 percent of the 79 percent moderately or severely food insecure was severely food insecure. They belong to the 23.5 percent among the poor wealth quintile group and 16.9 percent among the richest.

Coping Strategies in the last seven days

In addition to the FIES question, respondents were also asked whether they had enough food or enough money to buy food seven days before the survey. This question is normally used to collect data to inform the “reduced Coping Strategy Index” (r-CSI), an indicator typically used in the context of repeated surveys conducted for rapid emergency food security assessments. The results shown in **Table 31** indicate that about 41.5 percent of the HHs reported not having food or money to buy food seven days prior to the survey.

The disaggregation by place of residence (urban/rural) and by sex of the household head confirms the results already commented as derived from the FIES scale. That is, there is a slightly higher percentage of households reporting difficulties in buying or obtaining food in rural areas and among women headed HHs (even though differences are very small). As noticed earlier, the result shows that drinking water sources had no influence on food insecurity as equal proportion of households. Among the households using improved toilets, the percentage of households with insufficient food or money to buy food seven days before the survey was 39.8 against 43.5 for the households using proved toilets.

Also consistent with the FIES-based results, difficulties are reported by a significantly lower percentage of HHs when the household head has a higher education or when the HH belongs to the highest wealth quintile.

The only partly contrasting results concern the disaggregation by geopolitical zone. Though North Central and North West are confirmed areas with the lowest incidence of reported food access problems, households from the North East and the South West regions seem to have experienced significantly less difficulty than households in the South East and the South South when referring to problems experienced during the seven days prior to the survey. These results may point to a slightly better recent situation in the North East and South West zones than the entire past year, while the situation continued to be problematic in the South East and South.

Table 31. Percentage of Households that did not have Food or Money to buy Food in preceding 7 Days

Disaggregation	Total Households in Sample	
	(N)	%
National	9,106	41.5
Residence (Urban/Rural)		
Urban	3,990	40.6
Rural	5,116	42.1
Household Type		
Male-headed	8,089	41.1
Female-headed	1,017	45.2
Level of Education of Head		
None	1,569	37.6
Primary	2,496	47.0
Secondary	3,799	42.9
Post Secodary	1,193	31.1
Missing	49	37.3
Geopolitical Zone		
North Central	1,390	27.6
North East	1,458	39.9
North West	1,687	34.7
South East	1,327	52.3
South South	1,591	62.5
South West	1,653	39.8
Wealth Quintile		
Poor	1,517	43.1
Second	1,512	44.2
Middle	1,722	42.6
Fourth	2,066	45.8
Richest	2,289	32.6
Water Source		
Safe Water	5,546	41.5
Unsafe Water	3,560	41.5
Sanitation		
Improved Toilet	5,203	39.8
Unimproved Toilet	3,903	43.5

Food security and coping strategies

The Coping Strategies Index is one of the tools used for rapid food insecurity assessments in emergency contexts. It is quick and easy to administer, straight-forward to analyze, and rapid enough to provide real-time information. It aims to record what people do when they cannot access enough food and the adjustments households make in their consumption and livelihoods when they do not have enough food or money. Coping can be in terms of consumption changes, expenditure reduction, and income expansion. It is an appropriate tool for measuring food security during emergency situations when other methods are not practical or timely.

The index is obtained by counting coping strategies that are not equal in severity; thus, needs to be weighted differently, depending on how severe they are by the analysts. In building the rCSI, the frequency in which a given strategy is reported during the last seven days is multiplied by a weight that reflects the severity of individual behaviors. Finally, the totals are added. The Coping Strategy Index is a score that ranges from 0 to 56; smaller numbers reflect better food security than larger numbers. A high score means extensive use of negative coping strategies, hence, increased food insecurity.

Factors consider for Coping strategies	Severity weight
Number of days in a week - Rely on less preferred and less expensive foods	1
Number of days in a week - Borrow food, or rely on help from a friend or relative?	2
Number of days in a week - Limit portion size at mealtimes	1
Number of days in a week - Restrict consumption by adults in order for small children to eat	3
Number of days in a week - Reduce number of meals eaten in a day	1

The HHs are classified into three categories:

a. households with CSI = 0 – 3: None/Minimal food insecurity
b. households with CSI = 4 – 18: Stressed food consumption
c. households with CSI ≥ 19: Crisis food consumption

Table 32 presents the average rCSI score in the country, disaggregated by residence, household type, education, geopolitical zone, and wealth level. The national Coping Strategies Index Score was 18.2. There was little difference in the index score obtained for rural (17.9) and urban areas (18.7), indicating that almost equal proportion of households were food insecure across place of residence. Also, there was no significant difference for male- and female-headed households. There was no specific pattern to compare the north with the south as the index ranged from 17.4 for South-South and 19.9 for North Central. Though, the richest quintile had the lowest index of 16.9, the difference between the poorest quintile (18.1) was not significant.

Table 32. Coping Strategies Index Score

Disaggregation	Households in Sample (Not Having Food or Money to Buy Food in Preceding 7 Days)	Index Score		CI
National	3,943	18.2	18.2	18.2
Residence (Urban/Rural)				
Urban	1,672	18.7	18.7	18.7
Rural	2,271	17.9	17.9	17.9
Household Type				
Male-headed	3,472	18.1	18.1	18.2
Female-headed	471	18.6	18.6	18.6
Education of Head of HH				
None	614	17.9	17.9	17.9
Primary	1,221	18.7	18.7	18.7
Secondary	1,708	18.1	18.1	18.1
Post Secondary	380	17.1	17.1	17.2
Missing	20	22.7	22.6	22.8
Geopolitical Zone				
North Central	392	19.9	19.9	19.9
North East	600	16.7	16.6	16.7
North West	574	17.5	17.5	17.6
South East	698	18.9	18.9	18.9
South-South	998	17.4	17.3	17.4
South West	682	19.8	19.7	19.8
Wealth Quintile				
Poor	810	18.2	18.2	18.2
Second	830	18.6	18.6	18.7
Middle	873	19.0	19.0	19.0
Fourth	816	18.1	18.1	18.1
Richest	613	16.8	16.8	16.8
Water Source				
Safe Water	5,546	18.4	18.4	18.4
Unsafe Water	3,560	17.8	17.8	17.8
Sanitation				
Improved Toilet	5,203	17.9	17.9	17.9
Unimproved Toile	3,903	18.5	18.5	18.5

Households by Coping Index Group

Table 33 presents the distribution of households based on coping index groups. The households were grouped into three different categories: (1) none or minimal food insecurity; (2) stressed food consumption; and (3) crisis food consumption. The result shows that a very small proportion (3.4 percent) of households belonged to the group of no *or minimal food insecurity*. About 54 percent of the households belonged to the *stressed food consumption*, while 42 percent were found in the *crisis food consumption* group. This ratio was similar across other nominal variables (i.e., place of residence, sex, and education of the head of HH). Though a relatively small percentage belonged to the "none or minimal food insecurity" group across the zones, the pattern varied from one geopolitical zone to another.

Table 33. Percentage Distribution of Households by Coping Index Group

Disaggregation	Households in Sample (Not Having Food or Money to Buy Food in Preceding seven Days)	None or Minimal food insecurity	Stressed food consumption	Crisis food consumption
National	3,943	3.4	54.3	42.3
Residence (Urban/Rural)				
Urban	1,672	3.2	52.8	44.0
Rural	2,271	3.5	55.3	41.1
Household Type				
Male-headed	3,472	3.4	54.2	42.4
Female-headed	471	3.3	55.3	41.4
Education of Head of HH				
None	614	3.6	55.8	40.6
Primary	1,221	3.1	52.1	44.8
Secondary	1,708	2.9	55.8	41.3
Post Secondary	380	6.2	53.1	40.7
Missing	20	3.9	40.0	56.1
Geopolitical Zone				
North Central	392	3.5	48.7	47.8
North East	600	5.9	57.3	36.7
North West	574	5.3	51.5	43.3
South East	697	1.2	56.8	42.0
South-South	998	2.5	59.2	38.3
South West	682	2.0	50.6	47.4
Wealth Quintile				
Poor	672	3.5	54.9	41.7
Second	690	3.9	49.1	47.0
Middle	795	3.4	50.2	46.4
Fourth	1,006	2.6	56.9	40.5
Richest	780	3.9	61.0	35.1
Water Source				
Safe Water	1,495	3.4	53.5	43.1
Unsafe Water	3,943	3.5	55.7	40.9
Sanitation				
Improved Toilet	1,763	3.4	55.6	40.9
Unimproved Toilet	3,943	3.4	52.8	43.8

Production of animal source foods

Production of animal source foods by households is expected to engender ready access to nutritious food products needed for growth and development, thereby reducing food insecurity. Similarly, households that own livestock, rear small animals, or farm fish, or engage in fishing are expected to be more food secure than others. The households were asked if they owned any livestock, herds, other farm animals, or poultry. The response was used to determine the proportion of households involved in producing animal source foods.

Generally, the percentage of households involved in the production of animal sourced food was very low at 11.3 percent and disaggregated as follows: 6.4 percent own any livestock, herds, other farm animals, or poultry; 1 percent raise rabbit, guinea pigs, grass cutters, snails, fish, or other small animals; 1.5 percent raise fish; and 5 percent catch/harvest fish from the wild (**Table 34a**).

Table 34a. Percentage of households that produce animal sourced foods by type.

	Percent
Households that owned any livestock, herds, other farm animals, or poultry	6.4
Households that raised any of these animals for own consumption	1.0
Household that raised fish for households' own consumption	1.5
Households that catch/harvest fish from the wild for own consumption	5.0

The proportion of animal production in the rural areas (13.9 percent) was almost double than that of urban areas (7.5 percent) **(Table 34b**). The low proportion was observed among both male-headed (11.8 percent) and female-headed (7.2 percent) households. It is noteworthy that a similar low proportion of households produced animal source food irrespective of education, wealth strata, and across different geopolitical zones. Among the geopolitical zones, South West recorded the lowest proportion.

Table 34b. Percentage of Households that produce Animal Sourced Foods

Disaggregation	Total Households in Sample (N)	%
National	9,106	11.3
Residence (Urban/Rural)		
Urban	3,990	7.5
Rural	5,116	13.9
Household Type		
Male-headed	8,089	11.8
Female-headed	1,017	7.2
Education of Head of HH		
None	1,569	11.2
Primary	2,496	13.6
Secondary	3,799	9.9
Post Secondary	1,193	11.0
Missing	49	1.9
Geopolitical Zone		
North Central	1,390	10.6
North East	1,458	12.6
North West	1,687	11.8
South East	1,327	15.3
South-South	1,591	13.8
South West	1,653	6.3
Wealth Quintile		
Poor	1,517	12.3
Second	1,512	14.4
Middle	1,722	12.9
Fourth	2,066	9.7
Richest	2,289	7.9

Access to land for vegetable gardening

Globally, home gardens have been documented as an important supplemental source contributing to food and nutritional security and livelihoods. Home gardening refers to cultivating a small portion of land, which may be around the household or within walking distance from the family home (Odebode, 2006). The most fundamental benefit of home gardens stems from their direct contributions to household food security by increasing the availability, accessibility, and utilization of food products. Therefore, households with a vegetable garden that they use for their consumption are expected to be more food secure than others. Overall, the result indicates that almost 3 out of 10 sample households (29.2 percent) have land for vegetable gardening (**Table 35**). A higher proportion (38.3 percent) of households in rural areas had access to land for gardening compared to only 16.1 percent in urban areas. However, almost the same proportion (29 percent) of male- and female-headed households had access to land. Among the zones, more households (67.9 percent) in South East had access to land for gardening.

Table 35. Percentage of households in sample that have land for gardening.

Disaggregation	Total Households in Sample (N)	%
National	9,106	29.2
Residence (Urban/Rural)		
Urban	3,990	16.1
Rural	5,116	38.3
Household Type		
Male-headed	8,089	29.3
Female-headed	1,017	29.0
Education of Head of HH		
None	1,569	20.2
Primary	2,496	36.7
Secondary	3,799	30.1
Post Secondary	1,193	24.6
Missing	49	14.6
Geopolitical Zone		
North Central	1,390	25.5
North East	1,458	13.8
North West	1,687	21.3
South East	1,327	67.9
South-South	1,591	41.1
South West	1,653	24.7
Wealth Quintile		
Poor	1,517	25.9
Second	1,512	34.2
Middle	1,722	34.1
Fourth	2,066	29.2
Richest	2,289	23.5

Access to land and trees or bushes that bear fruits.

The presence of fruit-bearing trees or bushes for their consumption is expected to aid HH access to food products that give minerals and vitamins for increased food security. **Table 36** presents the percentage of households that have fruit-bearing trees or bushes for their own consumption.

Results obtained for households that have fruit-bearing trees or bushes indicated that 31 percent of the sample households had trees or bushes that produced fruits. Expectedly the proportion was higher in the rural areas (40.7 percent) compared with those in the urban areas (17.0 percent). Among the geopolitical zones, a higher proportion of households was found in the South East (56.0 percent) and South South (43.6 percent). South West recorded a low percentage (26.4 percent), but North East and North West recorded the lowest with 21.1 and 18.1 percent, respectively. However, with the exception of the richest quintile group, the proportion of households that had fruit-bearing trees or bushes were mostly evenly distributed among other wealth quintiles except for the richest.

Table 36. Percentage of households in sample that have trees or bushes that produced fruits.

Disaggregation	Total Households in Sample (N)	%
National	9,106	31.0
Residence (Urban/Rural)		
Urban	3,990	17.0
Rural	5,116	40.7
Household Type		
Male-headed	8,089	31.0
Female-headed	1,017	31.0
Education of Head of HH		
None	1,569	22.9
Primary	2,496	37.4
Secondary	3,799	32.4
Post Secondary	1,193	25.0
Missing	49	29.6
Geopolitical Zone		
North Central	1,390	38.5
North East	1,458	21.1
North West	1,687	18.8
South East	1,327	55.9
South-South	1,591	43.6
South West	1,653	26.4
Wealth Quintile		
Poor	1,517	31.8
Second	1,512	34.3
Middle	1,722	35.7
Fourth	2,066	30.2
Richest	2,289	24.2

Financial Inclusion

Financial inclusion emphasizes that households have access to valuable and affordable financial products and services that meet their needs – transactions, payments, savings and credit – made available and accessible responsibly and sustainably. One good measure of financial inclusion is having accounts with a bank or financial institution. It is expected that households that have access to credit or financial institutions will have more financial resources to procure nutritious foods when compared to other households that do not.

Table 37 presents the percentage of households having accounts with banks or financial institutions. The results indicated that about six out of 10 households in Nigeria were financially inclusive. This means that about 60 percent of households had at least one member has an account with a bank or other financial institution. However, more of these households were found in urban areas (81.5 percent) than in rural areas (43.4 percent).

Education seemed to play a key role in the proportion of households that had accounts with banks or financial institutions, as the majority had some degree of education. However, households in southern parts of the country had more households that had accounts in banks than their northern counterparts. Moreover, possession of bank accounts was higher with rich categories of households than their poor counterparts.

Table 37. Percentage of households that have accounts with financial institution.

Disaggregation	Total Households in Sample (N)	%
National	9,106	59.1
Residence (Urban/Rural)		
Urban	3,990	81.5
Rural	5,116	43.6
Household Type		
Male-headed	8,089	58.7
Female-headed	1,017	62.2
Level of Education of Head		
None	1,569	22.3
Primary	2,496	44.5
Secondary	3,799	76.0
Post Secondary	1,193	94.6
Missing	49	50.5
Geopolitical Zone		
North Central	1,390	60.7
North East	1,458	47.7
North West	1,687	32.8
South East	1,327	74.8
South-South	1,591	76.1
South West	1,653	78.9
Wealth Quintile		
Poor	1,517	11.4
Second	1,512	32.9
Middle	1,722	62.1
Fourth	2,066	83.9
Richest	2,289	95.7

Dietary intake

Overview of findings for the dietary component of the NFCMS

This section of the report presents information on the dietary intake of the sampled WRA aged 15-49 years, pregnant WRA aged 15-49 years, and children aged 6-59 months. The data in this report were obtained from a diet questionnaire and the 24-hr dietary recall interview which were administered during the same home visit. The 24-hour dietary recall data were collected using the INDDEX24 tool. A sub-sample was revisited for a repeat dietary recall.

Six thematic areas are considered in this report (refer to **Table 38**), namely (i) energy and nutrient intakes of women and children, (ii) inadequacy of nutrient intakes, (iii) Infant and Young Child Feeding (IYCF) indicators and nutrient density of the complementary diet of children aged 6-23 months, (iv) biofortification coverage and intake of biofortified foods, (v) food fortification coverage and intake of selected food vehicles and (vi) metrics of diet quality.

The structured diet questionnaire mainly provided the data on coverage of biofortification and fortification and few IYCF indicators while the 24-hour dietary recall data provided data on usual intakes of foods, nutrients, and corresponding inadequacies. This data was further analysed for several indicators of infant and young child feeding practices and some metrics of diet quality.

The **Table 38** below provides a summarized version of the thematic areas (related to dietary intake component) presented in this report. The operational definitions of the indicators are presented in **Annex 8** .

Table 38. Thematic areas of the dietary intake and associated results

Thematic Area	Results to be presented	Target group
Energy and Nutrientintakes	● Usual Intakes of energy ● Usual intakes of selected macronutrients ● Usual intakes of selected micronutrients	Women aged 15-49 years and Children aged 24-59 months
Inadequacy of Nutrient Intakes	● Prevalence of inadequacy of nutrient intakes	Women aged 15-49 years and Children aged 24-59 months
IYCF Indicators forChildren	WHO/UNICEF Breastfeeding Indicators ● Ever breastfed (children born in the last 24 months) ● NFCMS includes 6-23 months ● Continued breastfeeding among children aged 12-23 months	Children aged 6-23 months
	WHO/UNICEF Complementary Feeding Indicators ● Introduction of solid, semi-solid or soft foods (6-8 months) ● Minimum dietary diversity, MDD (6-23 months) ● Minimum meal frequency, MMF (6-23 months) ● Minimum milk feeds of non-breastfed children (6-23 months) ● Minimum acceptable diet, MAD (6-23 months) ● Egg and/or flesh food consumption (6-23 months) ● Sweet beverage consumption (6-23 months) ● Unhealthy food consumption (6-23 months) ● Zero vegetable or fruit consumption (6-23 months)	Children aged 6-23 months
	Other Indicators ● Bottle feeding (children born in the last 24 months, (NFCMS includes 6-23 months) ● Nutrient density of complementary diet (6-23 months)	Children aged 6-23 months

Table 38. Thematic areas of the dietary intake and associated results (continued)

Thematic Area	Results to be presented	Target Group
Biofortification Coverage	• Proportion of respondents who consumed biofortified foods in the past 30 days • Frequency of consumption of biofortified foods in the past 30 days	Women aged 15-49 years
	• Usual intakes of specific foods (raw form): biofortified foods • Contribution of specific foods to energy and Vitamin A intake	Non-pregnant Women aged 15-49 years and Children aged 24-59 months
Food Fortification coverage	• Proportion of population whose households consumed selected food vehicles • Proportion of population whose households consumed purchased food vehicles and branded food vehicles as proxy to fortifiable food vehicles • Types, sources, and brands of selected food vehicles used • Proportion of households who consumed the food vehicle labelled as fortified and selected food vehicles assumed to be fortified (using secondary data from GAIN1) • Fortification status of selected food samples collected from the homes of a sub-sample of non-pregnant WRA.	Women aged 15-49 years
	• Usual intake of food vehicles • Contribution of food vehicles to energy intake	Women aged 15-49 years and Children aged 24-59 months
Diet Quality Metricsamong women	• Global Diet Quality Score, GDQS • Global Diet Recommendations, GDR Score • Minimum Dietary Diversity for Women, MDD-W	Women aged 15-49 years

[1]Assumed fortification status based on data previously collected by GAIN (2021)

Characteristics of Respondents

Box 2. Key Findings on Characteristics of Respondents

Age of women of reproductive age: Over half of the women (57 percent of non-pregnant and 82 percent of pregnant women) were between 20 and 39 years old. The average age was 28 years.

Level of education: 44.6 percent of non-pregnant women, 35.2 percent of pregnant women, and only 7.7 percent of caregivers had completed senior secondary school.

Pregnancy status: Nationally, about 26 percent of the sampled pregnant women were in the first trimester of pregnancy, 19 percent were in the second trimester, and 25 percent were in the third trimester.

Lactation status (those who breastfed in the previous day): Nationally, about 24 percent of non-pregnant women reported breastfeeding a child (29 percent from rural areas and 18 percent from urban areas).

Characteristics of respondents for the dietary intake assessment component

The dietary intake component of this survey targeted non-pregnant women of reproductive age (WRA) aged 15-49 years, pregnant WRA aged 15-49 years, and children aged 6-59 months. The final sample for analysis of the diet questionnaire of the dietary component comprised 5326 non-pregnant women, 1010 pregnant WRA and 5079 children (1679 aged 6-23 months and 3400 aged 24-59 months) while the 24-hour recall respondents for analysis comprised 5241 non-pregnant women, and 999 pregnant WRA, 5020 children (1664 aged 6-23 months and 3356 aged 24-59 months), The average age of women in all categories was 28 years. Children aged 6-23 months had an average age of about 14 months, while children aged 24-59 months had an average age of 39 months.

Non-pregnant women were sampled as a single target group and were analyzed separately to factor in the lactating status and different requirements by age groups. Any woman who was pregnant and lactating was considered as belonging to the pregnant group and was not analysed as a lactating woman. Children were sampled as a single target group, but analyzed separately based on their breastfeeding status and the different requirements by age groups. Responses for children were given by the primary caregiver that is responsible for feeding and overall care of the selected child. Emphasis was placed on verifying primary caregivers during the training and during the home visit confirmatory questions were asked about the care of the child to identify if the respondent is the primary caregiver.

The characteristics of the respondents are shown in **Table 39.** Boys and girls in both age groups have a ratio of almost 1:1. Over half of the women (57 percent of non-pregnant and 82 percent of pregnant women) were between 20 and 39 years. Twenty-three (23) percent of the non-pregnant women and 10 percent pregnant women were teenagers (aged 15-19 years). Level of education completed by the caregiver and WRA shows that in all the groups, except non-pregnant women, about one-third of the respondents had no education, 18-27 percent had primary education, and 14-35 percent completed senior secondary school. Less than 10 percent of children's caregivers reported having education beyond senior secondary. More than 35 percent of all WRA completed education beyond senior secondary. In all the respondent groups, except non-pregnant women, about two-thirds were from the rural areas, while the rest were from urban areas.

Table 39. Characteristics of respondents for the Diet Questionnaire

	Children 6-23 months		Children 24-59 months		Non-Pregnant Women		Pregnant women	
	N[1]	% [95% CI] [2]	N[1]	% [95% CI] [2]	N[1]	% [95% CI] [2]	N[1]	% [95% CI] [2]
Gender								
Male	1679	47.1 [43.9, 50.4]	3400	51.1 [48.8, 53.3]	Not applicable			
Female		52.9 [49.6, 56.1]		48.9 [46.7, 51.2]				
Age								
15-19 years	Not applicable				5326	22.8 [21.1, 24.5]	1010	10.4 [8.0, 12.9]
20-29 years						32.8 [31.2, 34.5]		50.7[46.7,54.7]
30-39 years						24.9 [23.5, 26.5]		31.4[27.6,35.2]
40-49 years						19.4 [18.1, 20.7]		7.5[5.1,9.8]
Level of education completed by the caregiver and WRA[3]								
None	1654	30.5 [26.1,34.9]	3285	31.9 [28.4,35.4]	5306	22.2 [19.2, 25.1]	1006	31.4 [26.0, 36.8]
Primary		27.0 [23.7,30.4]		27.4 [24.3,30.5]		18.2 [16.0, 20.4]		19.2 [15.5, 22.8]
Secondary		34.8 [30.7,38.8]		33.0 [29.5,36.6]		15.0 [13.5, 16.6]		14.2 [11.4, 17.1]
Post-secondary		7.7 [5.7,9.7]		7.7 [6.0,9.3]		44.6 [41.3, 48.0]		35.2 [30.9, 39.6]
Residence[4]								
Urban	1679	34.6 [3.5, 27.6]	3400	34.5 [27.9, 41.0]	5326	44.1 [37.6, 50.7]	1010	35.4 [28.5, 42.3]
Rural		65.4 [3.5, 58.5]		65.5 [59.0, 72.1]		55.9 [49.3, 62.4]		64.6 [57.7, 71.5]
Wealth quintile[5]								
Lowest	1672	21.9 [17.6, 26.2]	3387	21.9 [18.0,25.8]	5304	17.3 [14.1,20.4]	1007	21.9 [17.0, 26.8]
Second		23.0 [18.4, 27.5]		22.6 [19.3,26.0]		18.8 [16.2,21.5]		22.4 [17.9, 26.9]
Middle		18.7 [15.9, 21.6]		19.4 [16.9,21.9]		20.9 [18.6,23.3]		21.0 [17.1, 24.7]
Fourth		18.8 [15.6, 22.1]		18.6 [16.3,21.0]		21.7 [19.1,24.3]		18.6 [14.6, 22.6]
Highest		17.6 [13.7, 21.4]		17.5 [13.7,21.3]		21.3 [18.1,24.4]		16.2 [12.8, 19.6]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]For children, the level of education relates pertains to the sampled child's caregiver; but for women 'the level of education' relates to herself
[4]These data pertain to the enumeration area of the sampled respondent

Pregnancy and lactation status of WRA

Women's quality of life and their reproductive health outcomes are intrinsically linked to their nutritional status. These outcomes can be influenced based on changes to physiological status resulting from pregnancy or breastfeeding. In this survey, when a woman was both pregnant and lactating, she was classified and reported as pregnant and the correspondent nutrient requirements were used in assessing her diet adequacy. These requirements vary with physiological status and for some nutrients, the requirements are higher for lactating women.

Pregnancy status

This section describes the self-reported pregnancy stages of all pregnant women respondents. Pregnancy stage was assessed because energy requirements for pregnant women vary by stage. The pregnancy stages reported by the respondents were categorized in trimesters: first (0-3 months); second (4-6 months); and third (7-9 months), as shown in **Figure 8**. Nationally, about 26 percent of the sampled pregnant women were in the first trimester of pregnancy, 19 percent were in the second trimester, and 25 percent were in the third trimester. Thirty (30) percent of the women did not know the stage of their pregnancy or were not willing to tell, possibly for cultural reasons. Similar patterns were observed in urban and rural areas. Since energy requirements vary by stage of pregnancy, we did not assess adequacy energy and they were not analyzed according to pregnancy stage. IOM EARs have one value for pregnancy.

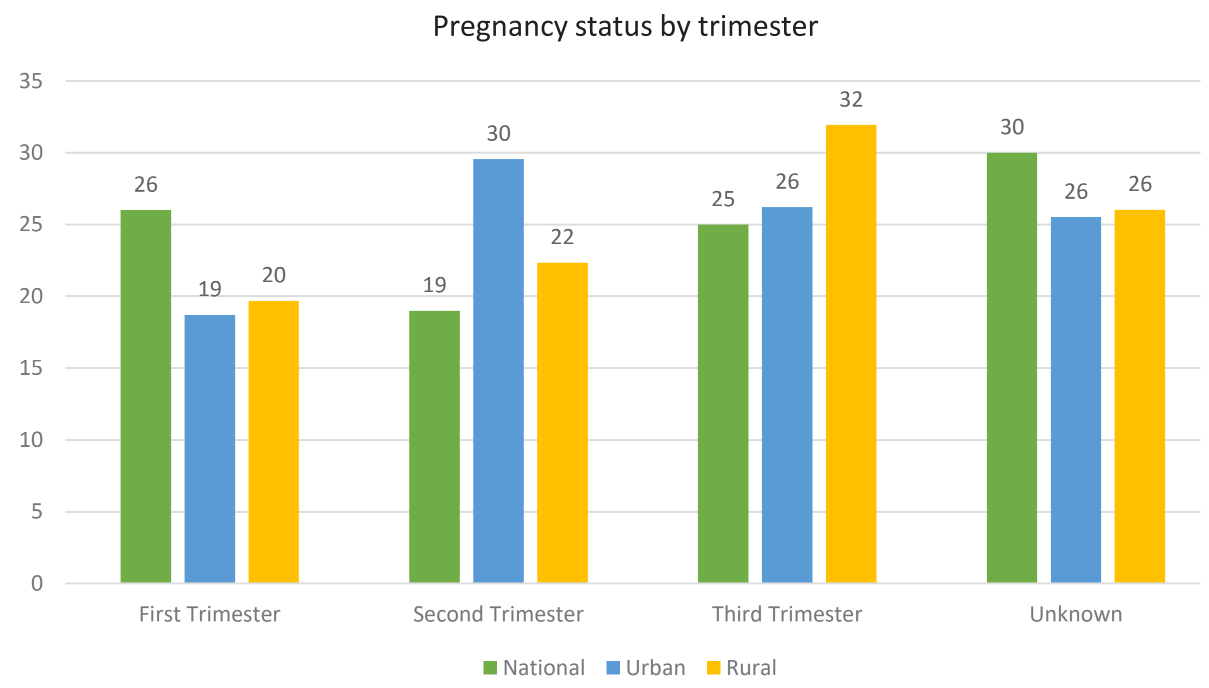

Figure 8. Pregnancy Stage by Trimester
Among pregnant women 15-49 years (Number of respondents = 1010)
Data are weighted to account for survey design and non-response

Lactation status

All women, regardless of their pregnancy status or whether they had young children, were asked whether they breastfed a child the previous day or night prior to the interview. Lactation status was assessed because energy and nutrient requirements for women increase during lactation.

Table 40 shows the percentage of WRA who reported having breastfed a child the previous day or night. Nationally, about 24 percent of the non-pregnant women and 10 percent of the pregnant women reported breastfeeding a child. About 29 percent of non-pregnant women from the rural areas and 18 percent from the urban areas reported breastfeeding a child. The proportion of women who breastfed ranged between 14 and 17 percent in the southern zones, and between 20 and 36 percent in the northern zones. Differences in breastfeeding rates likely reflect demographics and of whether the respondent woman has an infant or a young child.

Table 40. Lactating status of non-pregnant and pregnant women aged 15-49 years (i.e., breastfed a child of any age the previous day or night)

		Breastfed a child yesterday during the day or night
National	N[1]	% [95% CI][2]
Pregnant women	1010	10.1 [8.1, 12.3]
Non-pregnant women	5326	24.1 [21.9, 26.2]
Residence		
Urban	2129	17.7 [15.0, 20.3]
Rural	3186	29.1 [25.9, 32.3]
Zone		
North Central	860	19.5 [15.4, 23.6]
North East	831	27.1 [22.4, 31.7]
North West	944	36.2 [30.5, 42.0]
South East	865	14.8 [11.6, 18.1]
South South	893	14.4 [12.1, 16.7]
South West	916	17.1 [12.6, 21.6]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.

Breastfeeding stage is important because of varying energy and nutrient requirements throughout lactation. **Table 41** shows the age of the child being breastfed among lactating non-pregnant women who breastfed a child the day and night before the interview. About 25 percent and 33 percent of lactating non-pregnant women breastfed children aged less than 6 months and 6-12 months, respectively, while more than 40 percent breastfed a child 12 months and above. There were more lactating women breastfeeding (28 percent for <6 months and 42 percent for 6-11,9 months) in urban areas. More lactating women (48 percent) breastfed children ≥ 12 months in rural areas and North West (50.5 percent).

Table 41. Lactating stage of non-pregnant WRA who breastfed a child the previous day or night

	N[1]	Lactating stage in months (among non-pregnant women who breastfed a child yesterday during the day or night)[2]		
		<6 months	6-11.9 months	≥ 12 months
		% [95% CI]	% [95% CI]	% [95% CI]
National	1167	24.7 [21.4, 28.0]	33.4 [30.0, 36.8]	42.0 [38.0, 46.0]
Residence				
Urban	331	28.4 [23.6, 33.3]	42.2 [36.7, 47.7]	29.4 [23.5, 35.3]
Rural	836	22.9 [18.7, 27.1]	29.1 [25.2, 33.1]	48.0 [43.4, 52.6]
Zone				
North Central	184	29.1 [18.9, 39.3]	33.7 [26.3, 41.1]	37.2 [26.8, 47.6]
North East	233	24.3 [19.0, 29.6]	34.9 [28.0, 41.9]	40.8 [30.9, 50.7]
North West	343	21.2 [15.1, 27.2]	28.3 [22.6, 34.1]	50.5 [43.9, 57.0]
South East	132	36.0 [28.0, 44.0]	39.0 [30.9, 48.9]	24.1 [15.0, 33.2]
South South	134	28.2 [17.1, 39.3]	41.9 [30.3, 53.4]	29.9 [19.6, 40.1]
South West	141	26.3 [19.3, 33.4]	39.9 [30.9, 48.9]	33.8 [24.8, 42.7]

[1]Number of respondent who answered Yes to breastfeeding a child the previous day
[2]Sample weights are applied to account for survey design and non-response.

Characteristics of the caregiver of the sampled children (6-59 months)

For most of these children (90-96 percent), the respondent was the child's mother (**Table 42**). Over 70 percent of the respondents were between 20 and 39 years of age for both groups of children. Less than 10 percent of the respondents were either teenage or elderly caregivers.

Table 42. Characteristics of respondents for the sampled children

	Children aged 6-23 months		Children aged 24-59 months	
	N[1]	% [95% CI]	N[1]	% [95% CI]
Relationship of the respondent to the sampled child				
Mother	1679	95.6 [94.4, 94.7]	3400	89.8 [88.4, 91.2]
Father		0.8 [0.3, 1.3]		1.8 [1.2, 2.4]
Other family member		3.6 [2.6, 4.7]		8.4 [7.1, 9.7]
Gender of the respondent				
Female	1679	94.4 [92.8, 96.1]	3400	91.6 [89.8, 93.4]
Male		5.6 [3.9, 7.2]		8.4 [6.6, 10.2]
Age of the respondent				
15-19 years	1679	8.7 [6.4, 11.0]	3400	4.7 [3.6, 5.8]
20-29 years		51.4 [48.1, 54.8]		42.3 [39.6, 44.9]
30-39 years		31.4 [28.5, 34.3]		36.1 [33.6, 38.6]
40-49 years		5.6 [4.2, 7.0]		10.3 [8.8, 11.7]
50-59 years		0.8 [0.2, 1.4]		1.9 [1.3, 2.4]
60 years or older		2.1 [1.0, 3.1]		4.8 [3.5, 6.2]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.

Macronutrient Intakes for Women and Children

Box 3. Key Findings on Macronutrient Intakes for Women and Children

Usual mean energy intake for women of reproductive age: Nationally, the usual mean energy intake was 1848 kcal for non-pregnant non-lactating women, 2061 kcal for lactatingwomen, and 1899 kcal for pregnant women (1652 kcal in North Central and 2040 kcal in South East).

Usual mean energy intake for children 24-59 months: Nationally, the usual mean energy intake for children aged 24-59 months was 1200 kcal (1235 kcal for boys and 1163 kcal for girls). Data by geopolitical zone is not available for children.

Food sources contributing to energy intake: Palm olein (a refined version of palm oil fortified with vitamin A), rice, and red palm oil were the main contributors to energy intake for both women and children nationally (palm olein, maize flour, and rice main contributors in the Northern zones; rice, palm oil, garri, palm olein, and bread in the Southern zones.

Usual mean protein intakes for women of reproductive age: Nationally, non-pregnant non-lactating women and lactating women had intakes of 47 grams and 53 grams, respectively while pregnant women had a usual intake of 49 grams (North Central and North East had an intake of 42 grams and South West had an intake of 53 grams).

Protein inadequacy in women of reproductive age: About 35 percent of non-pregnant women have an inadequate protein intake, 58 percent of pregnant women, and 66 percent of lactating women have inadequate intake (51 percent urban and 63 percent rural dwellers for pregnant women).

Intake of animal-sourced protein for women of reproductive age: The usual intake of animal-sourced protein among non-pregnant women is 14 grams. Across the zones, it ranged from a low of 8 grams in the North East to a high of 23 grams in the South South.

Intake of plant-sourced protein for women of reproductive age: The mean usual intake of protein from plant sources was 35 grams irrespective of pregnancy status while it was different for non-lactating women (34 grams) and lactating women (40 grams). Across the zones, women in the Northwest had the highest intake of 41 grams, while South South women had the lowest intake of 26 grams.

Usual mean protein intake for children 24-59 months: Nationally, the usual mean protein intake for children aged 24-59 months is 29 grams (30.6 grams in urban and 28 grams in rural). Only 2 percent had inadequate intake.

Food sources contributing to protein intake for women and children 24-59 months: The main food sources for protein were rice, maize products, and cowpea products for both women of childbearing age and children 24-59 months.

Intake of animal- and plant-sourced protein for children 24-59 months: The usual intakeis 7 grams and 22 grams from animal and plant sources, respectively. Data by geopolitical zone is not available for children.

Contribution of protein to total usual energy intake for women and children 24-59 months: The mean contribution of protein to total usual energy intake was approximately 10 percent for women across the various categories and children 24-59 months (Animal sources contributed approximately 3 percent and plant sources generally contributed about 8 percent).

Usual intakes of fat for women and children 24-59 months: Nationally, the usual fat intake in non-pregnant women is 68.7 grams (North Central 58.4 grams and South East 79.3 grams). The usual fat intake of pregnant women living in rural areas was 67.4 grams and those in urban areas had an intake of 76.8 grams. The mean fat intake of children aged 24 –59 months is 45 grams.

Food Sources contributing to fat intake for women and children 24-59 months: Among women and children, the main sources of fat were edible oils (palm oil, its products, and other vegetable oils).

Percentage contribution of fat to total energy intake: The contribution of fat intake to overall energy intake was approximately 33 percent and 34 percent for women and children, respectively.

Usual intake of Carbohydrates in women: Usual mean carbohydrate intakes were 251 grams for non-pregnant non-lactating women, 280 grams for lactating women, and 255 grams for pregnant women (229 grams in the North Central and 274 grams in North west).

Usual intake of Carbohydrates in children 24-59 months: The usual carbohydrate intake is 162 grams (170 grams in urban and 158 grams in rural areas).

Food sources contributing to carbohydrate intake for women and children 24-59 months: Rice, maize, and cassava (garri) products were the major food sources across all groups of women and children 23-59 months. In the case of children, sugar was a higher contributor than bread when compared to women.

Percentage contribution of carbohydrate to total energy intake for women and children 24-59 months: The mean contribution of carbohydrate intake to overall energy intake was approximately 54 percent across the sampled categories of women (also 54 percent for children 24-59 months).

Energy and nutrient intakes of women and children

Usual energy, macronutrient and micronutrient intakes were derived from 24-hour recall data collected for non-pregnant reference WRA, pregnant women and children aged 24-59 months. Energy and several nutrient requirements are higher for breastfeeding women (IOM 2005); therefore, intakes for breastfeeding and non-breastfeeding women are presented separately. Usual intakes of the overall diet of children aged 6-23 months are not presented because breastmilk intakes were not measured in this survey, instead the nutrient density of the complementary diet is presented further in the report.

For non-pregnant women, for which the number of respondents was the largest, intakes are presented separately by residential areas (urban vs rural), geopolitical zones (three southern and three northern zones), and wealth quintiles. For pregnant women, intakes are also presented separately by residential areas (urban vs rural). For children, intakes are presented separately by sex and by residential areas (urban vs rural).

For all nutrients with an Estimated Average Requirement (EAR) and that meet, the assumptions for the EAR cut point method, the prevalence of inadequacy is provided. The two exceptions are energy and iron. Energy intakes are correlated with energy requirements because energy needs are dependent on individual characteristics of body weight and physical activity level. An individual's physical activity level cannot be accurately assessed in a large-scale survey. The prevalence of inadequacy cannot be determined, but a descriptive approach is used to compare the mean energy intake to an estimated average energy requirement based on an assumed level of activity. For iron, intakes are skewed and a full probability approach is used to assess the probability of inadequacy, which approximates a prevalence of inadequacy.

Usual energy intake of women and children

For WRA, there are two target groups, non-pregnant women and pregnant women. The non-pregnant women of reproductive age are subdivided into non-pregnant non-lactating women (NPNL) and non-pregnant lactating women. Dietary intake results are presented for each of the subgroups of non-pregnant women.

Usual mean energy intake was 1848 kcal for non-pregnant non-lactating women (NPNL), 2061 kcal for lactating women and 1899 kcal for pregnant women (Table 43). Usual mean energy intakes for non-pregnant women ranged from a low of 1652 kcal in the North Central zone to a high of 2040 kcal in the South East zone. No trends were observed by wealth quintiles. The mean energy requirement for an 18-29 year old NPNL woman, with a body weight of 55 kg and with a moderate activity level, ranges from 2100 to 2300 kcal. The mean intake of energy was slightly less than the range, particularly for North Central and North East.

Usual mean energy intake for children aged 24-59 months was 1200 kcal (**Table 44**). The usual mean energy intake was 1235 kcal and 1163 kcal for boys and for girls, respectively. The energy requirement for a child aged 24-59 months, with a moderate activity level, ranges from 1125 to1350 kcal for boys and from 1050 to 1250 kcal for girls.

The top foods that contributed to the overall energy intake of women and children are presented in the Annex section (**Annex 9)**. On a national level, palm olein (a refined version of palm oil fortified with vitamin A), rice and red palm oil were the prominent contributors to the overall energy intake of both women and children. Other top contributors included products from maize, cassava (*garri*), wheat (bread and biscuit), millet and sorghum. For non-pregnant women, the data was further disaggregated into geopolitical zones, and it revealed that, amongst other top foods, the contribution of palm olein, maize flour and rice were highest in the Northern zones of the country (**Annex 10**). Among the southern zones, rice, palm oil, *garri*, palm olein, wheat flour bread were consistently the highest contributors to energy intake.

Table 43. Usual energy intake of women aged 15-49 years

	Energy (kcal/day)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	1875 [1827, 1923]	24.4	1831 [1515, 2190]
NPNL[3]	4544	1848 [1801, 1894]	23.6	1807 [1501, 2151]
Lactating women[4]	697	2061 [1967, 2155]	47.7	1996 [1620, 2435]
Pregnant women	999	1899 [1818, 1980]	41.3	1862 [1553, 2203]
Residence				
Non-pregnant women				
Urban	2114	1868 [1806, 1930]	31.3	1823 [1504, 2183]
Rural	3127	1885 [1816, 1953]	34.8	1840 [1521, 2201]
Pregnant women				
Urban	402	1985 [1840, 2131]	73.4	1949 [1610, 2324]
Rural	597	1854 [1763, 1945]	46.0	1819 [1519, 2147]
Zone				
Non-pregnant women				
North Central	800	1652 [1551, 1753]	50.6	1603 [1316, 1937]
North East	824	1733 [1639, 1828]	47.2	1687 [1375, 2043]
North West	943	1992 [1885, 2098]	53.2	1952 [1643, 2298]
South East	871	2039 [1962, 2118]	39.0	2003 [1699, 2341]
South South	892	1989 [1910, 2070]	40.0	1962 [1671, 2279]
South West	911	1836 [1765, 1907]	35.7	1805 [1505, 2133]
Wealth Quintile				
Non-pregnant women				
Lowest	921	1842 [1708, 1977]	67.9	1782 [1433, 2184]
Second	875	1904 [1827, 1982]	39.2	1872 [1581, 2194]
Middle	1061	1815 [1730, 1901]	43.4	1782 [1504, 2092]
Fourth	1193	1867 [1784, 1950]	42.3	1818 [1489, 2196]
Highest	1170	1941 [1880, 2003]	31.0	1895 [1577, 2254]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, SE= Standard Error, NPNL = Non pregnant and non-lactating women

Table 44. Usual energy intakes of children aged 24-59 months

	Energy (kcal/day)			
	N[1]	Mean [95%CI][2]	SE	Median [25-75th]
National	3356	1200 [1170, 1231]	15.4	1168 [955, 1410]
Sex				
Male	1722	1235 [1199, 1270]	18.1	1202 [978, 1454]
Female	1634	1163 [1122, 1203]	20.6	1134 [933, 1360]
Residence				
Urban	1385	1261 [1200, 1321]	30.5	1228 [1016, 1473]
Rural	1971	1171 [1133, 1209]	19.3	1135 [926, 1376]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Usual intakes of macronutrients and their contribution to energy intake

This section presents results of usual intake of selected macronutrients - protein (total, animal and plant sourced), fat, and carbohydrates - and their corresponding percentage contribution to usual energy intake. Contributions of macronutrients intakes are compared to Acceptable Macronutrient Distribution Ranges (AMDR) (IOM, 2005). The AMDR are a range of contributions of macronutrient intakes that reduce the risk of chronic disease, while at the same time would provide adequate intakes. The ranges allow for the development of dietary recommendations across a variety of activity levels, physiological status, food preferences and food environment. The AMDR express intake recommendations as a percentage of total energy intake.

Usual intakes of protein and prevalence of inadequacy

Dietary protein is needed for body growth and development and is usually digested in the body into its constituent amino acids which the body then utilizes as building blocks to form its own protein mass in muscle, visceral organs, and circulating proteins. An adequate diet must contain foods that supply at least nine essential amino acids for proper nutrition and health. Generally, animal protein sources are good sources of these essential amino acids while plant sources are deficient in one or more. In this section, results are presented on the usual protein intake, protein intake from animal and plant sources with their corresponding contributions to usual energy intake.

As shown in **Table 45**, non-pregnant non-lactating women and lactating women had intakes of 47 grams and 53 grams, respectively while pregnant women had a usual intake of 49 grams. Across zones, women from North central and North East had a mean usual intake of 42 grams while women from South West had an intake of 53 grams. There was generally an increase in protein intake as the wealth quintile increased with women in the lowest and highest quintiles having an intake of 45 grams and 53 grams of protein respectively.

The intake of protein was compared against requirements (in grams) which were derived by multiplying the requirement in g/kg with a reference body weight. The inadequacy of protein intake in women varied widely across the reported categories (**Table 46**). About 35 percent of non-pregnant women have an inadequate protein intake while over half (58 percent) of pregnant women had inadequate intake. For lactating women about 66 percent had inadequate intake. The prevalence of inadequacy among pregnant urban and rural dwellers was 51 percent and 63 percent respectively. A consistent pattern in the zones was that northern zones had higher proportions of inadequacy compared to zones in the south and it ranged from a low of 20 percent in South West to a high of 50 percent in the North East. The inadequacy of protein ranged from 20 percent in the highest wealth quintile to 47 percent in the lowest wealth quintile.

The usual intake of animal- sourced protein among non-pregnant women is 14 grams (**Table 47**). This is similar among other categories of women reported in this survey. Across the zones, it ranged from a low of 8 grams among women living in the North east to a high of 23 grams among South South women. Intake of animal-source protein increased as wealth quintile increased, with women in the lowest quintile having an intake of 12 grams against those in the highest quintile (19 grams). The mean usual intake of protein from plant sources was 35 grams irrespective of pregnancy status while it was different for non-lactating women (34 grams) and lactating women (40 grams) respectively (**Table 48**). Across the zones, women in the Northwest had a highest intake of 41 grams, while South South women had a lowest intake of 26 grams. All wealth quintiles had approximately the same intake of 33 grams apart from the second wealth quintile (38 grams).

The top foods that contributed to the overall protein intake of women and children are presented in the Annex section (**Annex 11-12**). The prominent foods were rice, maize products, cowpea which are common plant sources of protein. The results show that the contribution of animal sourced protein was not high which suggests that they are possibly absent in the diet of most women and children.

Table 45. Usual protein intake of women aged 15-49 years

	Protein (grams)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	38-59	47.7 [46.1, 49.2]	0.7	45.7 [36.4, 56.9]
NPNL[3]	4544	38	46.9 [45.4, 48.4]	0.7	45.1 [36.1, 55.7]
Lactating women[4]	697	59	52.9 [49.6, 56.1]	1.6	50.0 [38.4, 64.2]
Pregnant women	999	50	48.7 [46.0, 51.3]	1.3	47.0 [37.5, 57.9]
Residence					
Non-pregnant women					
Urban	2114	38-59	49.1 [47.1, 51.1]	1.0	47.2 [37.7, 58.5]
Rural	3127	38-59	46.6 [44.3, 48.9]	1.2	44.7 [35.5, 55.6]
Pregnant women					
Urban	402	50	52.5 [48.0, 57.0]	2.3	49.8 [38.0, 64.2]
Rural	597	50	46.7 [43.3, 50.0]	1.7	45.3 [37.1, 54.8]
Zone					
Non-pregnant women					
North Central	800	38-59	42.0 [39.0, 45.0]	1.5	40.1 [32.1, 49.9]
North East	824		42.2 [40.0, 44.4]	1.1	40.3 [31.7, 50.7]
North West	943		48.6 [44.9, 52.4]	1.9	46.9 [38.0, 57.3]
South East	871		50.4 [47.1, 53.7]	1.6	48.7 [38.9, 60.2]
South South	892		49.9 [46.0, 53.7]	1.9	48.2 [38.7, 59.3]
South West	911		53.2 [50.4, 55.9]	1.4	51.5 [41.8, 62.7]
Wealth Quintile					
Non-pregnant women					
Lowest	921	38-59	44.5 [40.2, 48.9]	2.2	41.7 [31.7, 54.2]
Second	875		47.0 [43.9, 50.0]	1.5	45.5 [37.3, 55.0]
Middle	1061		44.2 [41.8, 46.5]	1.2	42.4 [34.2, 52.3]
Fourth	1193		48.8 [46.5, 51.1]	1.2	47.0 [37.9, 57.9]
Highest	1170		52.9 [50.9, 54.9]	1.0	51.4 [41.9, 62.3]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (The EAR was converted from grams per kg of body weight to grams using reference body weights (bw) provided by IOM (2002). For NPNL women aged 15-18 years: 0.71g protein/kg/day and 54 kg bw; NPNL women aged 19-49 years: 0.66 g protein/kg/day and 57 kg bw; lactating women aged 15-18 years 0.71 g protein/kg/day and 54 kg bw plus 21 g/d; lactating women aged 19-49 years 0.66 g protein/kg/d and 57 kg bw plus 21 g; pregnant women aged 15-18 years 0.88 g protein/kg/day and 54 kg bw; and pregnant women aged 19-49 years 0.88 g protein/kg/day and 57 kg bw)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 46. Prevalence of inadequacy of protein intakes of women aged 15-49 years

	EAR[1] grams/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	38-59	5241	35.4	[31.8, 38.9]
NPNL[4]	38	4544	29.4	[25.5, 33.2]
Lactating women[5]	59	697	66.4	[59.9, 72.9]
Pregnant women	50	999	57.8	[48.0, 67.5]
Residence				
Non-pregnant women				
Urban	38-59	2114	30.9	[26.0, 35.7]
Rural	38-59	3127	38.6	[33.1, 44.1]
Pregnant women				
Urban	50	402	50.5	[41.1, 59.9]
Rural	50	597	63.3	[48.9, 77.6]
Zone				
Non-pregnant women				
North Central		800	48.2	[38.6, 57.8]
North East		824	50.0	[43.9, 56.0]
North West	38-59	943	33.6	[26.1, 41.0]
South East		871	28.0	[18.9, 37.0]
South South		892	26.7	[12.8, 40.6]
South West		911	20.3	[13.2, 27.5]
Wealth Quintile				
Non-pregnant women				
Lowest		921	47.2	[37.8, 56.7]
Second		875	36.0	[27.1, 44.8]
Middle	38-59	1061	42.6	[35.2, 50.0]
Fourth		1193	30.9	[24.5, 37.4]
Highest		1170	20.2	[14.0, 26.4]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu). The EAR was converted from grams per kg of body weight to grams using reference body weights (bw) provided by IOM (2002). For NPNL women aged 15-18 years: 0.71g protein/kg/day and 54 kg bw; NPNL women aged 19-49 years: 0.66 g protein/kg/day and 57 kg bw; lactating women aged 15-18 years 0.71 g protein/kg/day and 54 kg bw plus 21 g/d; lactating women aged 19-49 years 0.66 g protein/kg/d and 57 kg bw plus 21 g; pregnant women aged 15-18 years 0.88 g protein/kg/day and 54 kg bw; and pregnant women aged 19-49 years 0.88 g protein/kg/day and 57 kg bw)
[2] Number of respondents
[3] Sample weights are applied to account for survey design and non-response.
[4] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 47. Usual animal-source protein intake of women aged 15-49 years

	Protein (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	13.6 [12.3, 14.9]	0.6	9.8 [5.0, 18.0]
NPNL[3]	4544	13.8 [12.5, 14.9]	0.6	10.2 [5.3, 18.1]
Lactating women[4]	697	13.6 [11.3, 15.8]	1.1	8.1 [3.4, 17.4]
Pregnant women	999	14.7 [12.8, 16.5]	1.0	9.2 [4.1, 18.9]
Residence				
Non-pregnant women				
Urban	2114	16.0 [14.5, 17.5]	0.8	11.3 [5.4, 21.4]
Rural	3127	13.0 [11.4, 14.5]	0.8	8.1 [3.7, 16.5]
Pregnant women				
Urban	402	17.2 [14.4, 19.9]	1.4	11.2 [4.7, 23.0]
Rural	597	14.8 [11.3, 18.2]	1.8	7.8 [3.2, 17.6]
Zone				
Non-pregnant women				
North Central	800	11.5 [10.0, 13.0]	0.7	8.5 [4.5, 15.1]
North East	824	7.8 [5.4 10.3]	1.2	5.0 [2.6, 10.0]
North West	943	11.0 [6.4, 15.7]	2.3	4.5 [1.8, 11.2]
South East	871	19.7 [17.3, 22.0]	1.2	17.6 [11.8, 25.3]
South South	892	23.4 [20.6, 26.2]	1.4	21.6 [15.2, 29.8]
South West	911	20.3 [17.8, 22.7]	1.2	18.8 [13.4, 25.6]
Wealth Quintile				
Non-pregnant women				
Lowest	921	12.3 [8.0,16.5]	2.2	4.9 [1.8, 12.6]
Second	875	11.2 [8.9,13.4]	1.1	6.5 [3.0, 13.4]
Middle	1061	11.7 [10.1,13.2]	0.8	9.3 [5.3, 15.4]
Fourth	1193	16.6 [14.9,18.3]	0.8	11.7 [5.6, 22.3]
Highest	1170	19.3 [17.3, 21.3]	1.0	17.3 [11.4, 24.9]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 48. Usual plant-sourced protein intake of women aged 15-49 years

	Protein (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	34.5 [33.5, 35.6]	0.5	33.3 [26.9, 40.9]
NPNL[3]	4544	33.7 [32.7, 34.7]	0.5	32.7 [26.8, 39.6]
Lactating women[4]	697	40.0 [37.5, 42.4]	1.3	37.6 [28.5, 49.0]
Pregnant women	999	35.3 [33.5, 37.1]	0.9	34.2 [27.5, 41.9]
Residence				
Non-pregnant women				
Urban	2114	34.0 [32.6, 35.5]	0.7	33.0 [26.6, 40.1]
Rural	3127	35.0 [33.4, 36.5]	0.8	33.7 [27.1, 41 .4]
Pregnant women				
Urban	402	36.0 [32.9, 39.0]	1.5	34.7 [27.0, 43.6]
Rural	597	34.9 [32.8, 37.0]	1.0	33.9 [27.8, 41.0]
Zone				
Non-pregnant women				
North Central	800	31.7 [29.6, 33.7]	1.0	30.6 [25.3, 36.9]
North East	824	36.0 [33.8, 38.1]	1.1	34.8 [28.1, 42.5]
North West	943	41.0 [38.5, 43.3]	1.2	40.2 [34.7, 46.4]
South East	871	30.9 [28.9, 32.8]	1.0	30.0 [24.7, 36.1]
South South	892	26.3 [24.6, 27.9]	0.8	25.3 [20.4, 31.1]
South West	911	33.0 [30.9, 35.0]	1.0	31.5 [24.6, 39.6]
Wealth Quintile				
Non-pregnant women				
Lowest	921	33.1 [33.1, 37.8]	1.2	33.1 [24.7, 43.7]
Second	875	38.0 [35.1, 40.7]	1.4	37.3 [32.0, 43.2]
Middle	1061	32.8 [31.1, 34.5]	0.9	31.5 [25.4, 38.8]
Fourth	1193	33.0 [31.2, 34.7]	0.9	31.8 [25.7, 39.0]
Highest	1170	33.8 [32.3, 35.2]	0.7	32.5 [26.3, 39.8]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, , SE= Standard Error

The usual protein intake of children aged 24-59 months is 29 grams (**Table 49**) and the resulting inadequacy was only 2% after comparing the distribution of intakes against requirements (**Table 50**). The top foods that contributed to the overall protein intake of children were mainly plant based which are not rich in essential amino acids (**Annex 11**). For children aged 6-23 months, *fura da nono* was the only top contributor of animal origin while beef also ranked lowest among the top foods for children (aged 24-59 months).

Table 49. Usual protein intake of children aged 24-59 months

	Protein (grams)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	10-15	28.9 [27.9, 29.9]	0.5	27.4 [21.1, 35.0]
Sex					
Male	1722	10-15	29.6 [28.5, 30.8]	0.6	28.0 [21.6, 35.9]
Female	1634	10-15	28.1 [26.8, 29.3]	0.6	26.6 [20.6, 34.0]
Residence					
Urban	1385	10-15	30.6 [29.0, 32.2]	0.8	29.4 [23.5, 36.5]
Rural	1971	10-15	28.0 [26.6, 29.4]	0.7	26.2 [20.0, 34.0]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu). The EAR was converted from grams per kg of body weight to grams using reference body weights provided by IOM (reference below). For children aged 24-47 months: 0.87g protein/kg/day and 12 kg bw; for children aged 48-59 months: 0.76 g protein/kg bw/day and 20 kg bw)
CI= Confidence Interval, SE= Standard Error

Table 50. Prevalence of inadequacy of protein intakes of children aged 24-59 months

	EAR[1] grams/day	N[2]	% < EAR[3]	[95% CI][3]
National	10-15	3356	1.8	[0.8, 2.8]
Sex				
Male	10-15	1722	1.5	[0.3, 2.6]
Female		1634	2.1	[0.3, 3.9]
Residence				
Urban	10-15	1385	0.7	[-0.2, 1.6]
Rural		1971	2.3	[0.7, 4.0]

Children aged 24-59 months had a usual intake of 7 grams and 22 grams from animal and plant sources of protein respectively (**Tables 51 and 52**).

Table 51. Usual animal-source protein intake (grams) of children aged 24-59 months

	Protein (grams)			
	N[1]	Mean [95%CI][2]	SE	Median [25-75th]
National	3356	6.9 [6.0, 7.6]	0.4	4.3 [1.9, 8.8]
Sex				
Male	1722	7.0 [6.1, 8.0]	0.5	4.8 [2.4, 9.2]
Female	1634	6.6 [5.7, 7.5]	0.4	3.8 [1.5, 8.4]
Residence				
Urban	1385	8.3 [7.6, 9.0]	0.3	5.7 [2.6, 11.1]
Rural	1971	6.7 [5.4, 8.0]	0.6	3.4 [1.4, 8.0]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Table 52. Usual plant-sourced protein intake of children aged 24-59 months

	Protein (grams)			
	N[1]	Mean [95%CI][2]	SE	Median [25-75th]
National	3356	22.3 [21.6, 22.9]	0.3	21.3 [16.9, 26.6]
Sex				
Male	1722	22.8 [22.0, 23.6]	0.4	22.0 [17.5, 27.2]
Female	1634	21.6 [20.7, 22.5]	0.4	20.7 [16.2, 26.0]
Residence				
Urban	1385	22.9 [21.8, 24.0]	0.6	22.1 [17.9, 27.1]
Rural	1971	21.9 [21.0, 22.6]	0.4	20.9 [16.4, 26.2]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Percentage contribution of protein to total energy intake

The results on contribution to energy intake are presented to compare protein intake with recommendations of Acceptable Macronutrient Distribution Ranges presented by Institute of Medicine (www.nap.edu). The acceptable percentage of energy from protein ranges for children and adults are from 5-20 percent among children 1-3 years, 10 to 30 percent in older children and 10-35 percent for adults (IOM, 2005). The contribution of protein to the energy intake of women and children was calculated as the overall contribution of protein and the individual contribution of plant protein and animal protein. In general, the observed ranges for protein (and other macronutrients like fat and carbohydrates) were within the acceptable ranges for women and children (**Annex 13**).

As for protein, mean contribution was approximately 10 percent for women across the various categories and children 24-59 months (**Table 53-54**). A larger contribution of more plant source over animal source was also observed. The trends were similar among women and children (**Table 55-57**). Animal sources contributed approximately 3 percent to energy intake irrespective of the respondent's category and ranged from a low of 2 percent in the lowest quintile category to a high of 4 percent in the highest quintile category (**Table 55 and 56**). Plant sources generally contributed about 8 percent to usual protein intake across the groups when the data was disaggregated (**Table 57 and 58**).

Table 53. Contribution of protein to total usual energy intake of women aged 15-49 years

	% Contribution of Protein to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	10.1 [9.9, 10.3]	0.1	10.0 [9.1, 11.0]
NPNL[3]	4544	10.1 [9.9, 10.3]	0.1	10.0 [9.1, 11.0]
Lactating women[4]	697	10.1 [9.7, 10.6]	0.2	10.0 [8.9, 11.2]
Pregnant women	999	10.1 [9.8, 10.5]	0.2	10.1 [9.3, 10.9]
Residence				
Non-pregnant women				
Urban	2114	10.5 [10.2, 10.8]	0.2	10.4 [9.4, 11.5]
Rural	3127	9.8 [9.5, 10.1]	0.1	9.8 [9.0, 10.6]
Pregnant women				
Urban	402	10.4 [9.9, 10.9]	0.3	10.4 [9.1, 11.6]
Rural	597	10.0 [9.5,10.6]	0.3	10.0 [9.4, 10.6]
Zone				
Non-pregnant women				
North Central	800	10.1 [9.8, 10.5]	0.2	10.1 [9.3, 11.0]
North East	824	9.6 [9.2, 10.1]	0.2	9.6 [9.0, 10.3]
North West	943	9.7 [9.3, 10.2]	0.2	9.7 [9.0, 10.4]
South East	871	9.8 [9.4, 10.2]	0.2	9.7 [8.7, 10.8]
South South	892	10.0 [9.2, 10.7]	0.4	9.9 [8.8, 11.1]
South West	911	11.6 [11.2, 11.9]	0.2	11.5 [10.6, 12.5]
Wealth Quintile				
Non-pregnant women				
Lowest	921	9.5 [9.1, 9.8]	0.2	9.4 [8.7, 10.1]
Second	875	9.9 [9.4, 10.4]	0.3	9.8 [8.6, 10.8]
Middle	1061	9.7 [9.3, 10.0]	0.2	9.6 [8.6, 10.6]
Fourth	1193	10.5 [10.2, 10.7]	0.1	10.4 [9.7, 11.2]
Highest	1170	11.0 [10.6, 11.2]	0.2	10.8 [9.9, 11.9]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 54. Contribution of protein to total usual energy intake of children aged 24-59 months

	% Contribution of Protein to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	9.5 [9.4, 9.7]	0.1	9.4 [8.4, 10.5]
Sex				
Male	1722	9.5 [9.3, 9.7]	0.1	9.4 [8.4, 10.5]
Female	1634	9.5 [9.3, 9.7]	0.1	9.4 [8.4, 10.6]
Residence				
Urban	1385	9.7 [9.5, 9.9]	0.1	9.6 [8.6, 10.6]
Rural	1971	9.4 [9.2, 9.6]	0.1	9.3 [8.2, 10.5]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Table 55. Contribution of animal-sourced protein to total usual energy intake of women aged 15-49 years

	% Contribution of Animal Protein to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	3.1 [2.91, 3.29]	0.09	1.8 [0.8, 4.0]
NPNL[3]	4544	3.1 [2.92, 3.26]	0.09	1.9 [0.8, 4.0]
Lactating women[4]	697	2.5 [2.14, 2.80]	0.17	1.7 [0.8, 3.3]
Pregnant women	999	3.2 [2.81, 3.57]	0.19	1.7 [0.7, 3.9]
Residence				
Non-pregnant women				
Urban	2114	3.3 [2.98, 3.58]	0.15	2.5 [1.3, 4.4]
Rural	3127	3.1 [2.77, 3.45]	0.17	1.5 [0.6, 3.6]
Pregnant women				
Urban	402	3.3 [2.84, 3.68]	0.21	2.4 [1.1, 4.4]
Rural	597	2.8 [2.25, 3.25]	0.25	1.7 [0.7, 3.4]
Zone				
Non-pregnant women				
North Central	800	2.6 [2.27, 2.90]	0.16	1.9 [1.0, 3.4]
North East	824	1.7 [1.13, 2.28]	0.29	1.3 [0.8, 2.2]
North West	943	1.9 [1.31, 2.45]	0.28	0.9 [0.4, 2.0]
South East	871	3.7 [3.30, 4.10]	0.20	3.5 [2.6, 4.6]
South South	892	4.6 [4.06, 5.12]	0.26	4.4 [3.3, 5.7]
South West	911	4.3 [3.83, 4.75]	0.23	4.1 [3.1, 5.3]
Wealth Quintile				
Non-pregnant women				
Lowest	921	2.1 [1.64, 2.65]	0.26	1.1 [0.5, 2.5]
Second	875	2.1 [1.76, 2.43]	0.17	1.3 [0.6, 2.6]
Middle	1061	2.4 [2.1, 2.7]	0.15	2.0 [1.1, 3.2]
Fourth	1193	3.3 [3.02, 3.63]	0.15	2.6 [1.4, 4.5]
Highest	1170	3.9 [3.52, 4.27]	0.19	3.6 [2.5, 5.0]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 56. Contribution of animal-sourced protein to total usual energy intake of children aged 24-59 months

	% Contribution of Animal Protein to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	2.6 [2.30, 2.80]	0.13	1.3 [0.5, 3.1]
Sex				
Male	1722	2.1 [1.90, 2.32]	0.11	1.6 [0.8, 2.8]
Female	1634	2.5 [2.18, 2.83]	0.17	1.2 [0.4, 3.0]
Residence				
Urban	1385	2.5 [2.36, 2.71]	0.09	1.9 [0.9, 3.4]
Rural	1971	2.9 [2.26, 3.59]	0.34	1.2 [0.4, 3.1]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Table 57. Contribution of plant sourced protein to total usual energy intake of women aged 15-49 years

	% Contribution of Plant Protein to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	7.5 [7.29, 7.66]	0.09	7.4 [6.2, 8.6]
NPNL[3]	4544	7.4 [7.24, 7.59]	0.09	7.3 [6.2, 8.5]
Lactating women[4]	697	7.9 [7.55, 8.23]	0.17	7.8 [6.5, 9.2]
Pregnant women	999	7.6 [7.35, 7.82]	0.12	7.5 [6.6, 8.5]
Residence				
Non-pregnant women				
Urban	2114	7.4 [7.19, 7.59]	0.10	7.3 [6.4, 8.3]
Rural	3127	7.5 [7.24, 7.83]	0.15	7.4 [6.1, 8.8]
Pregnant women				
Urban	402	7.3 [6.99, 7.68]	0.18	7.3 [6.3, 8.3]
Rural	597	7.7 [7.37, 8.04]	0.17	7.6 [6.8, 8.6]
Zone				
Non-pregnant women				
North Central	800	7.7 [7.45, 7.98]	0.13	7.7 [7.0, 8.4]
North East	824	8.4 [8.15, 8.61]	0.11	8.4 [7.8, 8.9]
North West	943	8.4 [7.99, 8.80]	0.20	8.3 [7.3, 9.3]
South East	871	6.1 [5.80, 6.37]	0.14	6.0 [5.3, 6.8]
South South	892	5.3 [5.03, 5.54]	0.13	5.2 [4.5, 6.0]
South West	911	7.2 [6.85, 7.55]	0.18	7.1 [6.0, 8.2]
Wealth Quintile				
Non-pregnant women				
Lowest	921	7.8 [7.50, 8.18]	0.17	7.8 [6.7, 9.0]
Second	875	8.0 [7.58, 8.42]	0.22	7.9 [6.5, 9.3]
Middle	1061	7.4 [7.09, 7.77]	0.17	7.3 [6.1, 8.6]
Fourth	1193	7.2 [6.90, 7.46]	0.14	7.1 [5.9, 8.3]
Highest	1170	7.0 [6.80, 7.22]	0.10	6.9 [6.1, 7.8]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 58. Contribution of plant sourced protein to total usual energy intake of children aged 24-59 months

	% Contribution of Plant Protein to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	7.5 [7.38, 7.67]	0.07	7.5 [6.4, 8.5]
Sex				
Male	1722	7.5 [7.30, 7.66]	0.09	7.4 [6.5, 8.4]
Female	1634	7.6 [7.36, 7.77]	0.10	7.5 [6.4, 8.7]
Residence				
Urban	1385	7.4 [7.20, 7.55]	0.09	7.3 [6.5, 8.2]
Rural	1971	7.6 [7.37, 7.80]	0.11	7.5 [6.4, 8.7]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Usual intakes of fat and prevalence of inadequacy

Dietary fats and oils are beneficial with regards to numerous functions which include transport of preformed fat-soluble vitamins, providing a necessary substrate for the synthesis of metabolically active compounds, constituting essential structural elements of cell membranes and lipoprotein particles, preventing carbohydrate-induced hypertriglyceridemia, and offering a concentrated form of metabolic fuel in times of scarcity. However, they are also indicated for negative reasons through serving as a reservoir for fat-soluble toxic compounds and contributing dietary saturated and trans-fatty acids, and cholesterol. They are also negatively implicated for providing a concentrated form of metabolic fuel in times of excess intake and comprises the major component of atherosclerotic plaque.

Usual fat intake of pregnant women living in rural areas was 67.4 grams while urban dwellers had an intake of 76.8 grams (**Table 59**). Across the zones, women from northwest, southeast and South South had a higher usual fat 72.6 grams, 79.3 grams and 76.9 grams respectively. There was generally an increase in fat intake as the wealth quintile increased from lowest to highest ranging from a low (66.1 grams) to 72.0 grams respectively. Mean fat intake of children aged 24 –59 months is 45 grams (**Table 60**).

Expectedly, the most commonly consumed foods that contributed to the overall intake of fat among women and children were edible oils (palm oil, its products and other vegetable oils) which are presented in the Annex section (**Annex 14-15**).

Table 59. Usual fat intake of women aged 15-49 years

	Fat (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	68.7 [66.7, 70.7]	1.0	66.8 [54.5, 80.9]
NPNL[3]	4544	67.7 [65.8, 69.6]	1.0	65.9 [53.7, 79.8]
Lactating women[4]	697	75.0 [70.4, 79.6]	2.3	73.1 [60.7, 87.3]
Pregnant women	999	70.5 [66.2, 74.9]	2.2	68.4 [55.3, 83.6]
Residence				
Non-pregnant women				
Urban	2114	69.1 [66.2, 72.0]	1.5	67.2 [55.0, 81.2]
Rural	3127	68.5 [65.8, 71.2]	1.4	66.6 [54.2, 80.9]
Pregnant women				
Urban	402	76.8 [68.8, 84.8]	4.0	75.7 [65.1, 87.4]
Rural	597	67.4 [62.9, 71.9]	2.3	65.1 [51.3, 80.7]
Zone				
Non-pregnant women				
North Central	800	58.4 [54.1, 62.7]	2.1	56.5 [45.2, 69.6]
North East	824	63.9 [59.5, 68.3]	2.2	62.3 [50.7, 75.4]
North West	943	72.6 [68.5, 76.6]	2.0	71.2 [60.4, 83.2]
South East	871	79.3 [75.3, 83.2]	2.0	76.7 [61.8, 94.1]
South South	892	76.9 [72.0, 81.9]	2.5	75.1 [61.6, 90.3]
South West	911	63.8 [60.3, 67.4]	1.7	62.4 [52.0, 74.3]
Wealth Quintile				
Non-pregnant women				
Lowest	921	66.1 [60.9, 71.2]	2.6	64.5 [53.1, 77.3]
Second	875	69.4 [65.9, 72.9]	1.8	67.6 [55.1, 81.8]
Middle	1061	67.7 [64.0, 71.2]	1.8	66.3 [56.0, 77.8]
Fourth	1193	68.1 [64.2, 71.9]	2.0	65.1 [51.0, 82.2]
Highest	1170	72.0 [69.3, 74.6]	1.3	70.4 [58.9, 83.3]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 60. Usual fat intake of children aged 24-59 months

	Fat (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	45.4 [43.9, 46.8]	0.7	43.9 [35.2, 53.9]
Sex				
Male	1722	47.0 [45.2, 48.7]	0.9	45.3 [35.9, 56.1]
Female	1634	43.7 [41.7, 45.6]	1.0	42.4 [34.8, 51.3]
Residence				
Urban	1385	47.8 [45.2, 50.3]	1.3	46.0 [37.2, 56.6]
Rural	1971	44.2 [42.5, 46.0]	0.8	42.7 [34.4, 52.5]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Percentage contribution of fat to total energy intake

The acceptable macronutrient distribution for the percentage of energy from fat ranges from 30 to 40 percent for children aged 1 to 3 years old, and from 25 to 35 percent for children aged 4 years and older (IOM, 2005). The acceptable macronutrient distribution ranges for adults range from 20 to 35 percent (IOM, 2005). The contribution of fat intake to overall energy intake was approximately 33 percent and 34 percent for women and children respectively (**Table 61 and 62**). This contribution did not vary when the data was disaggregated based on residence, zone and wealth quintile. The results indicate that 25 percent could have intakes higher than recommended since 75th percentile is around 35 percent. However, the 25th percentile of the usual intake distribution of percent energy from fat for children is around 30 percent, suggesting that around 25 percent may have intakes lower than the acceptable range.

Table 61. Contribution of fat to total usual energy intake of women aged 15-49 years

	% Contribution of Fat to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	33.0 [32.5, 33.5]	0.2	32.9 [30.3, 35.5]
NPNL[3]	4544	33.0 [32.5, 33.5]	0.3	32.9 [30.2, 35.6]
Lactating women[4]	697	33.0 [31.8, 34.2]	0.6	32.9 [31.3, 34.6]
Pregnant women	999	33.4 [32.2, 34.5]	0.6	33.1 [29.6, 36.9]
Residence				
Non-pregnant women				
Urban	2114	33.3 [31.5, 33.8]	0.6	33.2 [30.8, 35.6]
Rural	3127	32.8 [32.1, 33.4]	0.3	32.6 [29.9, 35.4]
Pregnant women				
Urban	402	34.7 [33.1, 36.2]	0.8	34.3 [30.9, 38.1]
Rural	597	32.7 [31.5 34.0]	0.6	32.4 [29.0, 36.1]
Zone				
Non-pregnant women				
North Central	800	31.8 [30.7, 32.8]	0.5	31.7 [29.8, 33.6]
North East	824	33.4 [32.2, 34.7]	0.6	33.2 [30.5, 36.0]
North West	943	33.0 [31.9, 34.2]	0.6	32.8 [30.6, 35.3]
South East	871	34.5 [33.6, 35.4]	0.4	34.5 [31.9, 37.1]
South South	892	34.6 [33.3, 35.9]	0.6	34.5 [31.4, 37.7]
South West	911	31.4 [30.4, 32.5]	0.5	31.3 [29.2, 33.4]
Wealth Quintile				
Non-pregnant women				
Lowest	921	32.7 [31.5, 33.8]	0.6	32.5 [30.6, 34.5]
Second	875	32.7 [31.6, 33.8]	0.5	32.5 [29.3, 35.9]
Middle	1061	33.7 [32.5, 34.7]	0.6	33.5 [32.2, 35.0]
Fourth	1193	32.5 [31.7, 33.4]	0.4	32.3[29.3, 35.6]
Highest	1170	33.6 [32.8, 34.3]	0.4	33.4 [31.0, 35.9]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 62. Contribution of fat to total usual energy intake of children aged 24-59 months

	% Contribution of Fat to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	34.0 [33.4, 34.6]	0.3	33.9 [31.1, 36.8]
Sex				
Male	1722	34.2 [33.5, 34.9]	0.3	33.9 [30.7, 37.4]
Female	1634	33.9 [33.0, 34.7]	0.4	33.7 [31.5, 36.0]
Residence				
Urban	1385	34.0 [33.2, 34.7]	0.4	33.9 [31.9, 36.0]
Rural	1971	34.1 [33.2, 34.9]	0.4	33.8 [30.8, 37.1]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Usual intakes of carbohydrate and prevalence of inadequacy

Carbohydrates are found in a wide array of foods and drinks mostly in form of sugars, fibres, and starches. Carbohydrates provide the body with glucose, which is converted to energy used to support bodily functions and physical activity. But carbohydrate quality is important; some types of carbohydrate-rich foods are better than others: The healthiest sources of carbohydrates—unprocessed or minimally processed whole grains, vegetables, fruits and common beans—promote good health by delivering vitamins, minerals, fibre, and a host of important phytonutrients. Less desirable sources of carbohydrates include highly processed or refined foods. These items contain easily digested carbohydrates that may contribute to weight gain, interfere with weight loss, and promote diabetes and heart disease.

Usual mean carbohydrate intakes were 251 grams for non-pregnant non-lactating women (NPNL), 280 grams for lactating women and 255 grams for pregnant women (**Table 63**). Across the zones, intake ranged from a low of 229 grams in the north central to a high of 274 grams among women in North west. As shown in **Table 64**, the usual carbohydrate intake of children aged 24-59 months is 162 grams. When the data was disaggregated by residence, urban dwellers had an intake of 170 grams while intake of rural dwellers was 158 grams.

The top foods that contributed to the overall carbohydrate intake of women and children are presented in the Annex section (**Annex 16-17**). Products of rice, maize and cassava (*garri*) were common across all groups of women and children. In the case of the children, sugar was a higher contributor than bread when compared to women. Sugar identified here was sugar added to dishes/ beverages after preparation (e.g. sugar added to a porridge or tea before consumption) and also sugar used as an ingredient in dishes and products, such as the sugar used in preparing a dessert.

Table 63. Usual carbohydrate intake of women aged 15-49 years

	Carbohydrate (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	254.4 [247.5, 261.2]	3.5	247.8 [202.8, 299.0]
NPNL[3]	4544	250.5 [243.8, 257.3]	3.4	244.5 [201.1, 293.6]
Lactating women[4]	697	280.2 [266.7, 293.6	6.8	270.1 [216.4, 332.7]
Pregnant women	999	254.8 [244.6, 265.0]	5.2	249.4 [206.5, 297.0]
Residence				
Non-pregnant women				
Urban	2114	251.1 [242.8, 259.3]	4.2	244.6 [200.1, 295.0]
Rural	3127	257.3 [247.4, 267.2]	5.0	250.8 [204.8, 302.8]
Pregnant women				
Urban	402	259.2 [243.2, 275.2]	8.1	253.8 [206.1, 306.7]
Rural	597	252.3 [239.4, 265.2]	6.5	247.0 [205.2, 293.4]
Zone				
Non-pregnant women				
North Central	800	228.8 [214.7, 243.0]	7.1	222.7 [183.4, 268.2]
North East	824	234.6 [220.4, 248.7]	7.0	225.9 [180.7, 279.2]
North West	943	273.7 [258.0, 289.3]	7.8	267.1 [219.2, 321.3]
South East	871	267.5 [257.9, 277.1]	4.8	264.2 [229.5, 302.0]
South South	892	261.1 [251.8, 270.4]	4.7	257.6 [218.8, 299.8]
South West	911	251.0 [241.9, 260.2]	4.6	246.8 [203.9, 293.2]
Wealth Quintile				
Non-pregnant women				
Lowest	921	253.9 [235.5, 272.3]	9.3	245.0 [195.1, 302.6]
Second	875	260.2 [248.8, 271.7]	5.8	254.9 [212.9, 302.1]
Middle	1061	245.6 [232.9, 258.3]	6.4	241.2 [200.1, 286.4]
Fourth	1193	253.0 [242.3, 263.6]	5.4	246.8 [203.3, 296.4]
Highest	1170	258.7 [249.0, 268.5]	5.0	250.6 [204.7, 303.9]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 64. Usual carbohydrate intake of children aged 24-59 months

	Carbohydrate (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	161.8 [157.6, 166.0]	2.1	157.7 [128.8, 190.3]
Sex				
Male	1722	166.0 [161.2, 170.8]	2.4	161.5 [130.5, 196.2]
Female	1634	157.1 [151.6, 162.6]	2.8	153.8 [126.9, 183.6]
Residence				
Urban	1385	170.0 [161.9, 178.2]	4.1	166.3 [138.7, 197.7]
Rural	1971	157.6 [152.2, 162.9]	2.7	152.9 [124.0, 186.0]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Percentage contribution of carbohydrate to total energy intake

The acceptable percentage contribution of carbohydrate to total energy intake ranges from 45 to 65 percent across all sample population (IOM, 2005). The mean contribution of carbohydrate intake to overall energy intake was approximately 54 percent across the sampled categories, which is near the mid-point of the acceptable range (**Table 65**). The results from zones ranged from a low of 53 percent among South East women to a high of 56 percent among women from North Central. The contribution of carbohydrate intake to overall energy intake of children was also 54 percent (**Table 66**). The results suggest adequacy of carbohydrate intake and could be sufficient for optimal nutrition.

Table 65. Contribution of carbohydrate to total usual energy intake of women aged 15-49 years

	% Contribution of Carbohydrate to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	54.2 [53.8, 54.7]	0.2	54.1 [51.3, 57.0]
NPNL[3]	4544	54.2 [53.8, 54.7]	0.2	54.1 [51.3, 57.1]
Lactating women[4]	697	54.3 [53.1, 55.5]	0.6	54.2 [51.4, 57.1]
Pregnant women	999	53.7 [52.6, 54.8]	0.6	53.5 [50.2, 57.0]
Residence				
Non-pregnant women				
Urban	2114	53.8 [53.1, 54.5]	0.4	53.7 [51.2, 56.2]
Rural	3127	54.6 [54.0, 55.2]	0.3	54.5 [51.4, 57.6]
Pregnant women				
Urban	402	51.6 [49.7, 53.6]	1.0	51.8 [49.4, 54.0]
Rural	597	54.6 [53.3, 56.0]	0.7	54.4 [50.9, 58.1]
Zone				
Non-pregnant women				
North Central	800	55.7 [54.6, 56.7]	0.5	55.5 [52.6, 58.5]
North East	824	53.9 [52.7, 55.2]	0.6	53.8 [50.9, 56.8]
North West	943	54.6 [53.6, 55.5]	0.5	54.6 [51.7, 57.5]
South East	871	53.0 [52.0, 53.9]	0.5	52.7 [49.9, 55.7]
South South	892	52.7 [55.6, 53.8]	0.5	52.5 [49.3, 55.8]
South West	911	54.7 [53.6, 55.7]	0.5	54.7 [52.8, 56.6]
Wealth Quintile				
Non-pregnant women				
Lowest	921	55.1 [54.0, 56.1]	0.5	55.0 [52.5, 57.6]
Second	875	54.6 [53.7, 55.6]	0.5	54.5 [51.1, 58.0]
Middle	1061	54.0 [53.0, 54.9]	0.5	54.0 [52.3, 55.7]
Fourth	1193	54.6 [53.7, 55.5]	0.4	54.3 [50.9, 58.0]
Highest	1170	53.1 [52.2, 54.0]	0.4	53.0 [50.3, 55.8]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 66. Contribution of carbohydrate to total usual energy intake of children aged 24-59 months

	% Contribution of Carbohydrate to Energy Intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	54.1 [53.5, 54.6]	0.3	53.9 [51.0, 57.0]
Sex				
Male	1722	54.0.[53.3, 54.6]	0.3	53.8 [50.6, 57.1]
Female	1634	54.2 [53.4, 55.0]	0.4	54.0 [51.4, 56.8]
Residence				
Urban	1385	54.3 [53.5, 55.0]	0.4	54.1 [51.8, 56.5]
Rural	1971	53.9 [53.1, 54.6]	0.4	53.7 [50.4, 57.1]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Micronutrient Intakes for Women and Children

Box 4. Key Findings on Micronutrient Intakes for Women and Children

Calcium

Usual mean calcium intakes in women: 466 mg for non-pregnant non-lactating women, 502 mg for lactating women and 490 mg for pregnant women (pregnant women in urban areas 534 mg and 465 mg in rural areas; non-pregnant women 351 mg in North East and 591 mg in South East).

Calcium inadequacy in women: 90 percent for lactating women and 95 percent for non-pregnant non-lactating women (89 percent for South East and 100 percent in North East).

Food sources contributing to calcium intake for women and children 24-59 months: The main calcium contributors are bread, shellfish, fura da nono, baobab powder, and soybean.

Usual mean calcium intakes in children 24-59 months: The usual calcium intake of children aged 24-59 months was 305 mg.

Calcium inadequacy in children 24-59 months: Nationally, 92 percent of children 24-59 months had inadequate intake of calcium (88 percent urban and 94 percent rural).

Iron

Usual mean iron intakes in women: 16.1 mg for non-pregnant non-lactating women and 18.9 mg among lactating women and 17.2 mg among pregnant women nationally (17.5 mg in rural areas and 14.3 mg in urban for non-pregnant non-lactating women; 13.7 mg in North Central and 19.1 mg in North West).

Iron inadequacy in women: 45 percent of non-pregnant non-lactating women, 82 percent of pregnant women, and 16 percent of lactating women had inadequate iron intake (59 percent in North Central and 31 percent in North West; 36 percent in the lowest wealth quintile and high 54 percent in the highest wealth quintile).

Food sources contributing to iron intake for women and children 24-59 months: Condiments (mainly fermented locust bean powder and seasonings used in preparing soups and sauces), peppers, millet, maize, and rice products. Non-heme iron is the major form in the diet in all the zones.

Usual mean iron intakes in children 24-59 months: The usual iron intake of children aged 24-59 months is 10.7 mg (9.9 mg in urban and 11.1 mg in rural).

Iron inadequacy in children 24-59 months: 18 percent nationally (16 percent rural and 22 percent in urban; 15 percent in males and 20.7 in females).

Zinc

Usual mean zinc intakes in women: the mean usual zinc intake of non-pregnant-non-lactating is 8.5 mg, lactating is 9.4 mg, and pregnant women is 8.8 mg (6.7 mg in North East and 10.9 mg in South South).

Zinc inadequacy in women: 46 percent of pregnant women and 26 percent of non-pregnant women had inadequate zinc intake (49 percent in North East and 4 percent in South South in non-pregnant women; 51 percent rural and 40 percent in urban for pregnant women).

Food sources contributing to zinc intake for women and children 24-59 months: The main contributors to nutrient intake of zinc among women and children were *garri*, rice, maize products, and beef. Products from cowpea, millet and sorghum were also among foods that were commonly consumed among women and children.

Usual mean zinc intakes in children 24-59 months: Nationally, usual zinc intake of children aged 24-59 months is 5.0 mg.

Zinc inadequacy in children 24-59 months: Inadequate zinc intake is 3.5 percent nationally (4.4 percent rural and 1.9 percent urban).

Vitamin A

Usual mean vitamin A intakes in women: 924 mcg for non-pregnant non-lactating women, 966 mcg for lactating women and 972 mcg for pregnant women (1567 mcg in South and 629 mcg in North West).

Vitamin A inadequacy in women: 26 percent of non-pregnant women (48.3 percent in North West and 1.3 percent in South East) and 58 percent of lactating women had an inadequate intake.

Food sources contributing to vitamin A intake for women and children 24-59 months: The main food sources of vitamin A are palm oil, banga (palm nut soup), palm olein (a refined version of palm oil fortified with vitamin A). Mango fruit with some leafy and non-leafy vegetables were also notable foods that contributed to vitamin A intake.

Usual mean vitamin A intakes in children 24-59 months: The usual vitamin A intake of children aged 24-59 months is 575 mcg.

Vitamin A inadequacy in children 24-59 months: 12.4 percent had inadequate intake of vitamin A (17.8 percent rural and 0.8 percent in urban).

Vitamin C

Usual mean vitamin C intakes in women: 61 mg for non-pregnant and 64 mg for pregnant women. Mean intake of pregnant women living in urban is 72 mg and 60 mg in rural areas.

Vitamin C inadequacy in women: 53 percent among non-lactating women, 87 percent among lactating women and 44.7 percent in South East and 67.9 percent in North West for all WRA.

Food sources contributing to vitamin C intake for women and children 24-59 months: The main contributors among women and children were peppers, tomato, onion, mango fruit, cocoa drink and tubers like sweet potato and white yam.

Usual mean vitamin C intakes in children 24-59 months: Mean intake of 41 mg (38 mg rural and 47 mg in urban areas.

Vitamin C inadequacy in children 24-59 months: Low prevalence of inadequacy, less than a tenth (5 percent) of all children.

Vitamin B1 (Thiamine)
Usual mean vitamin B1 intakes in women: thiamine intake of women was similar (0.8-1.0 mg) irrespective of residence, zone, and wealth quintile.

Vitamin B1 inadequacy in women: Nationally, about 65 percent of non-lactating women and 67 percent of non-pregnant women have a risk of inadequate thiamine intake which increased if the woman was lactating (77.3 percent) or pregnant (86.9 percent).

Food sources contributing to vitamin B1 intake for women and children 24-59 months: The main foods that contributed to the overall thiamine intake of women and children bread, products from maize, rice and millet. Noodles and sorghum products contributed across all age groups.

Usual mean vitamin B1 intakes in children 24-59 months: 0.5 mg with no substantial difference across the sex and residence of the children.

Vitamin B1 inadequacy in children 24-59 months: 32 percent of children have an inadequate intake.

Vitamin B2 (Riboflavin)
Usual mean vitamin B2 intakes in women: Riboflavin intake of women across all categories was a mean of 0.7 mg. This level of intake was consistently similar when intake was disaggregated across residence, zone and wealth quintile and only reached a high of 0.9 mg among women in South-West and in the highest wealth quintile.

Vitamin B2 inadequacy in women: Intake was inadequate in 80 percent of the women (94.8 percent in North-East and 59.3 percent in South-West).

Food sources contributing to vitamin B2 intake for women and children 24-59 months: rice, bread, peppers, catfish, cocoa and fura da nono were the main contributors to vitamin B2 intake. Among children, cocoa drink had a higher contribution to riboflavin intake compared to women.

Usual mean vitamin B2 intakes in children 24-59 months: The usual mean intake was 0.4 mg.

Vitamin B2 inadequacy in children 24-59 months: 59 percent of all children had an inadequate vitamin B2 intake (70 percent among rural and 39 percent in urban areas).

Vitamin B9 (Folate)
Usual mean vitamin B9 intakes in women: The mean usual folate intake of non-pregnant women is 200 mcg; 197 mcg for pregnant women and non-lactating women, and 217 mcg for lactating women (189 mcg for women in the lowest quintile and 208 mcg for women in the highest quintiles).

Vitamin B9 inadequacy in women: Inadequacy of vitamin B9 intake was greater than 90 percent across all categories of women with the highest prevalence of inadequacy (99.9 percent) among pregnant women. Prevalence among non-pregnant women was 88.8 percent in South West and 99.4 percent in North East.

Food sources contributing to vitamin B9 intake for women and children 24-59 months: The main food sources that contributed to the overall folate intake of women and children are cowpea, maize, and millet products, cassava (*garri*), baobab powder, and rice.

Usual mean vitamin B9 intakes in children 24-59 months: 122 mcg nationally, which when disaggregated by residence was 131 mcg among urban dwellers and 116 mcg among rural dwellers.

Vitamin B9 inadequacy in children 24-59 months: 63 percent of children 24-59 months nationally had an inadequate intake of folate (54.4 percent in urban and 67.6 percent in rural areas).

Vitamin B12 (Cobalamin)

Usual mean vitamin B12 intakes in women: Nationally, the mean usual vitamin B12 intake of non-pregnant women is 2.6 mcg (0.9-1.8 mcg in Northern zones and 4.4-5.0 mcg in Southern zones).

Vitamin B12 inadequacy in women: Nationally, 54.2 percent of non-pregnant women have inadequate intake of vitamin B12 (87.9 percent in North West and 8.4 percent in South South).

Food sources contributing to vitamin B12 intake for women and children 24-59 months: The main food sources of vitamin B12 for women of reproductive age are fish (mackerel, sardine, catfish, and hake), and beef.

Usual mean vitamin B12 intakes in children 24-59 months: Children aged 24-59 months had a usual intake of 1.4 mcg nationally (1.2 mcg in rural and 2.1 mcg in urban areas).

Vitamin B12 inadequacy in children 24-59 months: The inadequacy of vitamin B12 intake was 51.7 percent nationally (60.3 percent in rural and 43.0 percent in urban dwellers).

Usual intakes of micronutrients and prevalence of inadequacy

Poor intake of micronutrient-rich foods and correspondingly prevalent micronutrient inadequacies is still a global challenge affecting billions. In several contexts, it is not strange to observe co-existence of deficiencies in individuals or populations. This section provides results on the usual intakes of the micronutrients (Calcium, Iron, Zinc, Vitamin A, B1, B2, B9, B12, and C) considered in this survey.

Calcium

Calcium which is essential to the development of healthy bones and teeth but also plays a role in muscle contraction, nerve function, blood clotting and regulation of heart rhythm. Usual mean calcium intakes were 466 mg for non-pregnant non-lactating women (NPNL), 502 mg for lactating women and 490 mg for pregnant women (**Table 67**). Pregnant women living in urban areas had a mean intake of 534 mg compared to those in rural areas (465 mg) while intakes for non-pregnant women ranged from a low of 351 mg in the North East zone to a high of 591mg in the South East zone. Usual calcium intakes for non-pregnant women ranged from 436 mg for the lowest wealth quintile to 547 mg for the highest wealth quintile.

Based on the distribution of usual intakes, the percentage of women with intakes below the EAR (prevalence of inadequacy) ranged from 90 percent for lactating women to 95 percent for NPNL (**Table 68**). Prevalence of inadequacy ranged from a low of 89 percent for the South East zone to a high of 100 percent in the North East zone while no trend in prevalence of inadequacy was observed by wealth quintile.

The top food that contributed to the overall calcium intake of women and children aged 24-59 months was bread (**Annex 18-19**). Powdered milk was the main contributor to calcium intake in children aged 6-23 months. Foods that are rich in calcium were not commonly consumed in quantities that were adequate for nutrition.

Table 67. Usual calcium intake of women aged 15-49 years

	Calcium (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	800 - 1100	470 [448, 492]	11.2	437 [331, 573]
NPNL[3]	4544		466 [445, 488]	10.9	435 [331, 567]
Lactating women[4]	697	800 - 1000	502 [461, 543]	20.9	453 [332, 616]
Pregnant women	999		490 [455, 524]	17.4	451 [337, 599]
Residence					
Non-pregnant women					
Urban	2114	800 - 1100	490 [464, 516]	13.0	455.3 [339, 604]
Rural	3127		457 [421, 492]	18.0	426.2 [328, 551]
Pregnant women					
Urban	402	800 - 1000	534 [483, 585]	25.7	502.8 [391, 645]
Rural	597		465 [418, 513]	24.2	424.0 [312, 572]
Zone					
Non-pregnant women					
North Central	800	800 - 1100	377 [340, 414]	18.6	353 [275, 453]
North East	824		351 [325, 376]	12.7	331 [256, 424]
North West	943		450 [390, 509]	29.9	425 [338, 534]
South East	871		591 [553, 629]	19.0	569 [462, 697]
South South	892		583 [543, 622]	19.5	562 [454, 689]
South West	911		549 [515, 582]	16.7	527 [416, 657]
Wealth Quintile					
Non-pregnant women					
Lowest	921	800 - 1100	436 [363, 508]	36.7	381 [265, 544]
Second	875		437 [404, 469]	16.5	425 [360, 500]
Middle	1061		431 [399, 464]	16.5	340 [307, 521]
Fourth	1193		490 [453, 526]	18.5	467 [368, 587]
Highest	1170		547 [518, 576]	14.9	513 [388, 669]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years: 1100mg/day and women aged 19-49 years 800mg/day, For lactating and pregnant women: aged 15-18 years 1000 mg/d, aged 19-49 years 800 mg/d.)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 68. Prevalence of inadequacy of calcium intake of women

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	800 - 1100	5241	94.5	[92.5, 96.4]
NPNL[4]		4544	95.0	[93.0, 97.0]
Lactating women[5]	800 - 1000	697	89.7	[85.7, 93.8]
Pregnant women		999	91.8	[88.1, 95.4]
Residence				
Non-pregnant women				
Urban	800 - 1100	2114	92.5	[90.1, 94.9]
Rural		3127	95.7	[93.0, 98.5]
Pregnant women				
Urban	800 - 1000	402	90.2	[83.1, 97.2]
Rural		597	92.8	[88.2, 97.4]
Zone				
Non-pregnant women	800 - 1100			
North Central		800	99.0	[97.6, 100.3]
North East		824	99.6	[98.7, 100.6]
North West		943	97.3	[93.2, 101.5]
South East		871	89.0	[82.4, 95.7]
South South		892	90.1	[83.0, 97.2]
South West		911	90.9	[86.3, 95.5]
Wealth Quintile				
Non-pregnant women	800 - 1100			
Lowest		921	93.0	[87.5, 98.4]
Second		875	99.6	[97.7, 101.5]
Middle		1061	96.6	[94.0, 99.2]
Fourth		1193	95.4	[91.6, 99.3]
Highest		1170	89.0	[85.8, 92.1]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years: 1100mg/day and women aged 19-49 years 800mg/day, For lactating and pregnant women: aged 15-18 years 1000 mg/d, aged 19-49 years 800 mg/d.)
[2] Number of respondents
[3] Sample weights are applied to account for survey design and non-response.
[4] Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5] Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

Usual calcium intake of children aged 24-59 months was 305 mg (**Table 69**). Prevalence of inadequate calcium intake was similarly high for children (92 percent) with a slight difference in prevalence among rural (94 percent) and urban (88 percent) dwellers (**Table 70**).

Table 69. Usual calcium intake of children aged 24-59 months

	Calcium (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	500 - 800	305 [287, 323]	9.0	269 [186, 384]
Sex					
Male	1722	500 - 800	312 [292, 333]	10.5	277 [194, 391]
Female	1634		297 [276, 317]	10.6	262 [178, 376]
Residence					
Urban	1385	500 - 800	343 [319, 367]	12.1	311 [217, 434]
Rural	1971		285 [260, 311]	13.1	250 [174, 356]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years: 500 mg/day, for children aged 4-5years 800 mg/day)
CI= Confidence Interval, SE= Standard Error

Table 70. Prevalence of inadequacy of calcium intakes of children aged 24-59 months

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National	500 - 800	3356	92.4	[89.6, 95.1]
Sex				
Male	500 - 800	1722	92.1	[88.9, 95.3]
Female		1634	92.9	[89.7, 96.2]
Residence				
Urban	500 - 800	1385	88.4	[85.2, 91.6]
Rural		1971	94.3	[90.5, 98.1]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years: 500 mg/day, for children aged 4-5years 800 mg/day)
[2] Number of respondents
[3] Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Iron

Iron plays a wide range of functions in the body like oxygen transport, physical and neurological growth and development, cellular functioning and synthesis of some hormones though needed in small quantity. As shown in **Table 71**, the usual mean iron intakes among non-pregnant non-lactating women was 16.1 mg and 18.9 mg among lactating women and 17.2 mg among pregnant women. Women living in the rural areas had a numerically higher intake of iron than their counterparts in the urban areas. Iron intake reduced as the wealth quintile increased ranging from a low of 14.5 mg to a high of 18.6 mg.

When the usual intakes were compared against requirements, the inadequacy of iron intake in women varied across categories (**Table 72**). Forty-five percent of non-pregnant non-lactating women had inadequate iron intake, while 16 percent of lactating women had inadequate iron intake. Irrespective of pregnancy status, the proportion of women living in urban areas had a higher proportion of inadequacy when compared to women in rural areas. Iron intake inadequacy ranged from a high in North-Central (59 percent) to a low in the North-West (31 percent) and generally increased with an increase in wealth.

The most common foods that mainly contributed to the intake of iron (**Annex 20-21**) were condiments (mainly fermented locust beans powder and seasonings used in preparing soups and sauces), products from millet, rice and maize. It is worthy to note that bouillon cubes used as seasoning are fortified with iron. For both women and children, foods from the cereals group and peppers also contributed to iron intake. Notably, there were no foods of animal origin among the main contributors.

Table 71. Usual iron intake of women aged 15-49 years

Iron (mg)					
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
NPNL[3]	4544	14.2 - 14.6	16.1 [15.5, 16.7]	0.3	15.5 [12.5, 19.0]
Lactating women[4]	697	11.7 – 12.6	18.9 [17.5, 20.2]	0.7	17.4 [13.3, 22.8]
Pregnant women	999	22.0 – 23.0	17.2 [16.1, 18.2]	0.5	16.5 [13.2, 20.4]
National					
NPNL					
Urban	1885	14.2 - 14.6	14.3 [13.8, 14.8]	0.3	13.9 [11.5, 16.6]
Rural	2659		17.5 [16.5, 18.5]	0.5	16.9 [13.6, 20.7]
Pregnant women					
Urban	402	22.0 – 23.0	15.9 [14.6, 17.3]	0.7	15.4 [12.6, 18.8]
Rural	597		17.8 [16.4, 19.3]	0.7	17.1 [13.4, 21.4]
Zone					
NPNL					
North Central	696	14.2 - 14.6	13.7 [13.1, 14.3]	0.3	13.4 [11.2, 15.9]
North East	701		16.5 [15.2, 17.8]	0.7	15.9 [13.0, 19.4]
North West	770		19.1 [17.2, 21.0]	1.0	18.4 [15.1, 22.3]
South East	767		15.4 [14.7, 16.2]	0.4	15.2 [13.0, 17.5]
South South	794		14.4 [13.7, 15.1]	0.4	14.0 [11.3, 17.1]
South West	816		14.6 [13.8, 15.4]	0.4	14.3 [11.8, 17.0]
Wealth quintile					
NPNL					
Lowest	757	14.2 - 14.6	18.6 [17.3, 20.0]	0.7	17.7 [13.8, 22.5]
Second	738		18.2 [16.7, 19.7]	0.8	17.6 [14.7, 21.1]
Middle	931		15.4 [14.1, 16.7]	0.7	14.7 [11.6, 18.4]
Fourth	1047		14.6 [14.1, 15.2]	0.3	14.3 [11.8, 17.1]
Highest	1053		14.5 [13.9, 15.0]	0.3	14.1 [11.9, 16.7]

1Number of respondents.
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age.
4Lactating women are defined as breastfeeding an infant <12 months of age.
*Estimated Average Requirements (EAR) from the Institute of Medicine (www.nap.edu) are adjusted for the assumption of 10% iron bioavailability, except for pregnant women due to the increased efficiency of iron absorption during pregnancy. The EAR for NPNL women aged 15-18 years is 14.2 mg/day and aged 19-49 years is 14.6 mg/day. The EAR for lactating women aged 15-18 years is 12.6 mg/day, and aged 19-49 years is 11.7 mg/day. The EAR for pregnant women aged 15-18 years is 23 mg/day and aged 19-49 years is 22 mg/day.
CI=Confidence Interval, NPNL=Non pregnant and non-lactating women, SE= Standard Error

Table 72. Prevalence of inadequacy of iron intakes of women aged 15-49 years

	EAR[1] mg/day	N[2]	% EAR[3]	[95% CI][3]
National				
NPNL[4]	14.2 - 14.6	4544	45.4	[42.6, 48.2]
Lactating women[5]	11.7 – 12.6	697	16.4	[11.3, 21.6]
Pregnant women	22.0 – 23.0	999	82.1	[74.8, 89.4]
Residence				
NPNL				
Urban	14.2 - 14.6	1885	55.2	[51.8, 58.6]
Rural		2659	38.5	[34.5, 42.5]
Pregnant				
Urban	22.0 – 23.0	402	89.6	[79.8, 99.4]
Rural		597	78.1	[68.7, 87.6]
Zone				
NPNL				
North Central	14.2 - 14.6	696	58.9	[54.4, 63.5]
North East		701	42.7	[34.3, 51.1]
North West		770	30.7	[23.6, 37.8]
South East		767	46.3	[40.8, 51.8]
South South		794	54.7	[50.6, 58.7]
South West		816	53.1	[48.2, 58.1]
Wealth quintile				
NPNL				
Lowest	14.2 - 14.6	757	35.9	[28.9, 42.8]
Second		738	33.3	[26.4, 40.1]
Middle		931	50.1	[44.9, 55.3]
Fourth		1047	52.8	[48.4, 57.1]
Highest		1053	53.7	[49.8, 57.6]

1Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) EAR) from the Institute of Medicine (www.nap.edu) are adjusted for the assumption of 10% iron bioavailability, except for pregnant women due to the increased efficiency of iron absorption during pregnancy. The EAR for NPNL women aged 15-18 years is 14.2 mg/day and aged 19-49 years is 14.6 mg/day. The EAR for lactating women aged 15-18 years is 12.6 mg/day, and aged 19-49 years is 11.7 mg/day. The EAR for pregnant women aged 15-18 years is 23 mg/day and aged 19-49 years is 22 mg/day.
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
4Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
5Lactating women are defined as breastfeeding an infant <12 months of age CI=Confidence Interval, NPNL=Non pregnant and non-lactating women

The usual iron intake of children aged 24-59 months is 10.7 mg (T**able 73**) which corresponded to an inadequacy prevalence of 18 percent (22 percent to 16 percent in urban and rural dwellers, respectively) (**Table 74**).

Table 73. Usual iron intake of children aged 24-59 months

	Iron (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	3 - 4.1	10.7 [10.3,11.1]	0.2	10.3 [8.3, 12.7]
Sex					
Male	1722	3 - 4.1	11.0 [10.5, 11.5]	0.3	10.7 [9.0, 12.7]
Female	1634		10.4 [10.0,10.9]	0.2	10.0 [7.7, 12.6]
Residence					
Urban	1385	3 - 4.1	9.9 [9.4,10.4]	0.3	9.5 [7.8, 11.6]
Rural	1971		11.1 [10.6,11.6]	0.2	10.7 [8.7, 13.2]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) applying the assumption of 10% iron bioavailability (For children aged 1-3 years 3 mg/day, For children aged 4-5years 4.1 mg/day)
CI= Confidence Interval, SE= Standard Error

Table 74. Prevalence of inadequacy of iron intakes of children aged 24-59 months

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National	3 - 4.1	3356	17.7	[14.9, 20.5]
Sex				
Male	3 - 4.1	1722	15.0	[10.7, 19.2]
Female		1634	20.7	[17.9, 23.6]
Residence				
Urban	3 - 4.1	1385	22.1	[16.6, 27.7]
Rural		1971	15.6	[12.6, 18.7]

[1]Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) applying the assumption of 10% iron bioavailability (For children aged 1-3 years 3 mg/day, For children aged 4-5years 4.1 mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Zinc

Zinc is a component of many enzyme systems including those involved in protein synthesis, carbon dioxide transport, creation and maintenance of DNA and cell growth. As shown in **Table 75**, the mean usual zinc intakes of non-pregnant-non-lactating, lactating, and pregnant women were 8.5 mg, 9.4 mg, and 8.8 mg, respectively. Across zones, women from southern zones had comparatively higher intake than women from the northern zones and there was generally an increase in zinc intake as the wealth quintile increased with women in the lowest and highest quintiles having the smallest (7.5 mg) and highest (9.3 mg) zinc intake, respectively.

The inadequacy of zinc intake was derived by comparing intake values with the estimated average requirements presented by the International Zinc Consultative Group (IZiNCG) applying the assumption of a mixed refined diet. Inadequacy was about 26 percent of non-pregnant and 25 percent of non-lactating women (**Table 76**). The proportion whose intake was inadequate increased among lactating women (31.2 percent) and pregnant women (46.4 percent). The highest level of zinc intake inadequacy was found in the North-East (49.4 percent) while the lowest was in the South-South (4.0 percent). The inadequacy of zinc intake varied without a trend across the wealth quintile, but women in the lowest wealth quintile having the highest prevalence of 40.5 percent while those in the highest wealth quintile had the lowest prevalence of 16.9 percent.

The main contributors to nutrient intake of zinc among women and children were *garri (*cassava-based product*)*, rice, maize products and beef (**Annex 22-23**). Other contributors were food products from cowpea, millet and sorghum. However, there were notable differences across zones with cereals contributing more in the Northern zones while *garri* was prominent in the southern zones.

Table 75. Usual zinc intake of women aged 15-49 years

	Zinc (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	6.8 - 7.3	8.6 [8.2, 9.0]	0.2	8.1 [6.3, 10.4]
NPNL[3]	4544		8.5 [8.1, 8.9]	0.2	8.0 [6.3, 10.2]
Lactating women[4]	697	10.4 - 10.9	9.4 [8.5, 10.2]	0.4	8.6 [6.6, 11.3]
Pregnant women	999	9.5 - 10.5	8.8 [8.2, 9.3]	0.3	8.3 [6.5, 10.6]
Residence					
Non-pregnant women					
Urban	2114	6.8 - 7.3	8.6 [8.1, 9.1]	0.2	8.2 [6.4, 10.4]
Rural	3127		8.6 [8.0, 9.2]	0.3	8.1 [6.2, 10.4]
Pregnant women					
Urban	402	9.5 - 10.5	9.5 [8.7, 10.2]	0.4	8.9 [6.8, 11.5]
Rural	597		8.4 [7.7, 9.2]	0.4	8.0 [6.3, 10.1]
Zone					
Non-pregnant women					
North Central	800	6.8 - 7.3	7.2 [6.7, 7.6]	0.2	6.9 [5.5, 8.5]
North East	824		6.7 [6.2, 7.2]	0.2	6.4 [5.0, 8.1]
North West	943		8.0 [7.1, 8.9]	0.4	7.7 [6.2, 9.4]
South East	871		10.2 [9.5, 10.8]	0.3	9.7 [7.7, 12.2]
South South	892		10.9 [10.1, 11.7]	0.4	10.5 [8.6, 12.8]
South West	911		9.9 [8.9, 10.9]	0.5	9.5 [7.5, 11.8]
Wealth Quintile					
Non-pregnant women					
Lowest	921	6.8 - 7.3	7.5 [6.9, 8.2]	0.3	7.0 [5.3, 9.1]
Second	875		8.5 [7.7, 9.6]	0.5	8.3 [6.7, 10.2]
Middle	1061		8.3 [7.4, 9.1]	0.4	7.7 [6.0, 9.9]
Fourth	1193		9.0 [8.4, 9.6]	0.3	8.5 [6.4, 11.0]
Highest	1170		9.3 [8.8, 9.8]	0.2	8.9 [7.0, 11.1]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
* Estimated Average Requirements (EAR) from IZiNCG applying the assumption of a mixed refined diet for women (For non-pregnant women aged 15-18 years 6.8mg/day, women aged 19-49 years 7.3mg/day, For lactating women aged 15-18 years 10.9mg/day, women aged 19-49 years 10.4mg/day, For pregnant women aged 15-18 years 10.5mg/day, women aged 19-49 years 9.5mg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 76. Prevalence of inadequacy of zinc intakes of women aged 15-49 years

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	6.8 - 7.3	5241	25.8	[21.8, 29.7]
NPNL[4]		4544	24.9	[20.9, 28.9]
Lactating women[5]	10.4 - 10.9	697	31.2	[23.3, 39.0]
Pregnant women	9.5 - 10.5	999	46.4	[38.5, 54.4]
Residence				
Non-pregnant women				
Urban	6.8 - 7.3	2114	24.5	[18.8, 30.1]
Rural		3127	26.4	[20.7, 32.1]
Pregnant women				
Urban	9.5 - 10.5	402	39.6	[31.2, 47.9]
Rural		597	50.8	[38.2, 63.5]
Zone				
Non-pregnant women				
North Central	6.8 - 7.3	800	40.1	[28.6, 51.6]
North East		824	49.4	[40.8, 58.1]
North West		943	27.2	[18.5, 35.9]
South East		871	11.9	[7.1, 16.7]
South South		892	4.0	[-0.8, 8.8]
South West		911	12.3	[4.3, 20.2]
Wealth Quintile				
Non-pregnant women				
Lowest	6.8 - 7.3	921	40.5	[32.6, 48.4]
Second		875	19.9	[10.6, 29.2]
Middle		1061	29.7	[20.5, 38.9]
Fourth		1193	23.6	[16.6, 30.6]
Highest		1170	16.9	[10.8, 23.0]

[1]Estimated Average Requirements (EAR) from IZiNCG applying the assumption of a mixed refined diet for women (For non-pregnant women aged 15-18 years 6.8mg/day, women aged 19-49 years 7.3mg/day, For lactating women aged 15-18 years 10.9mg/day, women aged 19-49 years 10.4mg/day, For pregnant women aged 15-18 years 10.5mg/day, women aged 19-49 years 9.5mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

The mean usual zinc intake of children aged 24-59 months is 5.0 mg (**Table 77**) and according to **Table 78**, the prevalence of inadequate zinc intake among children resulted in only 3.5 percent of children at risk nationally.

Table 77. Usual zinc intake of children aged 24-59 months

	Zinc (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	2.5 - 4.0	5.0 [4.8, 5.2]	0.1	4.7 [3.6, 6.0]
Sex					
Male	1722	2.5 - 4.0	5.1 [4.8, 5.3]	0.1	4.8 [3.7, 6.1]
Female	1634		4.9 [4.7, 5.1]	0.1	4.6 [3.5, 6.0]
Residence					
Urban	1385	2.5 - 4.0	5.3 [5.0, 5.6]	0.1	5.1 [3.9, 6.4]
Rural	1971		4.8 [4.5, 5.1]	0.1	4.5 [3.4, 5.8]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
* Estimated Average Requirements (EAR) from IZiNCG applying the assumption of a mixed refined diet for children (For children aged 1-3 years 2.5 mg/day, For children aged 4-5years 4.0 mg/day)
CI= Confidence Interval, SE= Standard Error

Table 78. Prevalence of inadequacy of zinc intakes of children aged 24-59 months

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National	2.5 - 4.0	3356	3.5	[1.6, 5.5]
Sex				
Male	2.5 - 4.0	1722	2.4	[-0.1, 4.9]
Female		1634	4.9	[2.0, 7.9]
Residence				
Urban	2.5 - 4.0	1385	1.9	[-0.6, 4.4]
Rural		1971	4.4	[2.0, 6.8]

[1] Estimated Average Requirements (EAR) from IZiNCG applying the assumption of a mixed refined diet for children (For children aged 1-3 years 2.5 mg/day, For children aged 4-5years 4.0 mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Vitamin A

Vitamin A plays a role in immune function by stimulating the activity of the white blood cells, enhancement of vision, reproductive health, and foetal development. In this survey, the intake of Vitamin A is represented as Retinol Activity Equivalents measured in micrograms (mcg). The mean usual vitamin A intakes were 924 mg for non-pregnant non-lactating women (NPNL), 966 mcg for lactating women and 972 mcg for pregnant women (**Table 79**). Across zones, women from South east had the mean intake of 1567 mcg and women from the North west had a mean intake of 629 mcg. Vitamin A intake in the lowest and highest quintiles were 706 mcg and 1018 mcg respectively.

The inadequacy of vitamin A intake shows that a quarter (20 percent) of non-pregnant non-lactating women had inadequate intake while three-fifths (58 percent) of lactating women had an inadequate intake of Vitamin A (**Table 80**). A consistent pattern in the zones was that more women in the north were at more risk of vitamin A intake inadequacy with the highest level found in the North-West (48.3 percent) while the lowest was in the South-East (1.3 percent). Women in the lowest wealth quintile had the highest prevalence of 42.1 percent, while those in the highest wealth quintile had the lowest prevalence of 12.0 percent.

The foods that contributed to the overall vitamin A intake of women and children are presented in the Annex section (**Annex 24-25**). Palm oil, banga and palm olein (a refined version of palm oil fortified with vitamin A) were the main contributors. Mango fruit with some leafy and non-leafy vegetables were also notable foods that contributed to vitamin A intake. The nutrient intake deduced from the main sources (especially palm oil) in the southern zones were about double the consumption in the northern zones which influenced the proportion of inadequacy among both women and children.

Table 79. Usual vitamin A intake of women aged 15-49 years

	Vitamin A (mcg RAE)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	485 - 500	925 [868, 982]	29.2	808 [540, 1181]
NPNL[3]	4544		924 [864, 984]	30.4	811 [544.2, 1178]
Lactating women[4]	697	885 - 900	966 [852, 1080]	57.8	786 [505, 1220]
Pregnant women	999	530 - 550	972 [876, 1068]	48.9	866 [606, 1217]
Residence					
Non-pregnant women					
Urban	2114	485 - 500	915 [843, 986]	36.2	839 [614, 1132]
Rural	3127		938 [846, 1030]	46.7	785 [497, 1208]
Pregnant women					
Urban	402	530 - 550	1047 [913, 1181]	67.6	1010 [832, 1225]
Rural	597		934 [804, 1065]	66.0	798 [525, 1190]
Zone					
Non-pregnant women					
North Central	800	485 - 500	748 [650, 847]	49.1	698 [518, 923]
North East	824		650 [575, 724]	37.3	597 [440, 802]
North West	943		629 [551, 708]	39.2	564 [398, 789]
South East	871		1567 [1422, 1713]	72.7	1470 [1124, 1903]
South South	892		1549 [1328, 1769]	110.5	1403 [989, 1949]
South West	911		1030 [910, 1150]	60.2	987 [777, 1235]
Wealth Quintile					
Non-pregnant women					
Lowest	921	485 - 500	706 [615, 797]	46.1	618 [416, 899]
Second	875		822 [714, 929]	54.4	661 [401, 1057]
Middle	1061		1082 [936, 1229]	74.4	927 [617, 1370]
Fourth	1193		964 [864, 1064]	50.8	870 [614, 1214.1]
Highest	1170		1018 [943, 1092]	37.9	943 [697, 1255]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years: 485 µg/day, women aged 19-49 years 500 µg/day, For lactating women aged 15-18 years: 885 µg/day, women aged 19-49 years 900 µg/day, For pregnant women aged 15-18 years 530 µg/day, women aged 19-49 years 550 µg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 80. Prevalence of inadequacy of vitamin A intakes of women aged 15-49 years

	EAR[1] µg RAE/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	485 - 500	5241	26.0	[21.4, 30.7]
NPNL[4]		4544	20.5	[15.5, 25.5]
Lactating women[5]	885 - 900	697	58.0	[47.6, 68.4]
Pregnant women	530 - 550	999	19.3	[5.9, 32.7]
Residence				
Non-pregnant women				
Urban	485 - 500	2114	18.3	[10.9, 25.7]
Rural		3127	30.0	[23.6, 36.5]
Pregnant women				
Urban	530 - 550	402	1.9	[-10.8, 14.5]
Rural		597	27.3	[12.0, 42.6]
Zone				
Non-pregnant women				
North Central	485 - 500	800	28.2	[15.3, 41.2]
North East		824	40.6	[26.0, 55.3]
North West		943	48.3	[33.8, 62.7]
South East		871	1.3	[-1.5, 4.0]
South-South		892	3.8	[-2.2, 9.7]
South West		911	6.7	[1.0, 12.4]
Wealth Quintile				
Non-pregnant women				
Lowest	485 - 500	921	42.1	[28.4, 55.8]
Second		875	40.3	[31.4, 49.2]
Middle		1061	19.7	[8.7, 30.6]
Fourth		1193	19.0	[10.8, 27.2]
Highest		1170	12.0	[5.1, 18.9]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years: 485 µg/day, women aged 19-49 years 500 µg/day, For lactating women aged 15-18 years: 885 µg/day, women aged 19-49 years 900 µg/day, For pregnant women aged 15-18 years 530 µg/day, women aged 19-49 years 550 µg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

As shown in **Table 81 and 82**, the usual vitamin A intake of children aged 24-59 months is 575 mcg which resulted in an inadequacy of about a tenth of all children (12.4 percent). This prevalence was hugely different among urban (0.8%) and rural (17.8%) children.

Table 81. Usual vitamin A intake of children aged 24-59 months.

	Vitamin A (mcg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	210 - 275	575 [530.6, 619.1]	22.5	490 [315.6, 739.4]
Sex					
Male	1722	210 - 275	582 [527.2, 635.8]	27.6	506 [330.1, 746.4]
Female	1634		566 [515.4, 617.3]	25.9	471 [297.0, 729.8]
Residence					
Urban	1385	210 - 275	597 [545.5, 648.1]	25.9	567 [445.1, 716.7]
Rural	1971		565 [498.3, 631.6]	33.8	455 [274.6, 732.1]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 210 µg/day, for children aged 4-5years 275 µg/day)
CI= Confidence Interval, SE= Standard Error

Table 82. Prevalence of inadequacy of vitamin A intakes of children aged 24-59 months

	EAR[1] µg RAE/day	N[2]	% <EAR[3]	[95% CI][3]
National	210 - 275	3356	12.4	[7.8, 16.9]
Sex				
Male	210 - 275	1722	11.0	[5.0, 16.9]
Female		1634	14.4	[7.9, 21.0]
Residence				
Urban	210 - 275	1385	0.8	[-2.2, 3.9]
Rural		1971	17.8	[11.7, 23.9]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 210 µg/day, for children aged 4-5years 275 µg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Vitamin C

Vitamin C is required for biosynthesis of collagen, certain neurotransmitters, wound healing, protect cells against oxidative stress, and maintain a healthy skin, blood vessels, bones and cartilage, and to enhance the absorption of non-heme iron. The mean usual vitamin C intake of non-pregnant and pregnant women in is 61 mg and 64 mg respectively (**Table 83**). There was a difference in the mean intake of pregnant women living in urban (72 mg) and in rural areas (60 mg). Across zones, besides the intake in the north central, women from southern zones had comparatively higher intake than women from the northern zones. Vitamin C intake increased with wealth status. When compared to recommendations, inadequacy ranged from a low of 53 percent among non-lactating women to a high of 87 percent among lactating women (**Table 84**). The consumption patterns among non-lactating women and among lactating women was the same but the requirements for vitamin C are different which may explain the observed vitamin C inadequacy.

The highest contributors to the intake of Vitamin C among women and children were peppers, tomato and onion which are commonly blended together to make stew and sauces (**Annex 26- 27**). Mango fruit, cocoa drink (fortified commercial products) and tubers like sweet potato and white yam were also among the top foods but ranked lower.

Table 83. Usual vitamin C intake of women aged 15-49 years

	Vitamin C (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	56 - 60	61 [58, 64]	1.5	57 [42, 76]
NPNL[3]	4544		61 [58, 64]	1.4	57 [43, 75]
Lactating women[4]	697	96 - 100	63 [57, 69]	3.3	57 [39, 81]
Pregnant women	999	66 - 70	64 [59, 70]	2.8	61 [46, 79]
Residence					
Non-pregnant women					
Urban	2114	56 - 60	64 [60, 67]	1.8	59 [42, 80]
Rural	3127		59 [55, 64]	2.3	56 [43, 72]
Pregnant women					
Urban	402	66 - 70	72 [63, 82]	4.8	69 [54, 87]
Rural	597		60 [54, 67]	3.3	56 [41, 76]
Zone					
Non-pregnant women					
North Central	800	56 - 60	64 [57, 72]	3.7	62 [50, 76]
North East	824		55 [50, 61]	2.6	50 [34, 71]
North West	943		55 [47, 63]	3.9	51 [37, 69]
South East	871		67 [60, 74]	3.3	64 [52, 79]
South South	892		61 [54, 69]	3.7	59 [47, 73]
South West	911		70 [67, 74]	1.8	67 [50, 87]
Wealth Quintile					
Non-pregnant women					
Lowest	921	56 - 60	58 [48, 69]	5.2	54 [38, 74]
Second	875		55 [50, 60]	2.5	52 [39, 68]
Middle	1061		57 [52, 62]	2.5	54 [39, 71]
Fourth	1193		65 [61, 69]	2.0	60 [44, 81]
Highest	1170		69 [64, 74]	2.4	66 [52, 83]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years 56 mg/day, women aged 19-49 years 60 mg/day, For lactating women aged 15-18 years 96 mg/day, women aged 19-49 years 100 mg/day, For pregnant women aged 15-18 years 66 mg/day, women aged 19-49 years 70 mg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 84. Prevalence of inadequacy of vitamin C intakes of women aged 15-49 years

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	56 - 60	5241	58.7	[54.4, 63.1]
NPNL[4]		4544	53.0	[47.3, 58.3]
Lactating women[5]	96 - 100	697	87.0	[80.7, 93.3]
Pregnant women	66 - 70	999	63.9	[54.7, 73.2]
Residence				
Non-pregnant women				
Urban	56 - 60	2114	55.1	[50.5, 59.7]
Rural		3127	61.8	[52.7, 70.9]
Pregnant women				
Urban	56 - 60	402	51.5	[22.2, 80.8]
Rural		597	68.7	[59.5, 77.8]
Zone				
Non-pregnant women				
North Central	56 - 60	800	51.9	[38.7, 65.1]
North East		824	66.1	[59.5, 72.7]
North West		943	67.9	[56.6, 79.2]
South East		871	44.7	[20.5, 68.8]
South-South		892	56.4	[32.6, 80.3]
South West		911	45.0	[37.1, 52.9]
Wealth Quintile				
Non-pregnant women				
Lowest	56 - 60	921	63.9	[48.4, 79.4]
Second		875	67.6	[59.0, 76.1]
Middle		1061	63.9	[56.5, 71.3]
Fourth		1193	54.0	[48.7, 59.4]
Highest		1170	42.9	[30.4, 55.5]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years 56 mg/day, women aged 19-49 years 60 mg/day, For lactating women aged 15-18 years 96 mg/day, women aged 19-49 years 100 mg/day, For pregnant women aged 15-18 years 66 mg/day, women aged 19-49 years 70 mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

Children aged 24 – 59 months had a mean intake of 41 mg which resulted in a low prevalence of inadequacy, less than a tenth (5 percent) of all children (**Table 85-86**).

Table 85. Usual vitamin C intake of children aged 24-59 months

	Vitamin C (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	13-22	41 [39, 43]	1.1	38 [27, 51]
Sex					
Male	1722	13-22	41 [38, 44]	1.5	38 [27, 52]
Female	1634		40 [38, 43]	1.3	38 [28, 50]
Residence					
Urban	1385	13-22	47 [42, 51]	2.0	43.1 [31, 59]
Rural	1971		38 [35, 41]	1.3	35.2 [26, 47]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 13 mg/day, For children aged 4-5years 22 mg/day)
CI= Confidence Interval, SE= Standard Error

Table 86. Prevalence of inadequacy of Vitamin C intakes of children aged 24-59 months

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National	13-22	3356	5.0	[2.2, 7.8]
Sex				
Male	13-22	1722	5.8	[2.1, 9.6]
Female		1634	3.9	[0.1, 7.8]
Residence				
Urban	13-22	1385	3.6	[-0.1, 7.3]
Rural		1971	5.8	[1.8, 9.7]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 13 mg/day, For children aged 4-5years 22 mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Vitamin B1 (Thiamine)

Thiamine is a water-soluble vitamin which plays an important role in growth and functions of cell, energy metabolism, synthesis of DNA and RNA. As shown in **Table 87**, the usual thiamine intake of women was similar irrespective of physiological status, residence, zone, and wealth quintile. The level of inadequacy of thiamine intake varied across the categories. Nationally, about 65 percent of non-lactating women and 67 percent of non-pregnant women have a risk of inadequate thiamine intake, which increased if the woman was lactating (77.3 percent) or pregnant (86.9 percent) (**Table 88**).

The main foods that contributed to the overall thiamine intake of women and children are presented in the Annex section (**Annex 28-29**). These foods were mainly bread, products from maize, rice and millet. Among children, cocoa drink was a higher ranking food compared to women. Noodles and sorghum products also contributed across all age groups.

Table 87. Usual thiamine intake of women aged 15-49 years

	Vitamin B1 (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	0.9	0.8 [0.8, 0.9]	0.0	0.8 [0.6, 1.0]
NPNL[3]	4544		0.8 [0.7, 0.8]	0.0	0.8 [0.6, 1.0]
Lactating women[4]	697	1.2	1.0 [0.9, 1.0]	0.0	0.9 [0.7, 1.2]
Pregnant women	999		0.8 [0.8, 0.9]	0.0	0.8 [0.6, 1.0]
Residence					
Non-pregnant women					
Urban	2114	0.9	0.8 [0.8, 0.9]	0.0	0.8 [0.6, 1.0]
Rural	3127		0.8 [0.8, 0.9]	0.0	0.8 [0.6, 1.0]
Pregnant women					
Urban	402	1.2	0.9 [0.8, 0.9]	0.0	0.8 [0.6, 1.1]
Rural	597		0.8 [0.8, 0.9]	0.0	0.8 [0.6, 1.0]
Zone					
Non-pregnant women					
North Central	800	0.9	0.8 [0.7, 0.8]	0.0	0.7 [0.6, 0.9]
North East	824		0.8 [0.7, 0.9]	0.0	0.7 [0.6, 1.0]
North West	943		0.9 [0.8, 1.0]	0.0	0.9 [0.7, 1.1]
South East	871		0.8 [0.8, 0.9]	0.0	0.8 [0.6, 1.0]
South South	892		0.8 [0.7, 0.8]	0.0	0.7 [0.6, 0.9]
South West	911		0.9 [0.8, 0.9]	0.0	0.8 [0.6, 1.1]
Wealth Quintile					
Non-pregnant women					
Lowest	921	0.9	0.8 [0.7, 0.9]	0.0	0.8 [0.6, 1.0]
Second	875		0.8 [0.8, 0.9]	0.0	0.8 [0.7, 1.0]
Middle	1061		0.8 [0.7, 0.8]	0.0	0.7 [0.6, 0.9]
Fourth	1193		0.8 [0.8, 0.9]	0.0	0.8 [0.7, 1.0]
Highest	1170		0.9 [0.8, 0.9]	0.0	0.8 [0.7, 1.0]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-49 years 0.9 mg/day For both lactating and pregnant women aged 15-49 years 1.2 mg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 88. Prevalence of inadequacy of thiamine intake of women aged 15-49 years

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	0.9	5241	67.4	[63.0, 71.8]
NPNL[4]		4544	65.4	[60.6, 70.1]
Lactating women[5]	1.2	697	77.3	[71.3, 83.4]
Pregnant women		999	86.9	[82.2, 91.7]
Residence				
Non-pregnant women				
Urban	0.9	2114	67.2	[62.9, 71.6]
Rural		3127	67.3	[59.9, 74.6]
Pregnant women				
Urban	1.2	402	82.1	[75.9, 88.4]
Rural		597	89.4	[82.8, 96.0]
Zone				
Non-pregnant women				
North Central	0.9	800	75.8	[68.7, 82.8]
North East		824	71.1	[64.3, 77.8]
North West		943	62.1	[47.1, 77.0]
South East		871	68.0	[57.8, 78.2]
South-South		892	75.3	[64.7, 85.9]
South West		911	60.4	[54.3, 66.4]
Wealth Quintile				
Non-pregnant women				
Lowest	0.9	921	67.8	[58.7, 76.9]
Second		875	67.0	[55.2, 78.8]
Middle		1061	75.0	[65.0, 85.0]
Fourth		1193	66.6	[60.5, 72.8]
Highest		1170	62.3	[56.9, 67.9]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-49 years 0.9 mg/day For both lactating and pregnant women aged 15-49 years 1.2 mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

The usual intake of children aged 24-59 months was 0.5 mg with no substantial difference across the sex and residence of the children (**Table 89**) which resulted in about a third (32 percent) of children having an inadequate intake when compared with recommendations (**Table 90**).

Table 89. Usual thiamine intake of children aged 24-59 months

	Vitamin B1 (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	0.4 - 0.5	0.5 [0.5, 0.6]	0.0	0.5 [0.4, 0.7]
Sex					
Male	1722	0.4 - 0.5	0.6 [0.5, 0.6]	0.0	0.5 [0.4, 0.7]
Female	1634		0.5 [0.5, 0.6]	0.0	0.5 [0.4, 0.7]
Residence					
Urban	1385	0.4 - 0.5	0.6 [0.5, 0.6]	0.0	0.6 [0.4, 0.7]
Rural	1971		0.5 [0.4, 0.5]	0.0	0.5 [0.4, 0.6]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 0.4 mg/day, For children aged 4-5years 0.5 mg/day)
CI= Confidence Interval, SE= Standard Error

Table 90. Prevalence of inadequacy of thiamine intakes of children aged 24-59 months

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National	0.4 - 0.5	3356	32.0	[28.1, 35.8]
Sex				
Male	0.4 - 0.5	1722	30.7	[26.1, 35.3]
Female		1634	33.2	[27.5, 39.0]
Residence				
Urban	0.4 - 0.5	1385	26.8	[20.5, 33.1]
Rural		1971	34.7	[29.5, 39.8]

[1]Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 0.4 mg/day, For children aged 4-5years 0.5 mg/day)
[2]Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Vitamin B2 (Riboflavin)

Riboflavin is a water-soluble vitamin essential to the formation of two major coenzymes, flavin mononucleotide and flavin adenine dinucleotide, involved with the growth of cells, energy production and the breakdown of fats, steroids, and medications. Mean riboflavin intake of women across all categories was 0.7 mg. This level of intake was consistently similar when intake was disaggregated across residence, zone and wealth quintile and only reached a high of 0.9 mg among women in the highest wealth quintile (**Table 91**). Intake was generally inadequate in at least four-fifths of the women when compared to recommendations (**Table 92**). These inadequacies ranged from a high found among women in North-East (94.8 percent) to a low in South-West (59.3 percent). There was also a consistent decrease in the prevalence with increase in wealth status.

The top foods that contributed to the overall riboflavin intake of women and children are presented in the Annex section (**Annex 30-31**). Rice, bread, peppers, catfish, cocoa and fura da nono were the most commonly consumed foods. Among children, cocoa drink had a higher contribution to riboflavin intake compared to women.

Table 91. Usual riboflavin intake of women aged 15-49 years

	Riboflavin (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	0.9	0.7 [0.6, 0.7]	0.0	0.6 [0.4, 0.8]
NPNL[3]	4544		0.7 [0.6, 0.7]	0.0	0.6 [0.4, 0.8]
Lactating women[4]	697	1.2	0.7 [0.6, 0.8]	0.0	0.6 [0.5, 0.9]
Pregnant women	999	1.3	0.7 [0.6, 0.7]	0.0	0.6 [0.4, 0.9]
Residence					
Non-pregnant women					
Urban	2114	0.9	0.8 [0.7, 0.8]	0.0	0.7 [0.5, 1.0]
Rural	3127		0.6 [0.5, 0.6]	0.0	0.6 [0.4, 0.7]
Pregnant women					
Urban	402	1.3	0.8 [0.7, 0.9]	0.1	0.7 [0.5, 1.0]
Rural	597		0.6 [0.5, 0.7]	0.0	0.5 [0.4, 0.8]
Zone					
Non-pregnant women					
North Central	800	0.9	0.5 [0.5, 0.6]	0.0	0.5 [0.4, 0.7]
North East	824		0.5 [0.5, 0.6]	0.0	0.5 [0.4, 0.6]
North West	943		0.6 [0.5, 0.6]	0.0	0.6 [0.4, 0.7]
South East	871		0.8 [0.7, 0.9]	0.0	0.7 [0.6, 1.0]
South South	892		0.8 [0.7, 0.8]	0.0	0.7 [0.5, 1.0]
South West	911		0.9 [0.8, 1.0]	0.0	0.9 [0.6, 1.1]
Wealth Quintile					
Non-pregnant women					
Lowest	921	0.9	0.6 [0.5, 0.6]	0.0	0.5 [0.4, 0.7]
Second	875		0.6 [0.5 0.6]	0.0	0.5 [0.4, 0.7]
Middle	1061		0.6 [0.5, 0.6]	0.0	0.5 [0.4, 0.7]
Fourth	1193		0.7 [0.7, 0.8]	0.0	0.7 [0.5, 0.9]
Highest	1170		0.9 [0.8, 0.9]	0.0	0.8 [0.6, 1.05]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
* Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-49 years 0.9 mg/day For lactating women aged 15-49 years 1.2 mg/day, For pregnant women aged 15-49 years 1.3 mg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 92. Prevalence of inadequacy of riboflavin intakes of women aged 15-49 years

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	0.9	5241	83.3	[80.6, 86.0]
NPNL[4]		4544	81.6	[78.6, 84.6]
Lactating women[5]	1.2	697	92.7	[89.4, 96.1]
Pregnant women	1.3	999	91.4	[88.4, 94.7]
Residence				
Non-pregnant women				
Urban	0.9	2114	75.6	[71.0, 80.1]
Rural		3127	89.3	[85.3, 93.2]
Pregnant women				
Urban	1.3	402	82.5	[76.3, 88.7]
Rural		597	95.7	[91.8, 99.6]
Zone				
Non-pregnant women				
North Central	0.9	800	92.8	[88.3, 97.4]
North East		824	94.8	[91.3, 98.4]
North West		943	93.1	[86.3, 99.8]
South East		871	70.0	[62.1, 78.0]
South-South		892	73.2	[65.6, 80.7]
South West		911	59.3	[53.0, 65.6]
Wealth Quintile				
Non-pregnant women				
Lowest	0.9	921	91.9	[84.7, 99.0]
Second		875	94.7	[90.9, 98.6]
Middle		1061	88.5	[83.9, 93.0]
Fourth		1193	78.6	[73.3, 83.9]
Highest		1170	64.7	[57.5, 72.0]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-49 years 0.9 mg/day For lactating women aged 15-49 years 1.2 mg/day, For pregnant women aged 15-49 years 1.3 mg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

Among children, usual mean intake was 0.4 mg which resulted in inadequacy among three-fifths (59 percent) of all children (T**able 93 and 94**). This prevalence varied across residence among rural dwellers (70 percent) compared to urban dwellers (39 percent).

Table 93. Usual riboflavin-vitamin B2 intake of children aged 24-59 months

	Riboflavin (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	0.4 - 0.5	0.4 [0.4, 0.5]	0.0	0.4 [0.3, 0.5]
Sex					
Male	1722	0.4 - 0.5	0.4 [0.4, 0.5]	0.0	0.4 [0.3, 0.6]
Female	1634		0.4 [0.4, 0.4]	0.0	0.4 [0.3, 0.5]
Residence					
Urban	1385	0.4 - 0.5	0.6 [0.5, 0.6]	0.0	0.5 [0.3, 0.7]
Rural	1971		0.4 [0.3, 0.4]	0.0	0.3 [0.2, 0.5]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 0.4 mg/day, For children aged 4-5years 0.5 mg/day)
CI= Confidence Interval, SE= Standard Error

Table 94. Prevalence of inadequacy of riboflavin intakes of children aged 24-59 months

	EAR[1] mg/day	N[2]	% < EAR[3]	[95% CI][3]
National	0.4 - 0.5	3356	58.8	[55.1, 62.5]
Sex				
Male	0.4 - 0.5	1722	57.7	[53.5, 61.9]
Female		1634	60.4	[55.7, 65.2]
Residence				
Urban	0.4 - 0.5	1385	39.2	[31.9, 46.5]
Rural		1971	69.9	[64.9, 75.0]

1 Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (*For children aged 1-3 years 0.4 mg/day, **For children aged 4-5years 0.5 mg/day)
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Vitamin B9 (Folate)

Folate helps in DNA and RNA syntheses, protein metabolism, and formation of haemoglobin. According to **Table 95** the mean usual folate intake of non-pregnant and pregnant women is 200 mcg and 197 mcg, respectively. There was a wide numerical difference between the intake of non-lactating women (196 mcg) compared to lactating women (217 mcg). Across zones, women from southern zones had comparatively higher intake than women from the northern zones, and folate intake ranged from a low of 189 mcg to 208 mcg in the lowest and highest quintiles, respectively. Inadequacy of folate intake was greater than 90 percent across all categories of women with the highest prevalence of inadequacy among pregnant women (99.9 percent) (**Table 96**).

The top foods that contributed to the overall folate intake of women and children are products of Cowpea, cassava (*garri*) and rice (**Annex 32-33**).

Table 95. Usual folate intake of women aged 15-49 years

			Folate (mcg)		
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	320 - 330	200 [191, 208]	4.3	189 [148, 240]
NPNL[3]	4544		197 [189, 205]	4.2	187 [146, 237]
Lactating women[4]	697	450	217 [201, 233]	8.1	202 [156, 261]
Pregnant women	999	520	196 [186, 206]	5.2	186 [144, 237]
Residence					
Non-pregnant women					
Urban	2114	320 - 330	200 [188, 211]	5.9	189 [148, 240]
Rural	3127		200 [188, 212]	5.9	189 [148, 240]
Pregnant women					
Urban	402	520	212 [198, 225]	6.9	204 [166, 250]
Rural	597		188 [174, 201]	6.9	177 [134, 229]
Zone					
Non-pregnant women					
North Central	800	320 - 330	178 [158, 198]	10.1	167 [131, 213]
North East	824		164 [151, 177]	6.4	158 [127, 193]
North West	943		186 [167, 206]	9.7	178 [144, 220]
South East	871		231 [219, 243]	6.2	223 [179, 274]
South South	892		225 [210, 240]	7.5	216 [173, 266]
South West	911		233 [217, 250]	8.4	223 [176, 280]
Wealth Quintile					
Non-pregnant women					
Lowest	921	320 - 330	189 [166, 212]	11.5	171 [124, 234]
Second	875		198 [185, 211]	6.6	191 [158, 231]
Middle	1061		197 [182, 212]	7.8	184 [141, 238]
Fourth	1193		203 [190, 215]	6.4	195 [159, 238]
Highest	1170		208 [196, 220]	6.2	197 [155, 248]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years 330 µg/day, women aged 19-49 years 320 µg/day, For lactating women aged 15-49 years 450 µg/day, For pregnant women aged 15-49 years 520 µg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 96. Prevalence of inadequacy of folate intakes of women aged 15-49 years

	EAR[1]	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	320 - 330	5241	94.9	[92.5, 97.4]
NPNL[4]		4544	94.3	[91.6, 97.0]
Lactating women[5]	450	697	98.3	[96.2, 100.5]
Pregnant women	520	999	99.9	[99.7, 100.1]
Residence				
Non-pregnant women				
Urban	320 - 330	2114	95.3	[92.2, 98.5]
Rural		3127	94.6	[91.1, 98.2]
Pregnant women				
Urban	520	402	100.0	[99.7, 100.2]
Rural		597	99.9	[99.6, 100.2]
Zone				
Non-pregnant women				
North Central	320 - 330	800	97.1	[92.4, 101.8]
North East		824	99.4	[97.3, 101.6]
North West		943	98.4	[93.6, 103.2]
South East		871	90.5	[85.4, 95.7]
South-South		892	92.5	[87.0, 98.0]
South West		911	88.8	[82.9, 94.7]
Wealth Quintile				
Non-pregnant women				
Lowest	320 - 330	921	92.9	[86.6, 99.2]
Second		875	98.0	[95.0, 101.1]
Middle		1061	94.4	[90.9, 97.8]
Fourth		1193	96.7	[92.9, 100.4]
Highest		1170	94.1	[89.4, 98.7]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-18 years 330 μg/day, women aged 19-49 years 320 μg/day, For lactating women aged 15-49 years 450 μg/day, For pregnant women aged 15-49 years 520 μg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

The usual Vitamin B9 intake of children aged 24-59 months was 122 mcg which when disaggregated by residence was 131 mcg among urban dwellers and 116 mcg among rural dwellers (**Table 97**). When compared to requirements, about three-fifths (63 percent) of children had an inadequate intake of folate (**Table 98**)

Table 97. Usual folate intake of children aged 24-59 months

	Folate (mg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	120 - 160	122 [117, 126]	2.2	114 [87, 148]
Sex					
Male	1722	120 - 160	123 [117, 128]	2.6	116 [89, 148]
Female	1634		121 [114, 127]	3.1	112 [84, 148]
Residence					
Urban	1385	120 - 160	131 [124, 139]	3.7	125 [97, 158]
Rural	1971		116 [110, 122]	3.1	108 [82, 142]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (*For children aged 1-3 years 120 µg/day, **For children aged 4-5years 160 µg/day)
CI= Confidence Interval, SE= Standard Error

Table 98. Prevalence of inadequacy of Folate intakes of children aged 24-59 months

	EAR[1] µg/day	N[2]	% < EAR[3]	[95% CI][3]
National	120 - 160	3356	63.2	[59.7, 66.7]
Sex				
Male	120 - 160	1722	62.4	[58.1, 66.7]
Female		1634	63.9	[59.3, 68.5]
Residence				
Urban	120 - 160	1385	54.4	[47.6, 61.3]
Rural		1971	67.6	[62.9, 72.4]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (*For children aged 1-3 years 120 µg/day, **For children aged 4-5years 160 µg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Vitamin B12 (Cobalamin)

Vitamin B12 is needed to form red blood cells, protein metabolism, and DNA. It is also a key player in the function and development of brain and nerve cells and helps prevent megaloblastic anemia. , A lack of adequate vitamin B12 can increase homocysteine levels. High homocysteine levels are associated with an increased risk of heart disease and stroke as it may promote the formation of blood clots High homocysteine levels are associated with an increased risk of heart disease and stroke as it may promote the formation of blood clots. As shown in **Table 99**, the mean usual vitamin B12 intake of non-pregnant women is 2.6 mcg. Women in urban areas had mean intakes that were higher than rural dwellers irrespective of pregnant status. There was generally an increase in vitamin B12 intake as the wealth quintile increased with women in the lowest and highest quintiles having a mean intake of 1.3 mcg and 4.0 mcg respectively.

The inadequacy of vitamin B12 intake was prevalent in about half of all women but varied when data was disaggregated based on residence, zone, and wealth quintile (**Table 100**). Irrespective of pregnancy status, women living in rural areas had higher levels of inadequacy compared to women in urban areas. Across the zones, inadequacy ranged from a high of 88 percent in North-West to

South-South (8 percent) and the inadequacy of vitamin B12 intake generally decreased with an increase in wealth ranging from 81 percent in the lowest quintile to 33 percent in highest wealth quintile.

Vitamin B12, is naturally found in animal foods. It can also be added to foods or supplements. The top foods that contributed to the overall Vitamin B12 intake of women and children were mostly fish and are presented in the Annex section (**Annex 34-35**). The foods include mackerel fish (the main source), sardine, catfish, hake fish, and other fish. Garri and beef were also among top ten sources for both women and children.

Table 99. Usual vitamin B12 intake of women aged 15-49 years

	Vitamin B12 (mcg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National					
Non-pregnant women	5241	2.0	2.6 [2.3, 2.8]	0.1	1.8 [0.9, 3.4]
NPNL[3]	4544		2.6 [2.3, 2.8]	0.1	1.9 [0.9, 3.4]
Lactating women[4]	697	2.4	2.9 [2.0, 3.7]	0.4	1.7 [0.6, 3.7]
Pregnant women	999	2.2	2.7 [2.2, 3.3]	0.3	1.5 [0.5, 3.6]
Residence					
Non-pregnant women					
Urban	2114	2.0	3.4 [3.0, 3.8]	0.2	2.1 [0.9, 4.4]
Rural	3127		2.4 [1.9, 2.8]	0.2	1.6 [0.7, 3.1]
Pregnant women					
Urban	402	2.4	4.0 [2.9, 5.]	0.5	1.4 [0.4, 4.5]
Rural	597		2.5 [1.7, 3.4]	0.4	1.2 [0.4, 3.1]
Zone					
Non-pregnant women					
North Central	800	2.0	1.8 [1.5, 2.1]	0.2	1.9 [1.5, 2.2]
North East	824		1.0 [0.7, 1.4]	0.1	0.5 [0.2, 1.3]
North West	943		0.9 [0.7, 1.2]	0.1	0.4 [0.1, 1.1]
South East	871		4.4 [3.7, 5.0]	0.3	3.9 [2.5, 5.6]
South South	892		5.0 [4.3, 5.6]	0.3	4.4 [3.0, 6.3]
South West	911		4.9 [3.8, 6.0]	0.5	4.3 [2.8, 6.3]
Wealth Quintile					
Non-pregnant women					
Lowest	921	2.0	1.3 [1.0, 1.6]	0.2	0.6 [0.2, 1.6]
Second	875		2.0 [1.4, 2.6]	0.3	1.3 [0.6, 2.6]
Middle	1061		2.7 [2.2, 3.2]	0.2	1.8 [0.9, 3.5]
Fourth	1193		4.0 [3.5, 4.6]	0.3	2.3 [0.9. 5.1]
Highest	1170		3.5 [3.1, 3.8]	0.2	2.9 [1.7, 4.6]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-49 years 2.0 μg/day, For lactating women aged 15-49 years 2.4 μg/day, For pregnant women aged 15-49 years 2.2 μg/day)
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 100. Prevalence of inadequacy of usual vitamin B12 intakes of women aged 15-49 years

	EAR[1]	N[2]	% < EAR[3]	[95% CI][3]
National				
Non-pregnant women	2.0	5241	54.2	[49.6, 58.7]
NPNL[4]		4544	52.5	[47.9, 57.1]
Lactating women[5]	2.4	697	61.3	[51.7, 71.0]
Pregnant women	2.2	999	61.2	[54.8, 67.5]
Residence				
Non-pregnant women				
Urban	2.0	2114	48.8	[40.9, 56.6]
Rural		3127	59.9	[53.1, 66.7]
Pregnant women				
Urban	2.4	402	59.3	[49.0, 69.6]
Rural		597	66.0	[57.1, 74.8]
Zone				
Non-pregnant women				
North Central	2.0	800	57.1	[32.7, 81.6]
North East		824	85.7	[79.8, 91.7]
North West		943	87.9	[83.6, 92.1]
South East		871	15.7	[2.4, 28.9]
South-South		892	8.4	[-4.0, 20.9]
South West		911	12.0	[-0.9, 25.0]
Wealth Quintile				
Non-pregnant women				
Lowest	2.4	921	80.9	[75.4, 86.4]
Second		875	67.2	[57.1, 77.2]
Middle		1061	54.5	[42.5, 66.5]
Fourth		1193	46.4	[37.5, 55.3]
Highest		1170	33.1	[22.8, 43.3]

[1] Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For non-pregnant women aged 15-49 years 2.0 µg/day, For lactating women aged 15-49 years 2.4 µg/day, For pregnant women aged 15-49 years 2.2 µg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
[4]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[5]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

Children aged 24-59 months had a usual intake of 1.4 mcg (**Table 101**). The inadequacy of vitamin B12 intake was prevalent in about half of all children 24-59 months but varied when data was disaggregated based on residence with a lower prevalence among urban dwellers compared to rural dwellers (**Table 102**).

Table 101. Usual vitamin B12 intake of children aged 24-59 months

	Vitamin B12 (mcg)				
	N[1]	*EAR	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	0.7 - 1.0	1.4 [1.2, 1.5]	0.1	0.7 [0.3, 1.7]
Sex					
Male	1722	0.7 - 1.0	1.4 [1.2, 1.6]	0.1	0.7 [0.3, 1.8]
Female	1634		1.3 [1.1, 1.5]	0.1	0.7 [0.3, 1.7]
Residence					
Urban	1385	0.7 - 1.0	2.1 [1.9, 2.4]	0.1	1.0 [0.3, 2.6]
Rural	1971		1.2 [0.9, 1.4]	0.1	0.5 [0.2, 1.4]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
*Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 0.7 µg/day,
**For children aged 4-5years 1.0 µg/day)
CI= Confidence Interval, SE= Standard Error

Table 102. Prevalence of inadequacy of vitamin B12 intakes of children aged 24-59 months

	EAR[1]	N[2]	% < EAR[3]	[95% CI][3]
National	0.7 - 1.0	3356	51.7	[46.8, 56.6]
Sex				
Male	0.7 - 1.0	1722	51.7	[46.1, 57.3]
Female		1634	51.9	[45.4, 58.5]
Residence				
Urban	0.7 - 1.0	1385	43.0	[35.7, 50.2]
Rural		1971	60.3	[53.7, 66.8]

[1]Estimated Average Requirements (EAR) from Institute of Medicine (www.nap.edu) (For children aged 1-3 years 0.7 µg/day, **For children aged 4-5years 1.0 µg/day)
[2]Number of respondents
[3]Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, EAR = Estimated Average Requirements

Infant and Young Child Feeding

Box 5. Key Findings on Infant and Young Child Feeding

Ever Breastfed: Almost all (97 percent) children (aged 6-23 months) were ever breastfed. Similar patterns were observed in urban and rural areas, and for girls and boys.

Continued Breast Feeding: Nationally, 57 percent of children (aged 12-23 months) received continued breastfeeding. It was more common in rural areas (62 percent) than in urban areas (46 percent).

Introduction of Solid, Semi-Solid or Soft Foods: Most of children aged 6-8 months (95 percent) consumed at least one solid, semi-solid or soft food the previous day.

Minimum Dietary Diversity: More than half (58 percent) of the children aged 6-23 months achieved minimum dietary diversity.

Minimum Meal Frequency: Nationally, 84.8 percent of children aged 6-23 months achieved a minimal meal frequency.

Minimum Acceptable Diet: Nationally, 41.4 percent of children aged 6-23 months consumed a minimum acceptable diet. The proportion of children with a minimum acceptable diet was 42 percent, 53 percent and 28 percent for children aged 6-11, 12-17 and 18-23 months, respectively.

Minimum milk feeding frequency for non-breastfed children: Only 10 percent received Minimum Milk Feeds which was significantly lower in rural (3.9 percent) compared to urban (19.6 percent). The proportion of children that received the minimum number of milk feeds was 9 percent, 17 percent and 8 percent for children aged 6-11, 12-17 and 18-23 months, respectively.

Egg and/or flesh food consumption: One-third (35 percent) of children aged 6-23 months consumed egg and/or flesh foods the previous day.

Sweet beverage consumption: Nationally, 24 percent of children aged 6-23 months consumed sweet beverages the previous day (33 percent in urban and 20 percent in rural areas).

Unhealthy food consumption: Nationally, 55 percent of children aged 6-23 month consumed unhealthy foods the previous day (70 percent in urban and 47 percent in rural areas).

Zero vegetable or fruit consumption: One in six (17 percent) children aged 6-23 months did not consume fruits or vegetables the previous day. No differences were observed by sex or residence.

Bottle Feeding: One-fifth of children (20 percent) aged 6-23 months used a feeding bottle with a nipple the previous day. No differences were observed by sex or residence.

Infant and Young Child Feeding

Infant and young child feeding (IYCF) practices directly affect the health, development and nutritional status of children less than two years of age and, ultimately, impact child survival. Improving IYCF practices in children 0–23 months of age is therefore critical to improved nutrition, health and development. This survey was designed to assess IYCF practices for children aged 6-23 months using the 2021 WHO/UNICEF indicators (WHO/UNICEF 2021) (as summarized in **Table 103**). Since children under six months were not included in the survey, indicators that relate to this age group are not reported (i.e., early initiation of breastfeeding and exclusive breastfeeding). Some indicators (i.e., ever breastfed and bottle feeding) were included although the indicator is intended for children starting at 0 month. As such, these findings are not directly comparable to other surveys.

Data are presented for the age groups that these indicators relate to and are disaggregated into the age groups recommended by the WHO/UNICEF (as shown in **Table 104**). In addition, some indicators are presented for children aged 24-59 months (i.e., egg and/or flesh food, sweet beverage, unhealthy food consumption and zero vegetable or fruit consumption). Although some data required to assess the WHO/UNICEF IYCF indicators was collected using the diet questionnaire, most data was collected using quantitative 24-hour dietary recall data. The IYCF indicators were derived using the first 24-hour dietary recall interview (i.e., the food consumed as reported in the repeat interview in a sub-sample of children was not used). Indicators like Minimum dietary diversity, Minimum meal frequency and Minimum acceptable diet using 24h recall are not to be directly compared to indicators in other surveys that were collected by a pre-determined list based questionnaire. This is partly due to the probing methodology applied during a multi-pass 24hr recall method which accounts for details of ingredients and does not place limits on the amount that is accounted for the counting of food groups.

Table 103. IYCF indicators reported for infants and young children aged 6-23 months

WHO Indicators[1]	Definition	WHO age group for indicator	NFCMS	
			Age group	Data collection tool
Breastfeeding indicators				
Ever breastfed	Percentage of children born in the last 24 months who were ever breastfed	Children born in the last 24 months	Children 6-23 months of age	Diet questionnaire
Early initiation of breastfeeding	Percentage of children born in the last 24 months who were put to the breast within one hour of birth	Children born in the last 24 months	Not within the scope of this survey	
Exclusively breastfed for the first two days after birth	Percentage of children born in the last 24 months who were fed exclusively with breast milk for the first two days after birth	Children born in the last 24 months	Not within the scope of this survey	
Exclusive breastfeeding under six months	Percentage of infants (0-5 months old) who were fed exclusively with breast milk during the previous day	Infants 0-5 months of age	Not within the scope of this survey	
Mixed milk feeding under six months	Percentage of infants 0–5 months old who were fed formula and/or animal milk in addition to breast milk during the previous day	Infants 0-5 months of age	Not within the scope of this survey	
Continued breastfeeding 12-23 months	Percentage of children (aged 12–23 months) who were fed breast milk during the previous day	Children 12-23 months of age (12-15, 16-19 and 20-23 months)	Children 12-23 months of age	Diet questionnaire
Complementary feeding indicators				
Introduction of solid, semisolid or soft foods 6-8 months	Percentage of infants (aged 6-8 months) who consumed solid, semi-solid or soft foods during the previous day	Infants 6-8 months of age	Children 6-8 months of age (if sample size allows)	24-hour recall data

Minimum dietary diversity 6-23 months	Percentage of children (aged 6-23 months) who consumed foods and beverages from at least five out of eight defined food groups during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Minimum meal frequency 6-23 months	Percentage of children (aged 6-23 months) who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Minimum milk feeding frequency for non-breastfed children 6-23 months	Percentage of non-breastfed children (aged 6-23 months) who consumed at least two milk feeds during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Minimum acceptable diet 6-23 months	Percentage of children (aged 6-23 months) who consumed a minimum acceptable diet during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Egg and/or flesh food consumption 6-23 months	Percentage of children (aged 6-23 months) who consumed egg and/or flesh food during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 & 24-59 months of age	24-hour recall data
Sweet beverage consumption 6-23 months	Percentage of children (aged 6-23 months) who consumed a sweet beverage during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 & 24-59 months of age	24-hour recall data
Unhealthy food consumption 6-23 months	Percentage of children (aged 6-23 months) who consumed selected sentinel unhealthy foods during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 & 24-59 months of age	24-hour recall data
Zero vegetable or fruit consumption 6-23 months	Percentage of children (aged 6-23 months) who did not consume any vegetables or fruits during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 & 24-59 months of age	24-hour recall data
Other indicators				
Bottle feeding 0-23 months	Percentage of children (aged 0-23 months) who were fed from a bottle with a nipple during the previous day	Children 0-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	Diet questionnaire

[1]Taken from: Indicators for assessing infant and young child feeding practices: definitions and measurement methods. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2021. Licence: CC BYNC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo.

WHO/UNICEF Breastfeeding indicators

Two of the six WHO/UNICEF breastfeeding indicators were included in this report, these are ever breastfed and continued breastfeeding. The indicator ever breastfed relates to children born the last 24 months. Since the survey does not include children < 6 months of age, the results reported are not directly comparable to other surveys. The percentage of children breastfed the previous day broken down by age groups were 6-11 months (89%), 12-17 months (80%),18-23 months (32%), 24-59 months (5%).

Ever Breastfed

Breastfeeding is recommended for all infants worldwide, except in very few cases, for those with specific medical conditions (WHO/UNICEF 2021). In this survey, almost all (97 percent) children aged 6-23 months were reportedly ever breastfed (**Table 104**). Similar patterns were observed in urban and rural areas, and for boys and girls. But specifically, there is a significant difference ($p<0.05$) between boys and girls 6-23 months of age and a NS but marginal difference in the 18-23 months of age grouping. It appears that girls were more frequently "ever breastfed" as they grow older (no difference apparent during the 6-11 months period).

Table 104. Percentage of children aged 6-23 months who were ever breastfed

[1]	Children aged 6-11months		Children aged 12-17 months		Children aged 18-23months		Children aged 6-23 months	
	N	% [95% CI][2]	N	% [95% CI][2]	N	% [95% CI][2]	N	% [95% CI][2,3]
National	509	99.3 [98.6, 100.0]	604	97.6 [96.1, 99.2]	541	92.8 [89.2, 96.5]	1654	96.6 [95.4, 97.8]
Residence		(P=0.425)		(P=0.985)		(P=0.346)		(P=0.409)
Urban	234	99.6 [98.9, 100.0]	224	97.6 [95.5, 99.8]	224	90.4 [83.3, 97.4]	682	95.9 [93.8, 98.0]
Rural	275	99.1 [98.0, 100.0]	380	97.7 [95.7, 99.6]	317	94.2 [90.0, 98.5]	972	97.0 [95.4, 98.5]
Sex		(P=0.771)		(P=0.300)		(P=0.060)		(P=0.045)*
Male	235	99.4 [98.5, 100.0]	286	96.8 [94.5, 99.1]	257	89.0 [82.4, 95.5]	778	95.1 [92.8, 97.3]
Female	274	99.2 [98.2, 100.0]	318	98.4 [96.3, 100.0]	284	96.2 [92.6, 99.7]	876	97.9 [96.5, 99.3]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is percentage of children born in the last 24 months who were ever breastfed however theNFCMS includes infants aged 6-23 months.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001)

Continued Breast Feeding

The WHO Global Strategy for IYCF recommends that children continue to be breastfed for two years or beyond (WHO/UNICEF 2021). As shown in **Table 105**, 57 percent of children (aged 12-23 months) received continued breastfeeding. As expected, the practice of continued breastfeeding generally decreased with age, with 83 percent of children aged 12-15 months, 53 percent of children aged 16-19 months, and 25 percent of children aged 20-23 months still being breastfed. For children aged 12-15 and 16-19 months, similar patterns were observed in urban and rural areas. For children aged 12-23 months, 46 and 62 percent of children in urban and rural areas, respectively, were breastfed the previous day or night ($p<0.05$). Similar patterns were observed for boys and girls.

Table 105. Percentage of children aged 12-23 months with continued breastfeeding

N[1]	Children aged 12-15 months		Children aged 16-19 months		Children aged 20-23 months		Children aged 12-23 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]
National	434	82.9 [78.6, 87.2]	379	53.3 [46.6, 60.0]	341	25.3 [19.2, 31.4]	1154	56.7 [52.7,60.7]
Residence		(P=0.010)*		(P=0.109)		(P=0.037)*		(P=0.001)***
Urban	157	73.0 [64.2, 81.8]	157	45.1 [31.0, 59.2]	138	17.2 [8.6, 25.8]	452	45.5 [37.2,53.8]
Rural	277	86.7 [81.7, 91.7]	222	58.0 [50.6, 65.5]	203	29.7 [21.8, 37.6]	702	62.1 [57.7,66.5]
Sex		(P=0.661)		(P=0.088)		(P=0.330)		(P=0.141)
Male	205	83.8 [78.6, 89.0]	181	47.6 [38.4, 56.9]	162	21.7 [13.1, 30.3]	548	53.9 [48.1,59.7]
Female	229	82.1 [76.0, 88.2]	198	58.7 [50.2, 67.3]	179	28.4 [18.8, 38.0]	606	59.1[54.4,63.9]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is percentage of children (aged 12–23 months) who were fed breast milk during the previous day
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

WHO/UNICEF Complementary Feeding Indicators for Children

World Health Organization (WHO) defines complementary feeding as “a process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk” (ref: WHO material). This feeding starts and continues for a substantial part of the key window of opportunity (1st 1000 days) for preventing short and long-term consequences of malnutrition.

At six months, an infant’s nutrient requirements can no longer be met with breast milk alone which implies the need for foods that can adequately and appropriately “complement” breast milk. This transition, if not well implemented, can increase the risk of malnutrition in the child due to a lot of factors that are mainly caused by inadequate dietary intake or infections or a combination of both. Some instances of inadequate feeding may be explained by the low nutritional quality of the diet or insufficient portion size, or texture being served or low frequency of meals. In general, best practices of complementary feeding require that it should be timely (start from 6 months onward), adequate in amounts, frequency, diversity and consistency, prepared and served without risk of contamination, given in an appropriate texture for the age of the child while applying principles for psychosocial care for responsive feeding.

As referenced in **Table 103**, this report presents results on nine complementary feeding indicators from the suite of WHO/UNICEF indicators. The results are presented at national level with disaggregation among urban or rural dwellers and among boys and girls. Most of the indicators are recommended for children aged 6-23 months but, in this survey, where the target group were children aged 6 – 59 months, some results that pertain to intake of specific foods or food groups are presented for children aged 24 – 59 months which is to support growing interest in the feeding practices of not only infants but toddlers and pre-schoolers.

Introduction of Solid, Semi-Solid or Soft Foods (ISSSF)

This WHO/UNICEF indicator refers to the percentage of infants (aged 6-8 months) who consumed solid, semi-solid or soft foods during the previous day. Most of children aged 6-8 months (95 percent) consumed at least one solid, semi-solid or soft food the previous day (**Table 106**). This prevalence indicates that there is a generally a common practice of introducing complementary foods at 6 months especially for breast-fed children which is very important to the health and well-being of children, however this results do not explain if the foods were introduced too early since recommendations expect children below 6 months to be exclusively breastfed. These foods range from specific foods for infants and toddlers to family foods. The sample size requires that this finding should be interpreted with caution.

Table 106. Percentage of children aged 6-8 months who consumed solid, semi-solid or soft foods.

	Children aged 6-8 months	
	N[1]	% [95% CI][2,3]
National	227	95.0 [91.7, 98.2]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is percentage of infants (aged 6-8 months) who consumed solid, semi-solid or soft foods during the previous day.

Minimum Dietary Diversity (MDD)

Minimum Dietary Diversity is achieved when the 6-23 month old child has received any amount of at least 5 of 8 predefined food groups during the previous day. The eight food groups used for tabulation of this indicator are: 1. breast milk; 2. grains, roots, tubers and plantains; 3. pulses (beans, peas, lentils), nuts and seeds; 4. dairy products (milk, infant formula, yogurt, cheese); 5. flesh foods (meat, fish, poultry, organ meats); 6. eggs; 7. vitamin-A rich fruits and vegetables; and 8. other fruits and vegetables.

More than half (58 percent) of the children aged 6-23 months achieved minimum dietary diversity (**Table 107**). No differences were observed by sex or residence ($p>0.05$). The NS increase in proportion of children that achieved minimum dietary diversity from 50 percent in children aged 6-11 months to 68 percent in children aged 12-17 months can be explained by the increase in the consumption of pulses, fruits and vegetables (**Annex 13**). The NS decrease in proportion of children that achieved minimum dietary diversity from 68 percent in children aged 12-17 months to 53 percent in children aged 18-23 months can be explained by the decrease in the consumption of breastmilk and dairy products.

As explained earlier in the methodology section and sub-section 8.4, indicators like Minimum Dietary Diversity derived from a 24hr recall survey are not comparable with surveys that applied a list-based questionnaire format because of methodological differences in data collection.

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Table 107. Percentage of children aged 6-23 months who achieved minimum dietary diversity

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 Months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]
National	519	50.4 [44.6, 56.1]	602	67.9 [62.2, 73.6]	543	53.4 [47.5, 59.3]	1664	57.9 [54.7, 61.2]
Residence		(P= 0.961)		(P= 0.717)		(P= 0.342)		(P=0.692)
Urban	237	50.5 [43.3, 57.8]	226	69.2 [63.1, 75.3]	224	57.2 [47.8, 66.6]	687	58.8 [54.0, 63.6]
Rural	282	50.3 [42.0, 58.5]	376	67.3 [59.6, 75.1]	319	51.4 [43.8, 59.0]	977	57.5 [53.3, 61.7]
Sex		(P= 0.598)		(P= 0.086)		(P= 0.361)		(P= 0.975)
Male	239	48.7 [39.9, 57.6]	283	72.1 [65.1, 79.1]	260	50.4 [40.1, 60.6]	782	58.0 [52.9, 63.1]
Female	280	51.8 [44.4, 59.2]	319	64.2 [56.7, 71.6]	283	56.2 [49.5, 62.9]	882	57.9 [53.7, 62.0]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
3The WHO/UNICEF indicator is the percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Minimum Meal Frequency (MFF

Minimum Milk Feeds for non-breast fed children refers to the proportion of children who received at least 2 milk feeds during previous day if non-breastfed. Milk feeds include formula (e.g., infant formula, follow-on formula, “toddler milk”), animal milk other than human milk, (e.g., cow milk, goat milk, evaporated milk or reconstituted powdered milk), semi-solid and fluid/drinkable yogurt and other fluid/drinkable fermented products made with animal milk. The sample size for non-breastfed children across was 636, as such these findings should be interpreted with caution. Only a tenth of non-breastfed children (aged 6-23 months) received minimum milk feeds (**Table 109**). The proportion of children that received the minimum number of milk feeds was higher in urban areas when compared to rural areas ($P<0.001$). No differences were observed between boys and girls ($p>0.05$).

The proportion of children that received the minimum number of milk feeds was 9 percent, 17 percent and 8 percent for children aged 6-11, 12-17 and 18-23 months, respectively. The proportion of children that received the minimum number of milk feeds was higher in urban areas when compared to rural areas for children aged 12-17 and 12-23 months, but not for children aged 6-11 months. No differences were observed between boys and girls for all age groups ($p>0.05$).

Minimum milk feeding frequency for non-breastfed children (MMFF)

Minimum Milk Feeds for non-breast fed children refers to the proportion of children who received at least 2 milk feeds during previous day if non-breastfed. Milk feeds include formula (e.g., infant formula, follow-on formula, “toddler milk”), animal milk other than human milk, (e.g., cow milk, goat milk, evaporated milk or reconstituted powdered milk), semi-solid and fluid/drinkable yogurt and other fluid/drinkable fermented products made with animal milk. The sample size for non-breastfed children across was 636, as such these findings should be interpreted with caution. Only a tenth of non-breastfed children (aged 6-23 months) received minimum milk feeds (**Table 109**). The proportion of children that received the minimum number of milk feeds was higher in urban areas when compared to rural areas ($P<0.001$). No differences were observed between boys and girls ($p>0.05$)..

The proportion of children that received the minimum number of milk feeds was 9 percent, 17 percent and 8 percent for children aged 6-11, 12-17 and 18-23 months, respectively. The proportion of children that received the minimum number of milk feeds was higher in urban areas when compared to rural areas for children aged 12-17 and 12-23 months, but not for children aged 6-11 months. No differences were observed between boys and girls for all age groups ($p>0.05$).

Table 108. Percentage of children aged 6-23 months who achieved minimum meal frequency

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 Months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]
National	519	79.0 [73.3, 84.7]	602	82.0 [77.3, 86.6]	543	93.7 [91.4, 96.0]	1664	84.8 [82.3, 87.3]
Residence		(P=0.102)		(P=0.621)		(P<0.001)***		(P=0.940)
Urban	237	73.0 [63.2, 82.8]	226	83.7 [75.6, 91.7]	224	98.0 [96.4, 99.5]	687	84.6 [79.8, 89.4]
Rural	282	82.8 [76.9, 88.7]	376	81.2 [75.5, 86.9]	319	91.4 [88.0, 94.8]	977	84.9 [84.8, 87.8]
Sex		(P=0.061)		(P=0.926)		(P=0.002)**		(P=0.018)*
Male	239	83.1 [76.9, 89.4]	283	81.8 [75.5, 88.1]	260	97.4 [95.7, 99.1]	782	87.2 [84.5, 89.9]
Female	280	75.2 [67.6, 82.9]	319	82.1 [76.9, 87.3]	283	90.4 [86.3, 94.5]	882	82.6 [79.0, 86.2]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is the percentage of children (aged 6-23 months) who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more during the previous day.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Table 109. Percentage of non-breastfed children aged 6-23 months who consumed at least two milk feeds

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]
National	53	8.6 [2.1, 15.1]	175	17.0 [8.3, 25.8]	408	7.5 [4.8, 10.3]	636	10.0 [6.7, 13.2]
Residence		(P= 0.301)		(P< 0.001)***		(P<0.001)***		(P<0.001)***
Urban	21	15.5 [0.0, 31.3]	83	34.1 [18.2, 50.1]	183	14.2 [8.1, 20.2	287	19.6 [12.2, 27.0]
Rural	32	6.7 [0.0, 13.4]	92	4.5 [0.8, 8.3]	225	3.1 [0.4, 5.7]	349	3.9 [1.9, 5.9]
Sex		(P=0.217)		(P=0.169)		(P=0.553)		(P=0.843)
Male	28	5.1 [0.0, 11.9]	86	21.5 [9.9, 33.0]	201	6.7 [3.1, 10.2]	315	9.7 [5.46, 14.0]
Female	25	13.5 [1.6, 25.5]	89	13.4 [4.1, 22.7]	207	8.4 [3.9, 13.0]	321	10.2 [6.2, 14.2]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is the percentage of non-breastfed children who consumed at least two milk feeds during the previous day.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Minimum Acceptable Diet (MAD)

Minimum Acceptable Diet is a composite indicator that refers to the proportion of 6-23 month old children that received at least the minimum dietary diversity and minimum meal frequency for their age and at least two milk feeds (only for non-breastfed children) during the previous day. Less than half (41 percent) of the children aged 6-23 months achieved the minimum acceptable diet (**Table 110**). No differences were observed by sex or residence ($p>0.05$). The proportion of children with a minimum acceptable diet was 42 percent, 53 percent and 28 percent for children aged 6-11, 12-17 and 18-23 months, respectively. No differences were observed by sex or residence for all age groups ($p>0.05$).

Table 110. Percentage of children aged 6-23 months who consumed a minimum acceptable diet

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]
National	519	41.5 [36.3, 46.7]	602	53.0 [47.6, 58.5]	543	27.5 [22.2, 32.7]	1664	41.4 [38.1, 44.7]
Residence		(P= 0.810)		(P= 0.851)		(P= 0.557)		(P= 0.569)
Urban	237	42.3 [36.2, 48.3]	226	52.3 [44.8, 59.9]	224	25.5 [17.9, 33.1]	687	40.1 [34.9, 45.2]
Rural	282	41.1 [33.4, 48.7]	376	53.3 [46.2, 60.5]	319	28.6 [21.6, 35.5]	977	42.1 [37.7, 46.5]
Sex		(P= 0.790)		(P= 0.495)		(P= 0.406)		(P= 0.951)
Male	239	42.3 [33.8, 50.8]	283	54.9 [47.7, 62.1]	260	25.2 [17.7, 32.6]	782	41.5 [36.4, 46.7]
Female	280	40.8 [34.2, 47.5]	319	51.4 [43.9, 58.9]	283	29.6 [22.3, 36.9]	882	41.3 [36.8, 45.8]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is percentage of who achieved minimum dietary diversity and meal frequency.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Egg and/or flesh food consumption

The WHO rationale for this indicator is based on the feeding principle that “meat, poultry, fish or eggs should be eaten daily, or as often as possible” and is represented by the percentage of children 6–23 months of age who consumed egg and/or flesh food during the previous day.

One-third (35 percent) of children aged 6-23 months consumed egg and/or flesh foods the previous day (**Table 111**). The proportion of children aged 6-23 months who consumed egg and/or flesh foods was higher in urban areas when compared to rural areas ($p<0.001$). No differences were observed between boys and girls ($p>0.05$). The proportion of children who consumed egg and/or flesh foods was 28 percent, 33 percent and 44 percent for children aged 6-11, 12-17 and 18-23 months, respectively. The proportion of children who consumed egg and/or flesh was higher in urban areas for all age groups ($p<0.05$), except children aged 18-23 months. The proportion of children who consumed egg and/or flesh was similar for boys and girls, except for the 12-17 months age group ($p=0.028$). Almost half (49 percent) of children aged 24-59 months consumed egg and/or flesh foods the previous day.

Table 111. Percentage of children aged 6-23 months who consumed egg and/or flesh food

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months		Children aged 24-59 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]	N[1]	% [95% CI][2]
National	519	27.6 [23.0, 32.3]	602	32.7 [27.1, 38.3]	543	43.8 [37.5, 50.1]	1664	34.7 [31.3, 38.1]	3356	49.3 [45.5, 53.2]
Residence		(P= 0.002)**		(P= 0.005)**		(P= 0.062)		(P<0.001)***		(P<0.001)***
Urban	237	36.5 [30.3, 42.8]	226	45.1 [34.9, 55.3]	224	52.6 [41.0, 64.2]	687	44.6 [39.2, 49.9]	1385	65.5 [58.6, 72.4]
Rural	282	22.0 [15.8, 28.1]	376	27.4 [21.3, 33.6]	319	39.0 [30.7, 47.3]	977	29.5 [24.8, 34.2]	1971	40.9 [35.7, 46.0]
Sex		(P= 0.092)		(P= 0.028)*		(P= 0.621)		(P= 0.346)		(P= 0.903)
Male	239	23.3 [17.4, 29.1]	283	38.7 [30.9, 46.6]	260	45.2 [36.5, 53.8]	782	36.0 [31.4, 40.7]	1722	49.5 [44.9, 54.1]
Female	280	31.6 [24.3, 38.9]	319	27.5 [20.3, 34.7]	283	42.6 [34.9, 50.2]	882	33.5 [29.4, 37.5]	1634	49.2 [44.5, 53.8]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] The WHO/UNICEF indicator is the Percentage of children (aged 6-23 months) who consumed egg and/or flesh food during the previous day
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Sweet beverage consumption

Recommendations require that feeding children with sweetened beverages should be avoided since they usually contribute more of dietary energy (increasing risk of obesity) and may displace foods that could contribute the needed nutrients for growth and development. In addition, consumption of sweet items early in life can contribute to the establishment of taste preferences that last further into childhood and may contribute to overnutrition and dietary related non-communicable diseases later in life. In addition, consumption of sweet items early in life can contribute to the establishment of taste preferences that last further into childhood and may contribute to overnutrition and dietary related non-communicable diseases later in life. The indicator represents the percentage of children who consumed a sweet beverage the previous day.

One-fourth (24 percent) of children aged 6-23 months consumed sweet beverages the previous day (**Table 112**). The proportion of children aged 6-23 months consuming sweet beverages was higher in urban area (33 percent) than in the rural areas (20 percent) and higher among girls (27 percent) compared to boys (21 percent) ($p<0.05$). The proportion of children who consumed sweet beverages was 18 percent, 24 percent and 31 percent for children aged 6-11, 12-17 and 18-23 months, respectively. One-fourth (24 percent) of children aged 24-59 months consumed sweet beverages the previous day.

Table 112. Percentage of children aged 6-23 months who consumed a sweet beverage

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months		Children aged 24-59 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]	N[1]	% [95% CI][2]
National	519	18.4 [12.7, 24.1]	602	23.6 [18.8, 28.4]	543	31.0 [25.1, 37.0]	1664	24.4 [21.1, 27.7]	3356	24.2 [21.3, 27.0]
Residence		(P= 0.628)		(P< 0.001)***		(P= 0.008)**		(P= 0.001)***		(P<0.001)***
Urban	237	20.0 [13.0, 27.1]	226	36.4 [29.6, 43.3]	224	42.9 [31.0, 54.9]	687	32.9 [26.6, 39.1]	1385	38.7 [34.0, 43.4]
Rural	282	17.4 [9.2, 25.6]	376	18.1 [12.2, 24.1]	319	24.5 [17.5, 31.5]	977	19.9 [16.0, 23.9]	1971	16.6 [13.4, 19.8]
Sex		(P= 0.004)**		(P= 0.443)		(P= 0.952)		(P= 0.019)*		(P= 0.457)
Male	239	10.5 [6.5, 14.5]	283	21.8 [15.8, 27.8]	260	31.1 [23.9, 38.4]	782	21.3 [18.0, 24.7]	1722	23.5 [20.3, 26.8]
Female	280	25.5 [16.0, 35.0]	319	25.2 [18.3, 32.1]	283	30.9 [23.8, 38.0]	882	27.1 [22.5, 31.7]	1634	24.8 [21.4, 28.3]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is the percentage of children (aged 6-23 months) who consumed a sweet beverage during the previous day. Sweet beverages include soft drinks, energy drinks, cocoa beverages, etc.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Unhealthy food consumption

The WHO/UNICEF indicator refers to the percentage of children (aged 6-23 months) who consumed selected sentinel unhealthy foods during the previous day. Unhealthy foods included ultra-processed cereals, noodles, biscuits, cakes, fried starchy foods, pastries, sweets and chocolates. Just over half of the children (55 percent) aged 6-23 month consumed unhealthy foods the previous day (**Table 113**). The proportion of children aged 6-23 months who consumed unhealthy foods was higher in urban areas (70 percent) when compared to rural areas (47 percent) ($p<0.001$). No differences were observed between boys and girls ($p>0.05$). The proportion of children who consumed unhealthy foods was 49 percent, 53 percent and 63 percent for children aged 6-11, 12-17 and 18-23 months, respectively. The percentage of children consuming unhealthy foods was Higher percentages of intake of unhealthy food of urban children consumed unhealthy foods and ranged from 63 percent to 79 percent compared to rural dwellers with a range from 40 percent to 54 percent for all age groups ($p<0.001$). Almost two-thirds of (59 percent) aged 24- 59 month consumed unhealthy foods the previous day.

Table 113. Percentage of children aged 6-23 months who consumed foods classified as unhealthy

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months		Children aged 24-59 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]	N[1]	% [95% CI][2]
National	519	**49.1** [42.3, 55.9]	602	**53.0** [47.5, 58.5	543	**62.6** [56.9, 68.3]	1664	**54.9** [51.0, 58.8]	3356	**58.7** [54.7, 62.8]
Residence		(P< 0.001)***		(P< 0.001)***		(P< 0.001)***		(P< 0.001)***		(P< 0.001)***
Urban	237	**63.3** [54.1, 72.4]	226	**69.2** [62.1, 76.4]	224	**78.5** [71.7, 85.2]	687	**70.2** [65.3, 75.0]	1385	**78.6** [74.4, 82.9]
Rural	282	**40.0** [31.6, 48.4]	376	**46.1** [39.1, 53.1]	319	**54.0** [46.3, 61.6]	977	**46.8** [42.0, 51.7]	1971	**48.3** [43.3, 53.3]
Sex		(P= 0.837)		(P= 0.499)		(P= 0.211)		(P= 0.255)		(P= 0.520)
Male	239	**49.7** [40.6, 58.8]	283	**55.2** [46.8, 63.5]	260	**65.4** [58.2, 72.5]	782	**56.8** [51.8, 61.7]	1722	**59.5** [54.5, 64.6]
Female	280	**48.5** [39.8, 57.3]	319	**51.1** [43.3, 59.0]	283	**60.1** [53.2, 67.0]	882	**53.2** [48.1, 58.2]	1634	**57.8** [53.4, 62.3]

[1] Number of respondents
[2] Sample weights are applied to account for survey design and non-response.
[3] The WHO/UNICEF indicator is the percentage of children (aged 6-23 months) who consumed selected sentinel unhealthy foods during the previous day. Unhealthy foods included ultra-processed cereals, noodles, biscuits, cakes, fried starchy foods, etc.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).

Zero vegetable or fruit consumption

The WHO/UNICEF indicator is the percentage of children (aged 6-23 months) who did not consume any vegetables or fruits during the previous day. One in six children (17 percent) aged 6-23 months consumed no fruits or vegetables the previous day (**Table 114**). No differences were observed by sex or residence ($p>0.05$). The proportion of children who consumed no fruits or vegetables was 34 percent, 12 percent and 5 percent for children aged 6-11, 12-17 and 18-23 months, respectively. Similar patterns were observed in urban and rural areas and between boys and girls for all age groups. Very few children (2 percent) aged 24-59 months did not consumed any fruits and vegetables.

Table 114. Percentage of children aged 6-23 months who did not consume any vegetables or fruits

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months		Children aged 24-59 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]	N[1]	% [95% CI][2]
National	519	34.4 [29.4, 39.3]	602	11.8 [8.6, 14.9]	543	5.3 [3.1, 7.5]	1664	16.6 [14.6, 18.6]	3356	2.0 [1.3, 2.7]
Residence		(P= 0.638)		(P= 0.218)		(P= 0.189)		(P= 0.040)*		(P= 0.329)
Urban	237	35.7 [30.0, 41.5]	226	14.7 [9.4, 20.0]	224	7.2 [3.8, 10.7]	687	19.6 [16.2, 23.0]	1385	2.5 [1.2, 3.8]
Rural	282	33.5 [26.2, 40.8]	376	10.5 [6.6, 14.4]	319	4.3 [1.6, 7.0]	977	15.1 [12.6, 17.6]	1971	1.7 [0.9, 2.5]
Sex		(P= 0.680)		(P= 0.927)		(P= 0.754)		(P= 0.885)		(P= 0.630)
Male	239	35.6 [27.8, 43.4]	283	11.6 [6.7, 16.5]	260	4.9 [1.8, 8.1]	782	16.8 [13.6, 20.0]	1722	1.8 [0.9, 2.6]
Female	280	33.3 [26.3, 40.3]	319	11.9 [7.0, 16.8]	283	5.7 [2.4, 8.9]	882	16.5 [13.5, 19.4]	1634	2.2 [1.1, 3.2]

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]The WHO/UNICEF indicator is the percentage of children (aged 6-23 months) who did not consume any vegetables or fruits during the previous day
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001)

Other WHO/UNICEF Indicators for Children

Bottle Feeding

Bottle feeding is defined as the percentage of children 0–23 months of age who were fed from a bottle with a nipple during the previous day. The WHO guiding principles recommend avoiding the use of feeding bottles because they are difficult to keep clean and represent a particularly important route for the transmission of pathogens. In addition, bottle feeding may interfere with optimal suckling, as such cup feeding is preferable (WHO/UNICEF 2021).

One-fifth of children (20 percent) aged 6-23 months used a feeding bottle with a nipple the previous day (**Table 115**). No differences were observed by sex or residence ($p>0.05$).

The proportion of children used a feeding bottle with a nipple was 29 percent, 18 percent and 15 percent for children aged 6-11, 12-17 and 18-23 months, respectively. No difference was found in the use of feeding bottle with a nipple between rural and urban residence or between girls and boys for all age groups.

Table 115. Percentage of children 6–23 months of age who were fed from a bottle with a nipple

	Children aged 6-11 months		Children aged 12-17 months		Children aged 18-23 months		Children aged 6-23 months	
	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2]	N[1]	% [95% CI][2,3]
National	508	28.5 [23.6, 33.4]	601	18.3 [13.4, 23.2]	541	14.5 [10.6,18.5]	1650	20.1 [17.2,23.0]
Residence		(P= 0.184)		(P= 0.928)		(P= 0.258)		(P= 0.648)
Urban	234	32.4 [25.2, 39.5]	224	18.6 [11.7, 25.5]	224	11.8 [6.4, 17.2]	682	21.0 [16.3, 25.8]
Rural	274	25.8 [19.4, 32.3]	377	18.2 [11.8, 24.6]	317	16.1 [10.8,21.4]	968	19.6 [16.1, 23.3]
Sex		(P= 0.368)		(P= 0.675)		(P= 0.978)		(P= 0.719)
Male	234	25.7 [18.5, 32.9]	286	19.1 [12.7, 25.5]	257	14.4 [8.4, 20.5]	777	19.6 [15.8, 23.4]
Female	274	30.9 [23.2, 38.6]	315	17.6 [11.8, 23.3]	284	14.6 [8.8, 20.4]	873	20.6 [16.4, 24.8]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3The WHO/UNICEF indicator is the percentage of children (aged 0-23 months) who were fed from a bottle with a nipple during the previous day. The NFCMS only included infants aged 6-23 months, therefore this indicator is not directly comparable to other surveys.
Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001)

Nutrient Density of the Complementary Diet of Children Aged 6-23 Months

Box 6. Key Findings on the Nutrient Density of the Complementary Diet of Children Aged 6-23 Months.

Usual energy intake and nutrient density of the complementary diet in children aged 6-23 months: The mean usual energy intake of children aged 6-8 months from the complementary diet was 333 kcal. The usual energy intakes of children aged 12-23 months was adequate (776 kcal) when compared with recommended intakes for this age group.

Usual protein intake and nutrient density of the complementary diet in children aged 6-23 months: The protein density was 2.7g/100kcal. The mean protein density of the complementary diet of the children aged 6-23 months was also above the respective desired nutrient densities for each age classification.

Nutrient densities of minerals and vitamins: The mean densities of calcium, Iron and zinc, Vitamin B1, B2 and C in the complementary diet of children aged 6-8 months had mean densities that were below the recommended Desired Nutrient Densities.

Nutrient densities of minerals and vitamins by age group: Children aged 12 –23 months had inadequate densities for calcium and vitamin B9.

Nutrient density of the complementary diet of children aged 6-23 months.
Considering the growth requirement in the first 1000 days of life and the limited gastric capacity of young children, it is important that the diets of infants and young children have substantially high nutrient density to support optimum growth and development. This section presents results on the nutrient density of the complementary diet in children aged 6 -23 months. For this age group, it was not possible to assess intakes of the overall diet because breastmilk intakes were not measured in this survey.

The nutrient density of the complementary diet was computed as the quantity of nutrients per 100 kcal of complementary foods (as reported in the 24-hour dietary recall) and compared against Desired Nutrient Densities (DND) published by Dewey & Brown (2003). The DNDs represent the nutrient density values that would achieve the nutrient requirements after accounting for the daily nutrients delivery from breastmilk. The comparison of the usual nutrient density intakes to the Desired Nutrient Density provides a crude assessment of adequacy of the diet. Dietary intakes and requirements change rapidly during the first two years of life, as such data are presented separately for children aged 6-8, 9-11 and 12-23 months.

Usual energy intake and nutrient density of the complementary diet in infants aged 6-23 months

As shown in (**Tables 116-118**), the mean usual energy intake from complementary diet of children aged 6-8 months was 333 kcal and protein density was 2.7g/100kcal. For children aged 9-11 months and 12 –23 months, their respective intakes were 465 kcal and 2.51g/100 kcal, 776 kcal and 2.40 g/100 kcal respectively. These usual energy intakes of children aged 6-23 months are higher when compared with recommended intakes for this age group which assumes that average daily energy intake should be at least 200 kcal, 300 kcal and 550 kcal for children aged 6-8 months, 9-11 months and 12-23 months respectively (Dewey 2013).

The usual intake distribution of protein densities of the complementary diet of the children aged 6-23 months as presented in this survey were well above the respective Desired Nutrient Densities (DND) for each age classification (T**able 116-118**), which suggests that all or most of the children had complementary diets that achieved the desired density. However, this assertion may not be definite and applicable to adequacy and quality since the composition of essential amino acids in the complementary diet of the children was not evaluated here to ascertain limitations. From the previous results of **Table 51 and 52** (higher contributions of plant than animal protein for older children), there seems to be indications of an overall dependence on plant protein sources which are naturally limiting in essential amino acids and bioavailability. The limitation above is limited to non-breastfed children and may not be applicable to breastfed children who have the benefit of receiving breast milk.

The mean densities of calcium, iron and zinc, Vitamin B1, B2 and C in the complementary diet of children aged 6-8 months had mean densities that were below the recommended Desired Nutrient Densities (**Tables 116**). This was similar for children aged 9-11 months (**Table 117**). Among children aged 12 –23 months, mineral densities were 28, 1.0 and 0.4 mg/100 kcal for calcium, iron and zinc respectively, which were generally lower when compared with the DND values (**Tables 118**). Distinct differences were observed between urban and rural dwellers especially for calcium intake where urban dwellers had a higher intake. Iron intake was an exception in which rural dwellers had a higher intake than their urban counterparts. When densities of Vitamin B1, B2 and C were compared to the DND values, only vitamin C had a higher value and while there were no clear differences across the sex of the child and residence, girls and urban dwellers had slightly higher nutrient densities for vitamin B2 and vitamin C in their complementary diet (**Table 119-121**). The nutrient density of vitamin A and vitamin B9-folate of the complementary diet of infants aged 12-23 months were 43.6 and 10.0 mcg/100 kcal which when compared to the DND value, only Vitamin A had a higher value.

Most of the mean micronutrient densities reported are below the DND. Apart from Vitamin A for all children, Vitamin B9 for children 9-11 months and Vitamin C for children aged 12-23 months, other mean nutrient densities were either slightly lower or hugely distant from their respective DND (**Table 117 and 118**). These results raise the need to discuss the concept of “problem nutrients”. According to WHO, a “problem nutrient” is that nutrient for which there is the greatest discrepancy between its content in complementary foods and the estimated amount required by the child. These nutrients are usually identified by a comparison of the estimates of DND (recommended amount of nutrient per 100 kcal) with the actual densities of the nutrients in the foods consumed by breastfed children in various populations. Globally, when results from developing countries are compared, protein density is generally adequate, but several micronutrients are usually “problem nutrients” (ref: Dewey 2013). In this report, the results presented show that iron, zinc and Vitamin C could be considered “problem nutrients” for children aged 6-8 months while other nutrients, even though lower than DND, may not be severely low for most children. Among children aged 9-11 months, a similar observation is seen but the low densities could be considered as less severe since the consumption versus requirements gap is smaller compared to younger children. Children aged 12 –23 months had low densities for Calcium and Vitamin B9-Folate which suggests that these two nutrients are “problem nutrients” for these group.

Table 116. Usual energy intake and nutrient density of the complementary diet in infants aged 6-8 months

Nutrient	Desired Nutrient Density per 100 kcal	Mean [95%CI]²	Median [25-75th]
Energy (kcal)	-	333 [280, 386]	280 [165, 445]
Protein density	1.0	2.7 [2.5, 2.9]	2.7 [2.3, 3.0]
Calcium (mg)	40	35 [30, 40]	31 [21, 45]
IIron (mg)	5.3	1.3 [1.1, 1.5]	1.2 [0.8, 1.6]
Zinc (mg)	1.1	0.5 [0.4, 0.5]	0.5 [0.4, 0.6]
Vitamin A (mcg	82	44 [38, 50]	39 [26, 56]
Vitamin B1-Thiamine (mg)	0.08	0.06 [-0.4, 0.55]	0.06 [0.04, 0.07]
Vitamin B2-Riboflavin (mg)	0.08	0.06 [0.04, 0.08]	0.05 [0.04, 0.08]
Vitamin B9-Folate (mcg)	11	11 [10, 12]	11 [9, 12]
Vitamin C (mg)	11	3 [2, 3]	3[2, 4]

1Number of respondents (N=227)
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, DND=Desired Nutrient Density

Table 117. Usual energy intake and nutrient density of the complementary diet in infants aged 9-11 months (N=292)

Nutrient	Desired Nutrient Density per 100 kcal	Mean [95%CI]²	Median [25-75th]
Energy (kcal)	-	465 [410, 519]	406 [253, 612]
Protein density	1.0	2.5 [2.38, 2.64]	2.5 [2.23, 2.80]
Calcium (mg)	32	30 [26,34]	26 [18, 38]
Iron (mg)	3.5	1.0 [0.9, 1.1]	0.9 [0.7, 1.3]
Zinc (mg)	0.7	0.4 [0.4, 0.5]	0.4 [0.4, 0.5]
Vitamin A (mcg)	63	37.9 [32.4, 43.4]	33.8 [23.0, 48.1]
Vitamin B1-Thiamine (mg)	0.06	0.05 [0.04, 0.06]	0.05 [0.04, 0.06]
Vitamin B2-Riboflavin (mg)	0.06	0.05 [0.04, 0.06]	0.05 [0.03, 0.07]
Vitamin B9-Folate (mcg)	9	9 [8, 11]	9 [8, 11]
Vitamin C (mg)	8	3 [2, 3]	3 [2, 3]

¹Number of respondents (N=292)
²Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, DND=Desired Nutrient Density

Table 118. Usual energy intake and protein density of the complementary diet in aged 12-23 months

Nutrient	N¹	DND	Mean [95%CI]²	Median [25-75th]
Energy (kcal)		-		
National	1145	-	776 [722, 830]	702 [469, 1001]
Residence				
Urban	450	-	817 [751, 883]	760 [537, 1034]
Rural	695	-	755 [679, 831]	676 [458, 967]
Sex				
Male	543	-	837 [770, 904]	772 [537, 1063]
Female	602	-	717 [657, 777]	647 [438, 919]
Protein density (g/100 kcal)				
National	1145	0.9	2.4 [2.3, 2.5]	2.4 [2.2, 2.6]
Residence				
Urban	450		2.6 [2.4, 2.7]	2.5 [2.3, 2.8]
Rural	695		2.3 [2.2, 2.4]	2.3 [2.1, 2.6]
Sex				
Male	543		2.4 [2.3, 2.5]	2.4 [2.2, 2.7]
Female	602		2.4 [2.3, 2.5]	2.4 [2.2, 2.6]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, DND=Desired Nutrient Density

Table 119. Nutrient density of minerals (calcium, iron, and zinc) of the complementary diet in aged 12-23 months

Nutrient (mg/100kcal)	N[1]	DND	Mean [95%CI][2]	Median [25-75th]
Calcium				
National	1145	63	28 [26, 30]	26 [18, 36]
Residence				
Urban	450		34 [31, 37]	31 [22, 42]
Rural	695		25 [27, 27]	23 [17, 30]
Sex				
Male	543		27 [25, 29]	26 [19, 34]
Female	602		27 [24, 31]	25 [18, 34]
Iron				
National	1145	1.2	1.0 [0.9, 1.1]	1.0 [0.7, 1.2]
Residence				
Urban	450		0.9 [0.86, 0.98]	0.9 [0.66 1.1]
Rural	695		1.0 [0.94, 1.12]	1.0 [0.8 1.2]
Sex				
Male	543		1.0 [0.9, 1.0]	0.9 [0.7, 1.2]
Female	602		1.0 [0.9, 1.1]	0.97 [0.8, 1.2]
Zinc				
National	1145	0.4	0.4 [0.4, 0.4]	0.4 [0.3, 0.5]
Residence				
Urban	450		0.5 [0.4, 0.5]	0.4 [0.4, 0.6]
Rural	695		0.4 [0.4, 0.4]	0.4 [0.3, 0.5]
Sex				
Male	543		0.4 [0.4, 0.5]	0.4 [0.4, 0.5]
Female	602		0.4 [0.4, 0.4]	0.4 [0.3, 0.5}

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, DND=Desired Nutrient Density

Table 120. Nutrient density of Vitamins B1, B2, and C of the complementary diet in aged 12-23 months

Nutrient (mg/100kcal)	N[1]	DND	Mean [95%CI][2]	Median [25-75th]
Vitamin B1-Thiamine				
National	1145	0.07	0.05 [0.05, 0.05]	0.05 [0.04, 0.06]
Residence				
Urban	450		0.05 [0.05, 0.06]	0.05 [0.04, 0.06]
Rural	695		0.05 [0.04, 0.05]	0.04 [0.04, 0.05]
Sex				
Male	543		0.05 [0.05, 0.05]	0.05 [0.04, 0.06]
Female	602		0.05 [0.05, 0.05]	0.05 [0.04, 0.06]
Vitamin B2-Riboflavin				
National	1145	0.06	0.04 [0.04, 0.05]	0.04 [0.03, 0.06]
Residence				
Urban	450		0.06 [0.05, 0.06]	0.05 [0.03, 0.07]
Rural	695		0.04 [0.03, 0.05]	0.03 [0.02, 0.05]
Sex				
Male	543		0.04 [0.04, 0.04]	0.04 [0.02, 0.05]
Female	602		0.05 [0.04, 0.06]	0.04 [0.03, 0.06]
Vitamin C				
National	1145	0	3.08 [2.83, 3.32]	2.92 [2.20, 3.77]
Residence				
Urban	450		3.42 [3.02, 3.82]	3.21 [2.37, 4.21]
Rural	695		2.93 [2.58, 3.27}	2.81 [2.21, 3.52]
Sex				
Male	543		2.83 [2.59, 3.07}	2.69 [1.92, 3.58]
Female	602		3.35 [2.89, 3.80]	3.20 [2.54, 3.96]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, DND=Desired Nutrient Density

Table 121. Nutrient density of Vitamins A and B9 of the complementary diet in infants aged 12-23 months

Nutrient (mcg/100kcal)	N[1]	DND	Mean [95%CI][2]	Median [25-75th]
Vitamin A				
National	1145	5	43.6 [40.3, 46.9]	40.5 [29.0, 54.7]
Residence				
Urban	450		47.1 [42.2, 52.0]	43.7 [31.4, 58.7]
Rural	695		41.0 [36.3, 45.7]	37.9 [27.5, 50.8]
Sex				
Male	543		40.6 [35.9, 45.3]	37.5 [26.8, 50.8]
Female	602		45.3 [39.5, 51.2]	42.0 [30.1, 56.7]
Vitamin B9-Folate				
National	1145	19	10.0 [9.6, 10.5]	9.9 [8.5, 11.4]
Residence				
Urban	450		10.2 [9.6, 10.9]	10.1 [8.7, 11.7]
Rural	695		9.7 [9.1, 10.4]	9.6 [8.7, 10.6]
Sex				
Male	543		10.1 [9.3, 10.9]	10.0 [8.6, 11.5]
Female	602		9.6 [9.1, 10.2]	9.6 [8.7, 10.4]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, DND=Desired Nutrient Density

Biofortification and Food Fortification coverage

The NFCMS was designed to assess coverage and usual intakes of selected biofortified foods for WRA and children 6-59 months of age. The diet questionnaire was used to assess coverage and frequency of consumption in the last 30 days while the 24hr recall questionnaire was used to assess the consumption among respondents. The results presented in this section are in two categories. First, the results on coverage with provitamin A biofortified staple crops (yellow cassava, orange-fleshed sweet potato, and orange maize) are presented. Coverage is defined as the proportion of respondents (non-pregnant women) whose households use and consumed the food vehicle as regularly as possible in the last 30 days. Frequency in this survey is defined as the proportion of respondents who consumed such products at least once a day in the last 30 days. Secondly, results on estimated mean intakes of these biofortified crops over the previous 24-hours are also presented. Information on coverage and frequency were collected from women of reproductive age and intake was collected from both women of reproductive age and children 6-59 months.

The findings in this report provide information on fortification coverage of seven potentially fortifiable food vehicles, namely vegetable oil, wheat flour, maize flour, semolina flour, sugar, salt, and bouillon. Respondents were asked if their households use any of the food vehicles to prepare food at home. The usual utilization of these vehicles (in raw weight) is also presented in this section based on the 24-hour recall data.

Biofortification Coverage

Box 7. Key Findings on Biofortification Coverage

Consumption of biofortified crops: In the previous 30 days, 3, 5, and 14 percent of the respondents consumed yellow cassava, orange-fleshed sweet potato, and orange maize, respectively, with significant geographical variation. The consumption of biofortified foods were notably highest in the North East compared to other zones. About 5% consumed at least more than one biofortified food in the previous 30 days with the highest proportion coming from the North East.

Consumption of yellow cassava: Consumption was 1 percent in the North West and 8 percent in the North East. No differences were observed by residence (i.e., urban vs rural) and wealth quintile.

Consumption of orange-fleshed sweet potato: Consumption was 17 percent in the North East and 2 percent in all other zones. No differences were observed by residence and wealth quintile.

Consumption of orange maize: Consumption of orange maize was 38 percent in the North East and between 4 and 14 percent in all other zones. No differences were observed by residence and wealth quintile.

Frequency of consuming biofortified crops: Among the non-pregnant women who reported having consumed biofortified crops, the vast majority reported consuming it on 1 to 9 days in the past 30 days (77, 84, and 56 percent for yellow cassava, orange-fleshed sweet potato, and orange maize, respectively), whereas few consumed it daily (2, 0, and 16 percent for yellow cassava, orange-fleshed sweet potato, and orange maize, respectively).

Biofortification

Biofortification is a process of breeding staple crops to have higher levels of essential nutrients either through selective conventional breeding, agronomic practices (e.g. fertilizers), or genetic bioengineering. Biofortification of staple crops represents a major strategy to tackle micronutrient deficiency and enhance the availability of micronutrients among people with poor diets (Meenakshi et al., 2019). The focus of biofortification research is vitamin A, iron, and zinc deficiencies, which are of public health significance. In Nigeria, the staple crops of focus are cassava, maize, and sweet potato biofortified with pro-vitamin A, as well as millet and sorghum with iron and zinc through selective conventional breeding. Breeding efforts started in early 2000s but official take-off of the biofortification initiative started in 2010 and culminated in the first varietal releases in 2011, 2012 and 2013 for cassava, sweet potato and maize respectively. To date, more varieties have been released for cassava (6), sweet potato (3) and maize (10) respectively across the country. This survey looks at Nigerian staple crops with a visible colour trait that are biofortified with vitamin A, (yellow cassava, orange-fleshed sweet potato, and orange maize). As shown in Figure 9, few respondents reported having consumed biofortified crops, or any products made from them in the past 30 days.

Only 3, 5, and 14 percent of the respondents (non-pregnant women) consumed yellow cassava, orange-fleshed sweet potato, and orange maize, respectively. The consumption of biofortified foods were notably highest in the North east of the country compared to other zones (**Figure 10, 12 and 14**). About 5% consumed at least more than one biofortified food in the previous 30 days with the highest proportion coming from the North East.

The higher consumption of orange maize could be explained by better consumer acceptance because of the similarity to the conventional non-biofortified maize that consumers are familiar with. This is unlike cassava and sweet potato, with completely different colour traits between biofortified and non-biofortified (white) varieties. Differences may also relate to differences in the availability of the biofortified varieties. Efforts need to be made on the drivers of adoption of these crops, since there is still an existing opportunity to address deficiency especially in areas where non-biofortified (white) varieties are still staple.

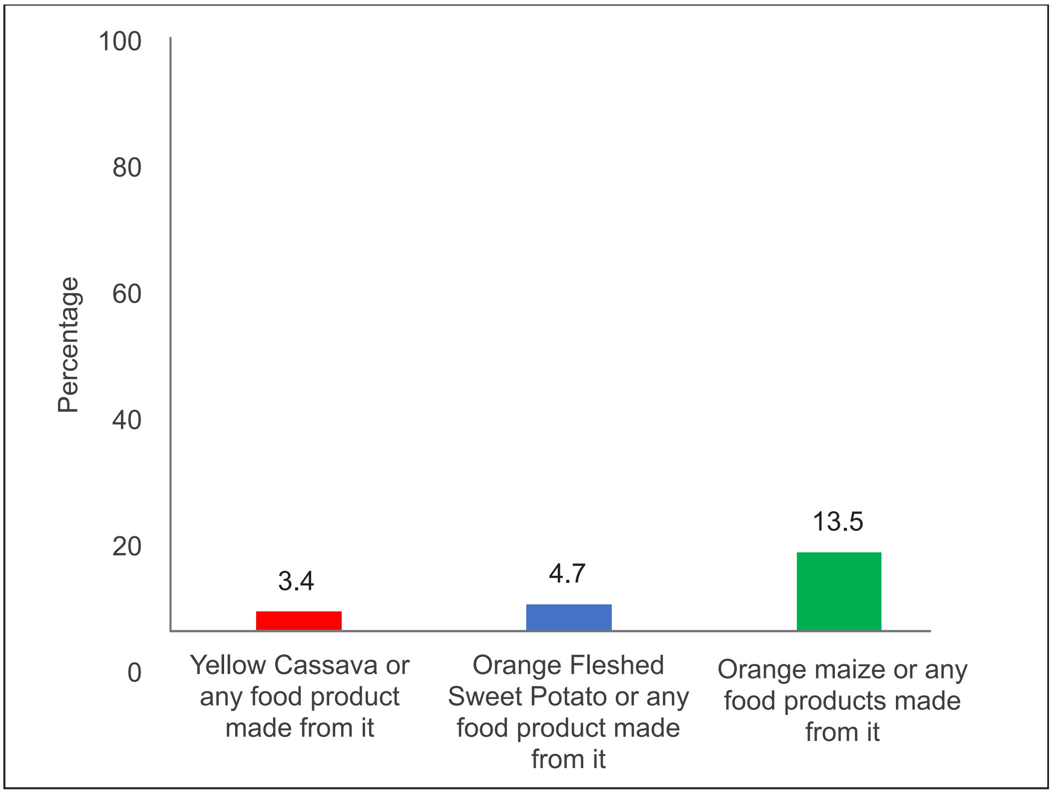


Figure 9. Percentage of respondents that consumed selected biofortified foods the previous 30 days
Among non-pregnant women (aged 15-49 years) (unweighted sample size responding was 5273 for yellow cassava, 5275 for orange-fleshed sweet potato, and 5264 for orange maize).
Data are weighted to account for survey design and non-response.
Differences across groups were not tested statistically.

Biofortified yellow cassava

As shown in **Figure 10** only three percent of the respondents (non-pregnant women) consumed yellow cassava (or any food products made from it) in the past 30 days. Although consumption of yellow cassava was found to be low across the country, significant differences were observed by zones (p<0.05). Only one percent of the respondents in North West and eight percent in North East reported having consumed yellow cassava.

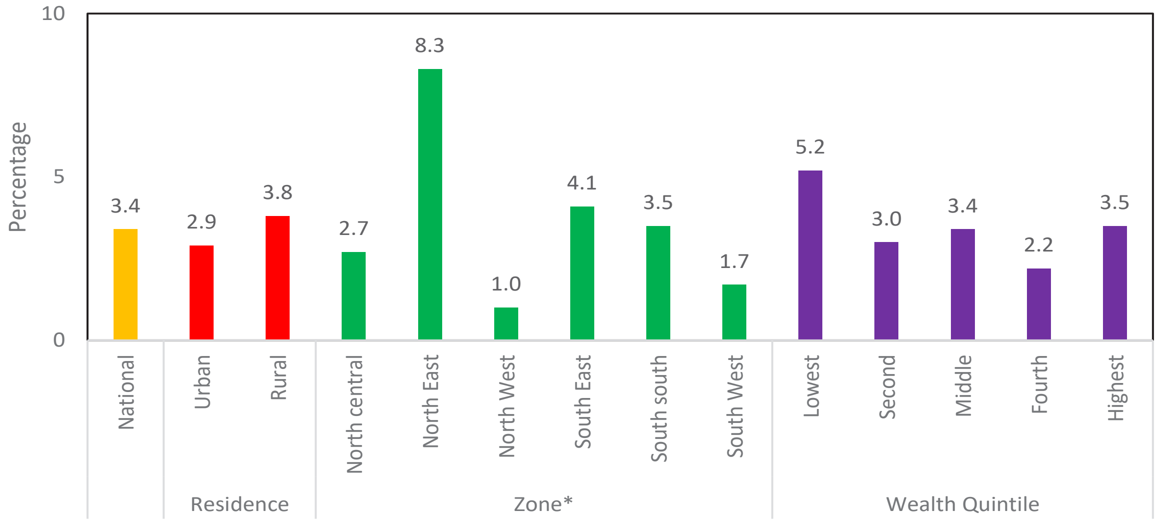


Figure 10. Percentage of respondents that consumed yellow cassava (or any food products made from it) the previous 30 days at national level and by residence, zone, and wealth quintile
Among non-pregnant women (15-49 years) (unweighted sample size = 5273 respondents)
Data for wealth quintile missing for 22 WRA because HH data was not collected.
Data are weighted to account for survey design and non-response.
*Signifies variable differs across groups (p<0.05) using Chi-square test.

Among the respondents (non-pregnant women) who reported having consumed yellow cassava, the vast majority (77 percent) reported consuming it for one to nine days in the past 30 days, whereas about two percent consumed it daily (**Figure 11**). As a result of the current low frequency of consumption, the impact of biofortified yellow cassava consumption on micronutrient deficiency in Nigeria is likely to be limited. However increased crop dissemination and adoption efforts in white cassava consuming areas that have low dietary vitamin-A intakes are warranted to enhance the impact of yellow cassava on Vitamin A deficiency prevention. A focus could also be the affordability of these products which could be a driver of uptake.

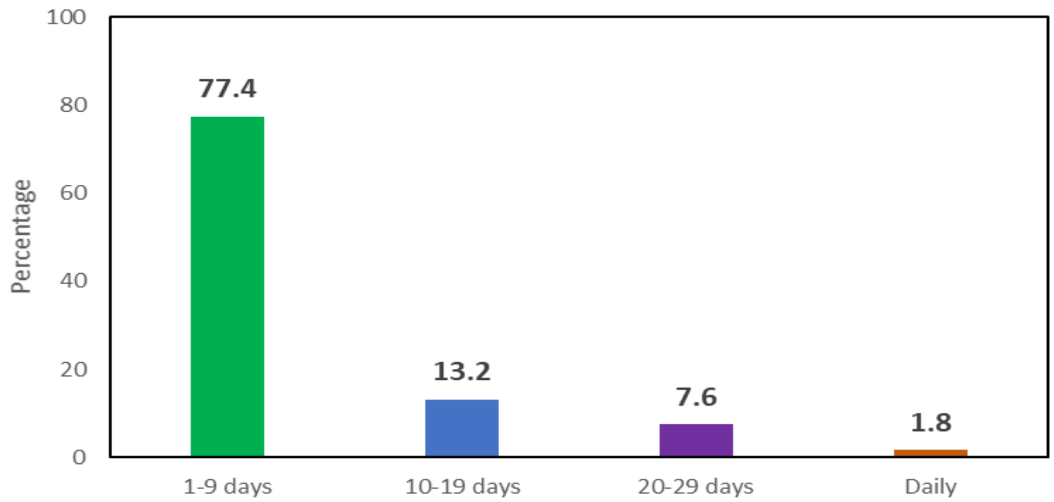


Figure 11. Frequency of consumption of yellow cassava (or any food products made from it) in the previous 30 days among consumers
Among non-pregnant women aged 15-49 years who consumed yellow cassava (or any food products made from it) in the previous 30 days (unweighted sample size for women = 188)
Data are weighted to account for survey design and non-response.

Mean intakes of biofortified cassava

As shown in **Tables 122 and 123**, the estimated daily mean intake of yellow cassava by non-pregnant women and children was 1.36 grams and 0.39 grams, respectively. Women residing in the southern zones had higher mean intakes with those in the South South zone having a mean intake of 6.3 grams. Consumption by women ranged from zero grams in the lowest quintile and 2.7 grams among those in the highest quintiles..

Table 122. Mean daily intake of biofortified yellow cassava (raw weight, grams) of women

		Yellow Cassava (grams)	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	1.36 [0.72, 2.00]	0.32
NPNL[3]	4544	1.20 [0.53, 1.88]	0.35
Lactating women[4]	697	2.32 [0.24, 4.40]	1.06
Pregnant women	999	1.25 [-0.20, 2.70]	0.74
Residence			
Non-pregnant women			
Urban	2114	1.31 [0.33, 2.28]	0.49
Rural	3127	1.40 [0.54, 2.27]	0.44
Pregnant women			
Urban	402	3.12 [-0.93, 7.16]	2.06
Rural	597	0.25 [-0.25, 0.76]	0.26
Zone			
Non-pregnant women			
North Central	800	0.40 [-0.20, 1.00]	0.31
North East	824	0.23 [-0.22, 0.67]	0.23
North West	943	0.62 [-0.61, 1.86]	0.63
South East	871	1.36 [0.20, 2.53]	0.59
South South	892	6.33 [2.76, 9.90]	1.81
South West	911	0.46 [-0.10, 1.01]	0.28
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.00 [0.00, 0.00]	0.00
Second	875	0.50 [-0.11, 1.11]	0.31
Middle	1061	2.01 [0.61, 3.40]	0.71
Fourth	1193	1.31 [0.24, 2.38]	0.54
Highest	1170	2.73 [0.43, 5.03]	1.17

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
3 Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4 Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 123. Mean daily intake of biofortified yellow cassava (raw weight, grams) of children consumed the previous day

		Yellow Cassava (grams)	
	N[1]	Mean [95%CI][2]	SE
National	3356	0.39 [0.15, 0.63]	0.12
Sex			
Male	1722	0.22 [0.03, 0.42]	0.10
Female	1634	0.56 [0.12, 1.01]	0.23
Residence			
Urban	1385	0.42 [0.07, 0.78]	0.18
Rural	1971	0.37 [0.05, 0.69]	0.16

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of biofortified yellow cassava to energy and vitamin A intake

As shown in **Table 124–127**, the contribution of Yellow Cassava to usual energy intake and Vitamin A intake of non-pregnant women and children is less than 1 percent. The results presented highlight the vast opportunity to expand the coverage of biofortified varieties in the country particularly in high risk areas where deficiency prevalence is still high. Given the known (high) contribution of cassava to the Nigerian diet, there is an obvious opportunity for also fortifying the products (e.g., prepackaged garri, etc.) derived from this crop.

Table 124. Contribution of biofortified yellow Cassava to usual energy intakes of women

		% Contribution to energy intake	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.77 [0.60, 0.94]	0.09
NPNL[3]	4544	0.76 [0.58, 0.93]	0.09
Lactating women[4]	697	0.83 [0.46, 1.19]	0.19
Pregnant women	999	0.70 [0.42, 0.98]	0.14
Residence			
Non-pregnant women			
Urban	2114	1.00 [0.68, 1.33]	0.16
Rural	3127	0.59 [0.40, 0.78]	0.10
Pregnant women			
Urban	402	0.90 [0.49, 1.31]	0.21
Rural	597	0.59 [0.20, 0.98]	0.20
Zone			
Non-pregnant women			
North Central	800	1.24 [0.63, 1.86]	0.31
North East	824	0.25 [0.02, 0.49]	0.12
North West	943	0.17 [-0.01, 0.35]	0.09
South East	871	1.82 [1.32, 2.31]	0.25
South South	892	0.56 [0.22, 0.91]	0.17
South West	911	1.60 [0.93, 2.27]	0.34
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.33 [0.08, 0.58]	0.13
Second	875	0.70 [0.37, 1.03]	0.17
Middle	1061	0.97 [0.54, 1.40]	0.22
Fourth	1193	0.90 [0.60, 1.20]	0.15
Highest	1170	0.86 [0.57, 1.14]	0.14

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 125. Contribution of biofortified yellow Cassava to usual energy intakes of children

		% Contribution to energy intake[1]	
	N[2]	Mean [95%CI][3]	SE
National	3356	0.57 [0.39, 0.75]	0.09
Sex			
Male	1722	0.55 [0.40, 0.70]	0.08
Female	1634	0.60 [0.31, 0.88]	0.14
Residence			
Urban	1385	0.67 [0.47, 0.87]	0.10
Rural	1971	0.52 [0.26, 0.79]	0.13

1For children 6-23 m, the denominator is usual energy intake from complementary diet
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Table 126. Contribution of biofortified yellow cassava to usual Vitamin A intake of women

		% Contribution to Vitamin A intake[x]	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.10 [0.07, 0.14]	0.02
NPNL[3]	4544	0.10 [0.06, 0.13]	0.02
Lactating women[4]	697	0.13 [0.05, 0.21]	0.04
Pregnant women	999	0.08 [0.04, 0.12]	0.02
Residence			
Non-pregnant women			
Urban	2114	0.14 [0.09, 0.20]	0.03
Rural	3127	0.07 [0.03, 0.11]	0.02
Pregnant women			
Urban	402	0.10 [0.04, 0.16]	0.03
Rural	597	0.07 [0.02, 0.12]	0.03
Zone			
Non-pregnant women			
North Central	800	0.20 [0.08, 0.32]	0.06
North East	824	0.04 [0.00, 0.08]	0.02
North West	943	0.05 [-0.02, 0.12]	0.04
South East	871	0.13 [0.09, 0.17]	0.02
South South	892	0.05 [0.02, 0.08]	0.01
South West	911	0.21 [0.11, 0.31]	0.05
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.04 [0.00, 0.08]	0.02
Second	875	0.10 [-0.01, 0.21]	0.01
Middle	1061	0.15 [0.06, 0.24]	0.05
Fourth	1193	0.12 [0.07, 0.18]	0.03
Highest	1170	0.10 [0.06, 0.13]	0.02

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error
[x] the assumed beta carotene contents and RAE of raw yellow cassava used to calculate the vitamin A intake were 452mcg and 37.7mcg, respectively

Table 127. Contribution of biofortified yellow Cassava to usual Vitamin A intake of children

		% Contribution to Vitamin A intake[x]	
	N[1]	Mean [95%CI][2]	SE
National	3356	0.07 [0.04, 0.10]	0.02
Sex			
Male	1722	0.08 [0.03, 0.13]	0.03
Female	1634	0.06 [0.02, 0.09]	0.02
Residence			
Urban	1385	0.09 [0.04, 0.14]	0.02
Rural	1971	0.05 [0.01, 0.09]	0.02

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error
*the assumed beta carotene contents and RAE of raw yellow cassava used to calculate the vitamin A intake were 452mcg and 37.7mcg, respectively

Biofortified orange-fleshed sweet potato

As shown in **Figure 12**, only five percent of the respondents consumed orange-fleshed sweet potato or any food products made from it in the past 30 days of the interview. Consumption was low irrespective of residence and wealth quintile. Although consumption was found to be low across zones, significant differences were observed ($p<0.05$). In the North East, 17 percent of respondents reported consuming orange-fleshed sweet potato, whereas only two percent of respondents in all other zones reported being consumers. The relatively higher percentage reported in the North East is likely due to food aids from government and development organizations in response to insurgence in the zone. Also, Working to Improve Nutrition in Northern Nigeria (WINNN), in collaboration with International Potato Centre (CIP) implemented nutrition sensitive kitchen garden intervention in the North East (Yobe) and West (Jigawa) in which WRA were given orange maize and sweet potato to plant in their kitchen gardens. The nutrition division of the FMARD also deployed orange-fleshed sweet potato to the zone in response to the emergence food insecurity from the insurgence.

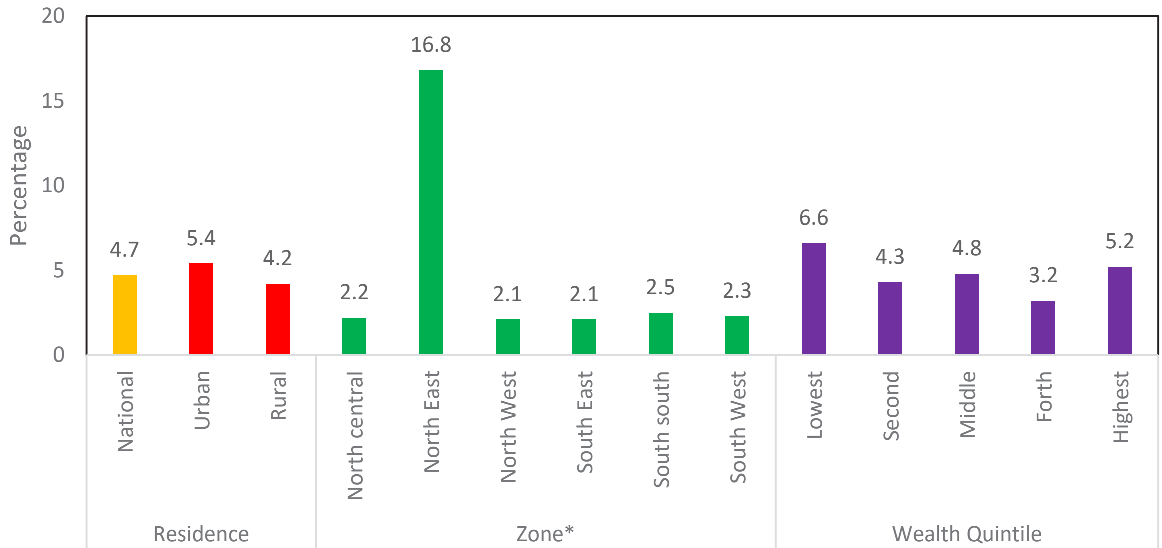


Figure 12. Percentage of Respondents that Consumed Orange-Fleshed Sweet Potatoes (or any food products made from it) in the Previous 30 Days at National Level and by Residence, Zone and Wealth Quintile

Among non-pregnant women (aged 15-49) years (unweighted sample size = 5275 respondents)
Data for wealth quintile missing for 22 WRA because HH data was not collected.
Data are weighted to account for survey design and non-response.
*Signifies variable differs across groups ($p<0.05$) using Chi-square test.

Among the respondents who reported having consumed orange-fleshed sweet potato, the vast majority (84 percent) reported consuming it in one to nine days in the past 30 days, whereas no one (0 percent) consumed it daily (**Figure 13**). As a result of the low frequency of consumption, the contribution of biofortified orange-fleshed sweet potato to reduction of micronutrient deficiency in Nigeria is likely to be limited.

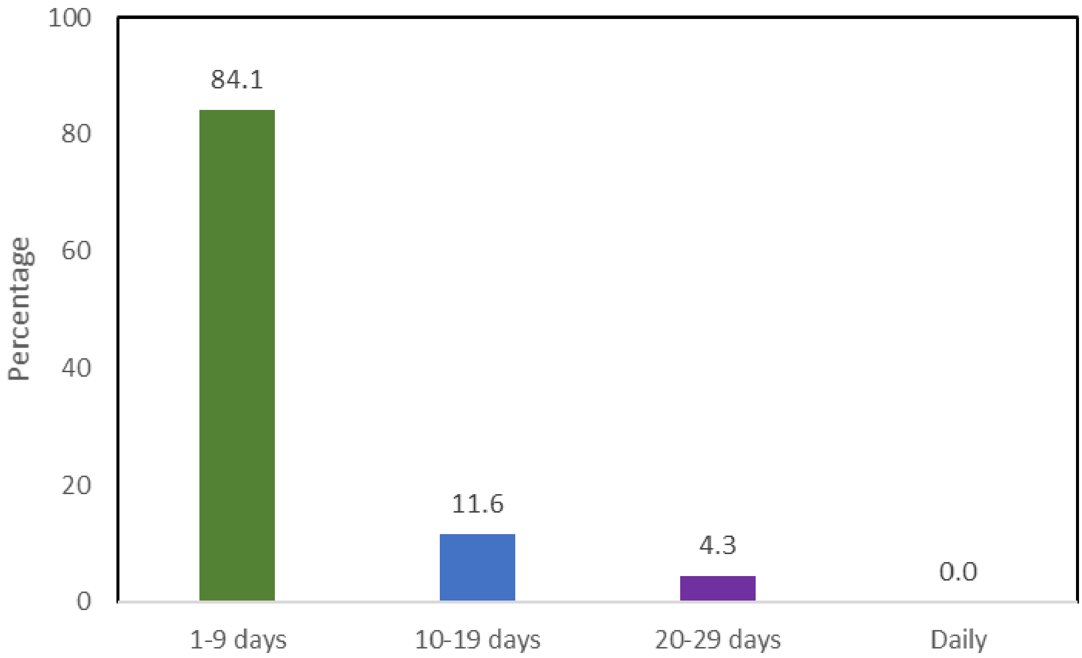


Figure 13. Frequency of consumption of orange-fleshed sweet potato (or any food products made from it) in the previous 30 days among consumers
Among non-pregnant women (aged 5-49 years) who consumed orange-fleshed sweet potato (or any food products made from it) the previous 30 days (unweighted sample size for women = 222)
Data are weighted to account for survey design and non-response

Mean intakes of biofortified orange-fleshed sweet potato

The mean intakes of orange-fleshed sweet potato by lactating and non-pregnant women were 0.45 grams and 0.27 grams (**Table 128**), respectively while for children, the mean intake of orange-fleshed sweet potato by children was 0.13 grams nationally (**Table 129**).

Table 128. Mean daily intake of orange-fleshed sweet potato (raw weight, grams) of women

		Sweet Potato (grams)	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.27 [0.05, 0.49]	0.11
NPNL[3]	4544	0.24 [0.02, 0.46]	0.11
Lactating women[4]	697	0.45 [-0.43, 1.33]	0.45
Pregnant women	999	1.05 [-0.83, 2.94]	0.96
Residence			
Non-pregnant women			
Urban	2114	0.11 [0.02, 0.21]	0.05
Rural	3127	0.39 [0.02, 0,78]	0.20
Pregnant women			
Urban	402	0.07 [-0.07, 0.20]	0.07
Rural	597	1.58 [-1.29, 4.45]	1.46
Zone			
Non-pregnant women			
North Central	800	0.14 [-0.06, 0.34]	0.10
North East	824	0.46 [-0.28, 1.20]	0.38
North West	943	0.33 [-0.18, 0.83]	0.26
South East	871	0.22 [-0.21, 0.64]	0.22
South South	892	0.37 [-0.36, 1.10]	0.37
South West	911	0.04 [-0.02, 0.09]	0.03
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.50 [-0.33, 1.34]	0.43
Second	875	0.33 [-0.32, 0.98]	0.33
Middle	1061	0.08 [-0.08, 0.23]	0.08
Fourth	1193	0.11 [-0.03, 0.26]	0.07
Highest	1170	0.38 [-0.15, 0.90]	0.27

[1]Number of respondents
[2]Sample weights are applied to account for survey design and non-response.
[3]Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
[4]Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 129. Mean daily intake of orange-fleshed sweet potato (raw weight, grams) of children

		Sweet Potato (grams)	
	N[1]	Mean [95%CI][2]	SE
National	3356	0.13 [0.00, 0.25]	0.06
Sex			
Male	1722	0.07 [-0.03, 0.17]	0.05
Female	1634	0.18 [-0.05, 0.41]	0.12
Residence			
Urban	1385	0.14 [-0.08, 0.37]	0.11
Rural	1971	0.12 [-0.03, 0.26]	0.08

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of biofortified orange-fleshed sweet potato to energy and vitamin A intake

As shown in the **Tables 130–133**, the contribution of orange-fleshed sweet potato to usual energy intake and vitamin A intake was consistently less than 1 percent across all categories for women and children.

Table 130. Contribution of biofortified orange-fleshed sweet potato to usual energy intakes of women

		% Contribution to energy intake	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.03 [0.00, 0.05]	0.01
NPNL[3]	4544	0.03 [0.00, 0.06]	0.01
Lactating women[4]	697	0.01 [-0.01, 0.04]	0.01
Pregnant women	999	0.01 [-0.04, 0.16]	0.01
Residence			
Non-pregnant women			
Urban	2114	0.02 [0.00, 0.04]	0.01
Rural	3127	0.03 [-0.01, 0.07]	0.02
Pregnant women			
Urban	402	0.01 [-0.01, 0.04]	0.01
Rural	597	0.08 [-0.06, 0.23]	0.07
Zone			
Non-pregnant women			
North Central	800	0.02 [-0.01, 0.05]	0.02
North East	824	0.02 [-0.01, 0.05}	0.02
North West	943	0.06 [-0.02, 0.13]	0.04
South East	871	0.02 [-0.02, 0.06]	0.02
South South	892	0.02 [-0.02, 0.06]	0.02
South West	911	0.01 [0.00, 0.01]	0.00
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.07 [-0.05, 0.19]	0.06
Second	875	0.01 [-0.01, 0.03]	0.01
Middle	1061	0.01 [-0.01, 0.02]	0.01
Fourth	1193	0.02 [-0.01, 0.05]	0.01
Highest	1170	0.04 [-0.01, 0.08]	0.02

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 131. Contribution of biofortified orange fleshed sweet potato to usual energy intakes of children.

		% Contribution to energy intake[1]	
	N[2]	Mean [95%CI][3]	SE
National	3356	0.01 [0.00, 0.02]	0.01
Sex			
Male	1722	0.01 [0.00, 0.02]	0.01
Female	1634	0.01 [0.00, 0.02]	0.01
Residence			
Urban	1385	0.01 [-0.01, 0.03]	0.01
Rural	1971	0.01 [0.00, 0.02]	0.01

Table 132. Contribution of biofortified orange-fleshed sweet potato to total usual vitamin A intake of women.

		% Contribution to Vitamin A intake	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.04 [0.01, 0.07]	0.02
NPNL[3]	4544	0.04 [0.01, 0.07]	0.02
Lactating women[4]	697	0.07 [-0.07, 0.21]	0.07
Pregnant women	999	0.08 [-0.05, 0.21]	0.07
Residence			
Non-pregnant women			
Urban	2114	0.03 [0.00, 0.06]	0.02
Rural	3127	0.05 [0.00, 0.10]	0.03
Pregnant women			
Urban	402	0.01 [-0.01, 0.03]	0.01
Rural	597	0.12 [-0.08, 0.31]	0.10
Zone			
Non-pregnant women			
North Central	800	0.05 [-0.03, 0.13]	0.04
North East	824	0.12 [-0.04, 0.28]	0.08
North West	943	0.03 [-0.01, 0.07]	0.02
South East	871	0.03 [-0.03, 0.08]	0.03
South South	892	0.02 [-0.02, 0.05]	0.02
South West	911	0.00 [0.00, 0.01]	0.00
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.08 [-0.04, 0.20]	0.06
Second	875	0.05 [-0.05, 0.16]	0.05
Middle	1061	0.01 [-0.01, 0.03]	0.01
Fourth	1193	0.02 [0.00, 0.03]	0.01
Highest	1170	0.06 [-0.01, 0.13]	0.03

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error
[x] the assumed beta carotene contents and RAE of raw deep yellow sweet potato used to calculate the vitamin A intake were 2400mcg and 200mcg, respectively

Table 133. Contribution of biofortified orange fleshed sweet potato to total usual vitamin A intake of children.

		% Contribution to Vitamin A intake	
	N[1]	Mean [95%CI][2]	SE
National	3356	0.04 [0.00, 0.08]	0.02
Sex			
Male	1722	0.05 [-0.02, 0.11]	0.03
Female	1634	0.03 [-0.01, 0.07]	0.02
Residence			
Urban	1385	0.03 [-0.02, 0.09]	0.03
Rural	1971	0.04 [-0.01, 0.09]	0.03

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error
[x] the assumed beta carotene contents and RAE of raw deep yellow sweet potato used to calculate the vitamin A intake were 2400mcg and 200mcg, respectively

Biofortified orange maize

As shown in **Figure 14**, 14 percent of the respondents consumed orange maize, or any food products made from it in the past 30 days of the interview. Consumption was low irrespective of residence and wealth quintile. Although consumption was found to be low across zones, significant differences were observed (p<0.05). In the North East, 38 percent of respondents consumed orange maize, whereas consumption ranged between 3 and 14 percent in the other zones. This, again, could be due to government and development organization food support to the zone in response to the insurgency.

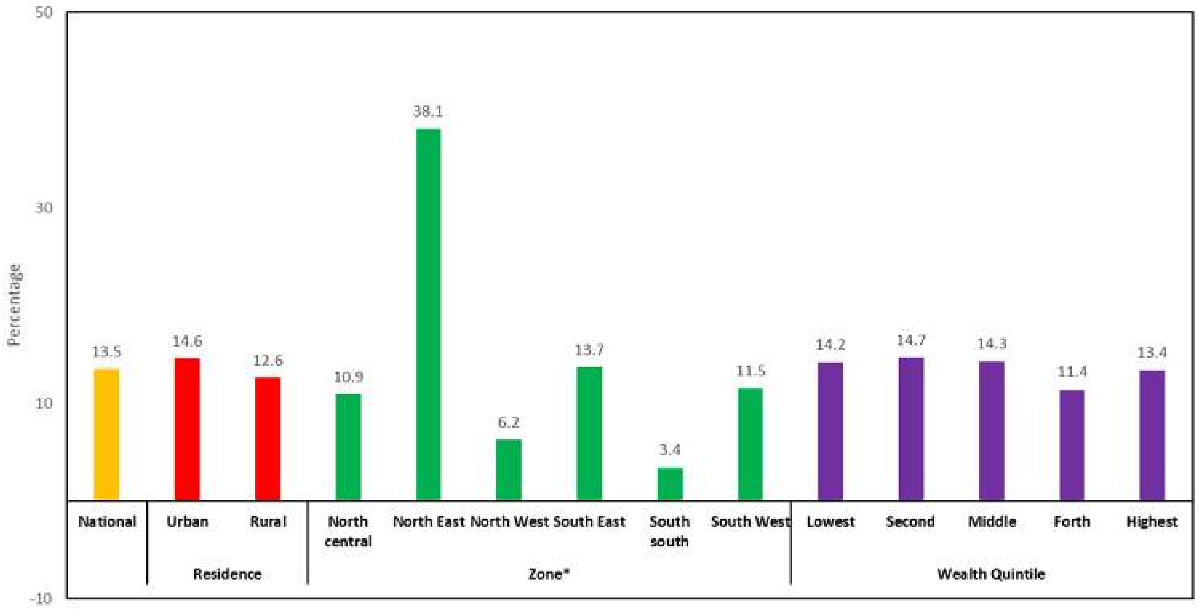


Figure 14. Percentage of respondents that consumed orange maize (or any food products made from it) in the previous 30 days at national level and by residence, zone, and wealth quintile
Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5275 respondents)
Data for wealth quintile missing for 32 WRA because HH data was not collected.
Data are weighted to account for survey design and non-response.
*Signifies variable differs across groups (p<0.05) using Chi-square test.

Among the respondents who reported having consumed orange maize, 57 percent reported consuming it in one to nine days in the past 30 days, whereas 16 percent reported consuming it daily (**Figure 15**). Maize is a staple in Nigeria, especially in the North East, where it is consumed in many forms. With the nutritional benefit of the crop, it has the potential to contribute to the national goal of reducing vitamin A deficiency in Nigeria if consumer awareness and acceptance can be strengthened.

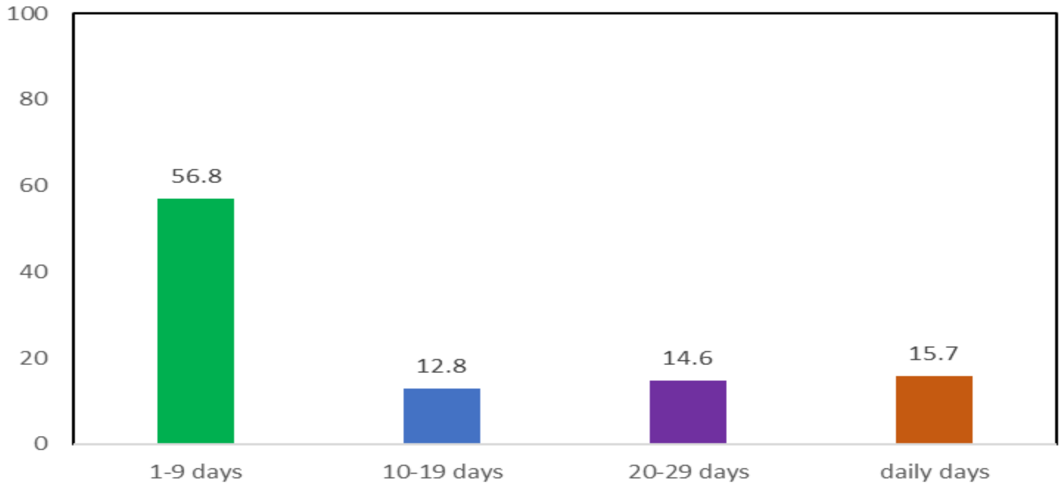


Figure 15. Frequency of consumption of orange maize (or any food products made from it) in the previous 30 days among consumers
Among non-pregnant women (aged 15-49 years) who consumed orange maize (or any food products made from it) the previous 30 days (unweighted sample size for women = 663)
Data are weighted to account for survey design and non-response

Mean Intakes of Yellow maize

The mean intake of yellow maize of non-pregnant and pregnant women nationally is 4.04 grams and 3.86 grams (**Table 134**). The mean intake of women ranged across the zones with women in the North-East zone having intake of 1.32 grams, while the women in the South-East zone had an intake of 10.92 grams.

Table 134. Mean daily intake of yellow maize (raw weight, grams) of women

		Orange Maize (grams)	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	4.04 [3.15, 4.93]	0.45
NPNL[3]	4544	3.98 [3.06, 4.90]	0.47
Lactating women[4]	697	4.41 [2.52, 6.30]	0.96
Pregnant women	999	3.86 [2.33, 5.39]	0.78
Residence			
Non-pregnant women			
Urban	2114	5.12 [3.51, 6.72]	0.82
Rural	3127	3.22 [2.15, 4.29]	0.54
Pregnant women			
Urban	402	4.97 [2.76, 7.17]	1.12
Rural	597	3.27 [1.16, 5.38]	1.07
Zone			
Non-pregnant women			
North Central	800	5.80 [3.18, 8.43]	1.33
North East	824	1.32 [0.10, 2.53]	0.62
North West	943	0.94 [-0.07, 1.96]	0.52
South East	871	10.92 [7.42, 14.42]	1.78
South South	892	3.08 [1.30, 4.86]	0.91
South West	911	8.24 [4.65, 11.83]	1.83
Wealth Quintile			
Non-pregnant women			
Lowest	921	2.02 [0.35, 3.68]	0.85
Second	875	3.92 [2.08, 5.76]	0.94
Middle	1061	4.41 [2.66, 6.16]	0.89
Fourth	1193	4.90 [3.31, 6.48]	0.81
Highest	1170	4.62 [3.15, 6.09]	0.75

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
3 Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4 Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Children had a mean intake of 2 grams nationally (**Table 135**). The survey did not distinguish orange from yellow maize during data collection of dietary intake and thus had to combine the reporting of yellow and orange maize together.

Table 135. Mean daily intake of yellow maize (raw weight, grams) of children

		Orange Maize (grams)	
	N[1]	Mean [95%CI][2]	SE
National	3356	1.98 [1.28, 2.67]	0.35
Sex			
Male	1722	1.78 [1.30, 2.25]	0.24
Female	1634	2.19 [1.00, 3.38]	0.60
Residence			
Urban	1385	2.20 [1.55, 2.84]	0.33
Rural	1971	1.86 [0.84, 2.89]	0.52

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of yellow maize to Energy and Vitamin A intake

As presented in T**ables 136–139**, the contribution of yellow maize to usual energy intake and vitamin A intake of women was consistently less than 1 percent across all categories for women and children.

Table 136. Contribution of yellow maize to total usual energy intakes of women

		% Contribution to energy intake	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.77 [0.60, 0.94]	0.09
NPNL[3]	4544	0.76 [0.58, 0.93]	0.09
Lactating women[4]	697	0.83 [0.46, 1.19]	0.19
Pregnant women	999	0.70 [0.42, 0.98]	0.14
Residence			
Non-pregnant women			
Urban	2114	1.00 [0.68, 1.33]	0.16
Rural	3127	0.59 [0.40, 0.78]	0.10
Pregnant women			
Urban	402	0.90 [0.49, 1.31]	0.21
Rural	597	0.59 [0.20, 0.98]	0.20
Zone			
Non-pregnant women			
North Central	800	1.24 [0.63, 1.86]	0.31
North East	824	0.25 [0.02, 0.49]	0.12
North West	943	0.17 [-0.01, 0.35]	0.09
South East	871	1.82 [1.32, 2.31]	0.25
South South	892	0.56 [0.22, 0.91]	0.17
South West	911	1.60 [0.93, 2.27]	0.34
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.33 [0.08, 0.58]	0.13
Second	875	0.70 [0.37, 1.03]	0.17
Middle	1061	0.97 [0.54, 1.40]	0.22
Fourth	1193	0.90 [0.60, 1.20]	0.15
Highest	1170	0.86 [0.57, 1.14]	0.14

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
3 Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4 Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 137. Contribution of yellow maize to total usual energy intakes of children

		% Contribution to energy intake[1]	
	N[2]	Mean [95%CI][3]	SE
National	3356	0.57 [0.39, 0.75]	0.09
Sex			
Male	1722	0.55 [0.40, 0.70]	0.08
Female	1634	0.60 [0.31, 0.88]	0.14
Residence			
Urban	1385	0.67 [0.47, 0.87]	0.10
Rural	1971	0.52 [0.26, 0.79]	0.13

1For children 6-23 m, the denominator is usual energy intake from complementary diet
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Table 138. Contribution of yellow maize to total usual vitamin A intake of women

		% Contribution to Vitamin A intake	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.10 [0.07, 0.14]	0.02
NPNL[3]	4544	0.10 [0.06, 0.13]	0.02
Lactating women[4]	697	0.13 [0.05, 0.21]	0.04
Pregnant women	999	0.08 [0.04, 0.12]	0.02
Residence			
Non-pregnant women			
Urban	2114	0.14 [0.09, 0.20]	0.03
Rural	3127	0.07 [0.03, 0.11]	0.02
Pregnant women			
Urban	402	0.10 [0.04, 0.16]	0.03
Rural	597	0.07 [0.02, 0.12]	0.03
Zone			
Non-pregnant women			
North Central	800	0.20 [0.08, 0.32]	0.06
North East	824	0.04 [0.00, 0.08]	0.02
North West	943	0.05 [0.02, 0.12]	0.04
South East	871	0.13 [0.09, 0.17]	0.02
South South	892	0.05 [0.02, 0.08]	0.01
South West	911	0.21 [0.11, 0.31]	0.05
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.04 [0.00, 0.08]	0.02
Second	875	0.10 [-0.01, 0.21]	0.06
Middle	1061	0.15 [0.06, 0.24]	0.05
Fourth	1193	0.12 [0.07, 0.18]	0.03
Highest	1170	0.10 [0.06, 0.13]	0.02

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error
[x] the assumed beta carotene contents and RAE of yellow maize used to calculate the vitamin A intake were 159mcg and 13.3mcg, respectively

Table 139. Contribution of yellow maize to total usual vitamin A intake of children

		% Contribution to Vitamin A intake	
	N[1]	Mean [95%CI][2]	SE
National	3356	0.07 [0.04, 0.10]	0.02
Sex			
Male	1722	0.08 [0.03, 0.13]	0.03
Female	1634	0.06 [0.02, 0.09]	0.02
Residence			
Urban	1385	0.09 [0.04, 0.14]	0.02
Rural	1971	0.05 [0.01, 0.09]	0.02

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error
[x] the assumed beta carotene contents and RAE of yellow maize used to calculate the vitamin A intake were 159mcg and 13.3mcg, respectively

Fortification Coverage and Intake of Fortifiable Food Vehicles

Box 8. Key Findings for Fortification Coverage and Intake of Fortifiable Food Vehicles

Consumption of fortified food vehicles: A high proportion of households of sampled non-pregnant women of reproductive age consumed vegetable oil (90 percent), sugar (88 percent), salt (99 percent), and bouillon (99 percent) in any form.

Consumption of flours: Fewer households of sampled non-pregnant WRA consumed flours in any form (57 percent for maize flour, 29 percent for semolina flour, and 28 percent for wheat flour).

Consumption of branded food vehicles: The proportion of respondents whose households consumed these foods in a branded form was 33 percent for vegetable oil, 22 percent for sugar, 13 percent for wheat flour, <1 percent for maize flour, 23 percent for semolina flour, 47 percent for salt, except for bouillon, which remained high at 96 percent.

Consumption of unbranded and unknown oil: Higher in the northern zones (65 percent North central, 56 percent North East, and 68 percent North West) compared to the southern zones (South East 23 percent, South South 26 percent and South West 32 percent).

Usual intake of vegetable oil: The mean usual intake of vegetable oil among non-pregnant women was 27 grams

Usual intake of wheat flour: The mean usual intake of wheat flour among non-pregnant women was 39 grams

Usual intake of sugar: The mean usual intake of sugar among non-pregnant women was 12 grams

Usual intake of salt: The mean usual intake of salt among non-pregnant women was 4 grams

Usual intake of bouillon: The mean usual intake of bouillon among non-pregnant women was 6 grams.

Usual intake of rice: The mean usual intake of rice (raw) among non-pregnant women was 61 grams.

Contribution of fortifiable vehicles to energy intake: vegetable oil contributed 13 percent, wheat (8 percent), sugar (5 percent percent) and rice (25 percent).

Usual intake of fortifiable vehicles among children: The mean usual intake of vegetable oil among children was 19 grams, wheat flour (26 grams), sugar (11.5 grams), salt (2.6 grams), bouillon (4 grams) and rice (38 grams).

Food Fortification

Food fortification is the practice of adding micronutrient(s) to commonly consumed foods during processing to increase their nutritional value. It is carried out at large-scale and endorsed by governments as a public health policy that aims to reduce micronutrient deficiencies within a population. In Nigeria, mandatory fortification of salt with iodine began in 1993, while that of sugar, margarine and edible oil with vitamin A and all flours (wheat, maize, cassava, and semolina) with multiple micronutrients, (vitamin A, iron and zinc) started 2002 (Standard Organizations of Nigeria, 2000a, 2000b, 2000c, 2010, 2015a, 2015b). In addition, voluntary fortification of some other food vehicles is gaining popularity e.g., bouillon.

Overview of fortification indicators among WRA

Below are terms used in the NFCMS 2021 as defined by Friesen et al, (2019):

Food vehicle: Refers to the food that is selected for the addition of one or more nutrients; it is usually a staple food or condiment that is widely consumed in any form.

Fortifiable food vehicle: Refers to a food vehicle that is industrially processed and therefore amenable to large-scale food fortification.

Fortified food vehicle: Refers to a food vehicle that has been confirmed by laboratory analyses to contain the added micronutrient(s) (in any amount).

For the 2021 Nigerian NFCMS, the definitions for fortifiable food vehicles and fortified foods were adapted to the context of Nigeria.

Fortifiable food vehicles: Two proxies were used to assess the coverage of fortifiable food vehicles:

- food vehicle that was purchased (i.e., not homemade)
- food vehicle that was branded (i.e., commercially produced)

There are limitations in the use of these proxy indicators. Defining fortifiable as purchased has the limitation that in Nigeria not all purchased foods are produced by large-scale industries. For instance, vegetable oil is produced both at large and cottage level, but the production at the cottage level does not provide an opportunity for fortification. This variable is therefore an overestimation of the true coverage.

Defining fortifiable as branded has the limitation that this information is not always available. When the brand of the food vehicle is unknown, it is not possible to determine whether the food is fortified. This variable is therefore an underestimation of the true coverage.

Fortified foods: Two proxies were used to assess the coverage of fortified foods:

- food vehicle that is labelled as fortified based on information provided by the brand manufacturer was used (i.e., fortification logo or statement on the label of the package of the branded product)
- food vehicle that is fortified (in any amount) based on linking of the reported brand used by household of the sampled respondent to a fortification status (fortified or not fortified) based on micronutrient content from laboratory analysis of multiple food samples for the given brand using secondary data from the 2021 Global Alliance for Improved Nutrition (GAIN) market assessment of fortified food vehicles. This was done for all foods except bouillon, which was not included in the market assessment as it is not currently required to be fortified in Nigeria.

There are also limitations in the use of these proxy indicators. When the brand of the food vehicle is unknown, it is not possible to examine the label or link the data to the GAIN database. Also, the label information and database information may not reflect the true fortification status. A brand previously fortified may no longer be fortified, or vice versa. Also, there are micronutrient losses during transportation, shelf storage, retail display, etc. between market and homes. In addition to results that represent the indicators in **Table 140**, **Table 140** further provides information on the data processing from the Diet Questionnaire. Also, descriptive data are presented for types, sources, and brands of food vehicles consumed in the household. The results for non-pregnant women aged 15-49 y are presented in the body of the report (n=5381), while those for all survey target groups are presented in Annex 36-43.

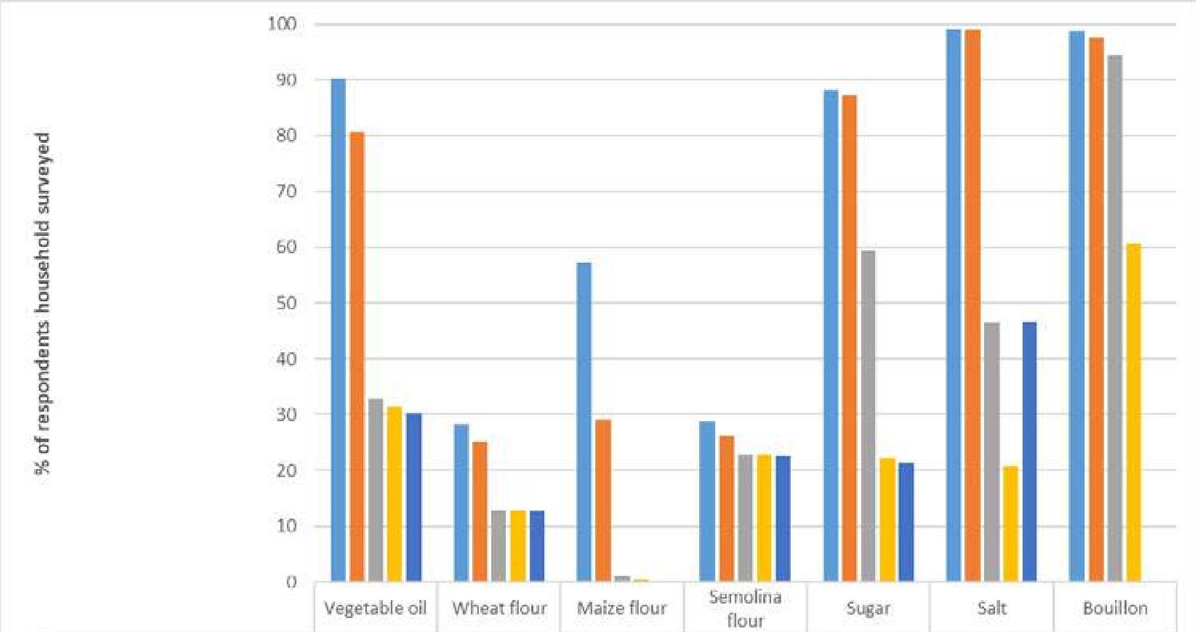
Table 140. Fortification coverage indicators reported in the NFCMS using data collected in the diet questionnaire

NFCMS survey Indicator definition	Survey question	Data analysis	Food vehicles included
Proportion of respondents in each target group (non-pregnant women, pregnant women and children) whose households consumed the food vehicle	Does your household use [food vehicle] to prepare foods at home?	The following response categories were created: -consumed food vehicle -did not consume food vehicle	vegetable oil, wheat flour, maize flour, semolina flour, sugar, salt, and bouillon
Proportion of respondents in each target group (non-pregnant women, pregnant women and children) whose households consumed the purchased food vehicle (this is a proxy for fortifiable)	-The last time your household got [food vehicle], how did you get it?	The following response categories were created: - purchased - homemade - donations/gifted - unknown	vegetable oil, wheat flour, maize flour, semolina flour, sugar, salt, and bouillon
Proportion of respondents in each target group (non-pregnant women, pregnant women and children) whose households consumed the branded food vehicle (this is a proxy for fortifiable)	-The last time your household got [food vehicle], what was the brand?	The following response categories were created: - branded - unbranded - unknown	vegetable oil, wheat flour, maize flour, semolina flour, sugar, salt, and bouillon
Proportion of respondents in each target group (non-pregnant women, pregnant women and children) whose households consumed the food vehicle that was labelled as fortified (this is a proxy for fortified)		- The brand name reported was linked to label information (visual inspection of fortification logo or statement on food label)	vegetable oil, wheat flour, maize flour, semolina flour, sugar, salt, and bouillon
Proportion of respondents in each target group (non-pregnant women, pregnant women and children) whose households consumed the food vehicle that was assumed to be fortified (this is a proxy for fortified)		- The brand name reported was linked to secondary data on fortification status from GAIN 2021 market assessments - Data were disaggregated as fortified below minimum standard range of fortification and fortified at or above standard.	vegetable oil, wheat flour, maize flour, semolina flour, sugar, and salt

In addition to the variables derived from the diet questionnaire, samples for vegetable oil, wheat flour, semolina flour, sugar and salt were collected from a sub-sample of non-pregnant women. These samples were analyzed in the laboratory and the finding are presented here.

Overview of all the selected food vehicles at national level

A high proportion of households of sampled non-pregnant women of reproductive age (WRA) consumed vegetable oil (90 percent), sugar (88 percent), salt (99 percent), and bouillon (99 percent) in any form (**Figure 16**). Fewer households of sampled non-pregnant WRA consumed flours in any form (57 percent for maize flour, 29 percent for semolina flour, and 28 percent for wheat flour). The proportion of households of sampled non-pregnant women of reproductive age that consumed foods that were obtained through purchases (as opposed to for example gifts or food aid) were like those consuming the food in any form for most food vehicles, except for maize flour (57 percent of household consumed it, but only 29 percent purchased it).



	Vegetable oil	Wheat flour	Maize flour	Semolina flour	Sugar	Salt	Bouillon
Consumed foods	90.3	28.2	57.4	28.7	88.2	99.2	98.9
Purchased foods	80.7	25.3	29.2	26.2	87.3	99	97.5
Branded foods	32.9	12.9	1.2	22.8	59.4	46.6	94.3
Foods labelled as fortified	31.4	12.9	0.5	22.8	22.2	20.8	60.7
*Food fortified (in any amount)	30.3	12.7	0	22.7	21.3	46.7	

Figure 16. Coverage of Selected Food Vehicles among Households of the sampled Non-Pregnant Women at National Level

Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Differences across groups were not tested statistically.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status (i.e., fortified or not fortified) by brand based on analysis of multiple food samples per brand.

The proportion of respondents whose households consumed these foods in a branded form (which was used as a proxy for commercially processed and thus amenable to large-scale fortification) was considerably lower for most foods, i.e., vegetable oil (33 percent), sugar (59 percent), wheat flour (13 percent) maize flour (1.2 percent), semolina flour (23 percent), salt (47 percent), except for bouillon, which remained high (94 percent). That said, the same proportion of households that consumed branded foods also consumed foods labelled as fortified and confirmed to be fortified (in any amount) based on linking the report brand to secondary market data on fortification quality. This suggests that most foods that are labelled as fortified are in fact fortified. For bouillon, the drop in the proportion of women from households that consumed bouillon that was branded and labelled as fortified, is likely because fortification is currently on voluntary basis and therefore only some brands are fortifying and labelling their products as such as a means of increasing market competitiveness.

Where there is high coverage of foods that are purchased and branded, there is an opportunity for large-scale fortification to reach a high proportion of the population and where a sharp decline is observed between purchased and branded for most foods (except bouillon), it may be due to either a high proportion of non-pregnant women reported their households consumed unknown and/or unbranded food vehicles (sugar, vegetable oil, salt)or a high proportion of them obtained food vehicle(s) from small/cottage-scale production (maize flour and vegetable oil) with no brands.

Vegetable oil

Figure 17 presents the coverage indicators for vegetable oil nationally among households of the sampled non-pregnant WRA (15-49 years old). There was a high proportion of households of the sampled non-pregnant women that consumed vegetable oil in any form (90 percent) and purchased it (81 percent) (**Figure 17**). At the same time, only about one-third of households of the sampled women of reproductive age consumed vegetable oil that was branded, labelled as fortified and fortified (in any amount). However, the result for these latter three indicators may be underestimated as about 25 percent of women could not report the brand of the consumed vegetable oil.

These results reveal that fortification of vegetable oil is currently reaching at least 31 percent of households of the sampled respondents and has the potential to reach up to around 60 percent of households if all the branded oil is fortified. However, while 33 percent of women come from households that consumed branded vegetable oil (and 26 percent were unknown), 25 percent consumed unbranded oil (**Figure 17**) and thus would not be reached with large-scale food fortification.

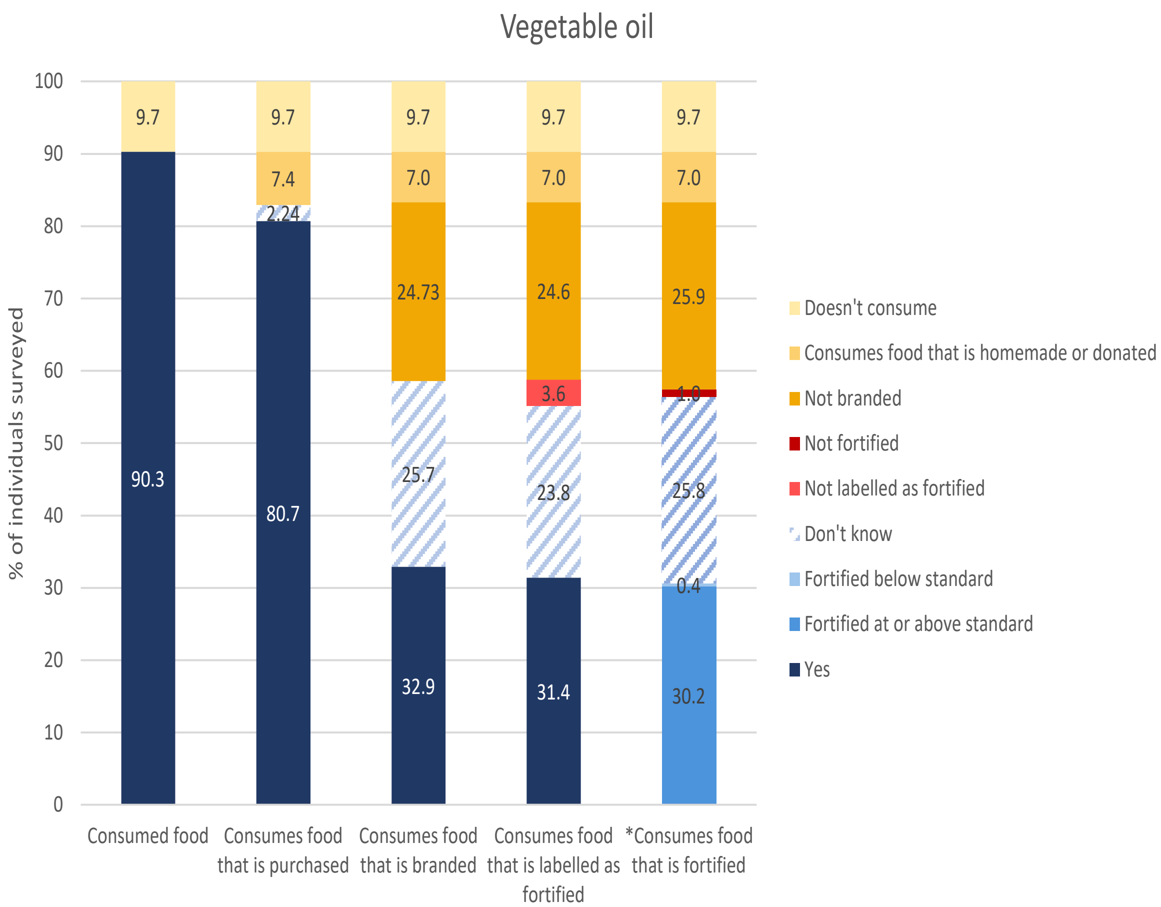


Figure 17. Percentage of Non-Pregnant Women Whose Households Consumed Vegetable Oil (purchased, branded, labelled as fortified and fortified) at National Level
Among non-pregnant women aged 15-49 years (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Differences across groups were not tested statistically.
Data for bouillon is missing for 22 non-pregnant women.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status by brand

Unbranded vegetable oil could originate from small-scale processors (cottage industries) that take their products to the open market (e.g., unrefined groundnut oil) for sale; this type of oil is truly unbranded. This practice is common with groundnut oil, which is commonly processed by women at cottage-level. According to FAO, 2003 (Mustapha and Suleiman, 2006), the locally processed groundnut oil is about 25 percent of the total vegetable oil produced in Nigeria.

Unbranded vegetable oil could also come from downsized and repackaged branded vegetable oil, whose identity would have been lost at the point of purchase. Nigeria has the common practice of downsizing and repackaging vegetable oil from barrels/drums into smaller local measures that low-income earners can afford. When this is done, the brand identity of the oil is lost. These oils may be branded originally, but at the time of purchase, the brand is not disclosed to the consumer.

Furthermore, the similarity in the proportion of women from households that consumed food that is branded, labelled as fortified and fortified are indicators that most of the producers of vegetable oils that are branded are in fact labelling and fortifying their products.

Across residence sectors and zones, even though the proportion of households of the selected respondents that consumed vegetable oil was found high nationally, the proportion was higher among urban dwellers compared to rural (96 percent vs. 85 percent) with the same trend found for the proportion of households of the selected respondents that consumed vegetable oil that is purchased, branded, labelled as fortified and fortified (**Table 141**). Contrarily, the proportion of households of the sampled respondents that consumed unbranded vegetable oil was slightly higher in rural areas compared to urban (28 percent vs. 21 percent) This may be explained by the fact that this type of oil is often cheaper and therefore may be more affordable in rural areas.

Within the zones, the proportion of households of the sampled non-pregnant women of reproductive age that consumed vegetable oil were higher in South South (92 percent) South West (92 percent) and north central (94 percent) zones compared to other zones (88 percent each). The proportion of households of the sampled respondents that consumed unbranded vegetable oil was higher in the northern zones (16-54 percent), especially North central (54 percent) compared to the southern zones (12-29 percent) (**Table 141**). This is likely because groundnut oil, which is a very common type of oil made at cottage-scale, is produced more widely in the north and unbranded.

Also, groundnut is the base crop grown more in the north (FAO, 2003 in Mustapha and Suleiman, 2006). This may account for lower proportion of households of the sampled respondents that consumed the branded vegetable oil in the north (12-21 percent) compared to those in the south (57-65 percent). Higher proportion of women's households consuming unknown brands was also found, especially in the northern zones (11-52 percent) (**Table 141**), which could be traced to the practice of downsizing and repackaging vegetable oil that are cheaper and more affordable by the low-income earners. In general, a higher proportion of households of the respondents that consumed unbranded and unknown oil was found in the northern zones (65 percent North central, 56 percent North East, and 68 percent North West) compared to the southern zones (South East 23 percent, South-South 26 percent and South West 32 percent) (**Table 141**). The same trend was found with wealth quintile as consumption of branded vegetable oil is more in the rich than the poor HHs.

With the high percentages of unknown and unbranded vegetable oil, fortification status of vegetable oil consumed in these HHs could not be truly assessed. This could be a challenge in the evaluation of the impact of fortification programme in Nigeria.

Table 141. Percentage of Non-Pregnant Women Whose Households Consumed Vegetable Oil (purchased, branded, labelled as fortified and fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2, 4]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified[2, 4]		
					Unknown	Unbranded		At standard	Below standard	Not fortified
		% [95%CI]								
National[3]										
Non-pregnant women aged 15-49 years	5281	90.3[88.5-92.1]	80.7[78.4-83.0]	32.9 [29.9-35.9]	25.8[22.9-28.6]	24.7[22.2-27.2]	31.4[28.5-34.4]	30.1[27.3-32.9]	0.2[0.0-0.5]	0.5[0.2-0.9]
Residence		P < 0.0001***								
Urban	2156	96.2[95.0-97.3]	87.6[84.7-90.5]	48.0[42.6-53.3]	21.6[16.5-26.8]	21.3[17.7-24.8]	46.0[40.5-51.6]	44.1[38.5-49.6]	0.5[0.0-1.1]	1[0.3-1.7]
Rural	3125	85.2[82.3-88.1]	74.7[71.3-78.0]	19.8[16.7-22.8]	29.3[25.0-33.7]	27.7[24.2-31.2]	18.7[15.7-21.8]	18.0[15.0-20.9]	0	0.1[0.0-0.3]
Zone		P = 0.1722								
North Central	857	94.3[91.5-97.1]	84.5[79.8, 89.2]	21.0[13.1-28.9]	11.4[8.6-14.2]	53.5[45.7-61.3]	21.0[13.1-28.9]	19.5[11.7-27.3]	0	0
North East	830	87.6[83.1-92.1]	68.1[62.0-74.2]	15.2[6.2-24.2]	38.3[31.6-45.0]	18.2[12.4-24.1]	15.0[6.0-24.0]	12.9[5.4-20.5]	0	0
North West	944	88.7[84.3-93.1]	77.0[71.3-82.6]	12.5[7.3-17.8]	52.3[46.3-58.3]	16.1[12.5-19.7]	8.8[4.2-13.4]	7.5[3.2-11.7]	0	1.7[0.6-2.8]
South East	855	87.9[83.8-92.0]	78.5[73.1-83.8]	61.1[53.8-68.4]	10.6[6.5-14.7]	12.3[9.0-15.7]	60.0[52.6-67.4]	57.7[50.4-65.0]	0.1[0.0-0.2]	0
South South	888	92.4[87.4-97.3]	90.6[85.0-96.1]	65.1[56.9-73.3]	5.9[4.0-7.8]	20.4[15.7-25.0]	64.5[56.4-72.6]	64.3[56.2-72.5]	0.1[0.0-0.2]	0
South West	907	91.6[87.5-95.7]	89.1[85.0-93.1]	57.4[50.1-64.7]	3.5[2.2-4.9]	29.0[23.8-34.2]	56.6[49.4-63.7]	55.4[48.4-62.4]	1.3[0.0-2.8]	0.1[0.0-0.4]
Wealth quintile		P < 0.0001***								
Lowest	1081	80.3[75.9-84.7	67.4[62.4-72.4]	6.9[4.5-9.2]	39.4[33.3-45.4]	23.8[19.9-27.7]	5.7[3.5-7.9]	5.4[3.2-7.5]	0.1[0.0-0.3]	0.1[0.0-0.4]
Second	1111	87.2[83.7-90.6]	73.8[68.9-78.6]	15.8[12.5-19.0]	34.0[28.5-39.6]	27.1[22.2-31.9]	14.5[11.3-17.8]	14.1[10.9-17.3]	0.2[0.0-0.6]	0.6[0.0-1.5]
Middle	1100	93.2[90.9-95.6]	82.9[79.5-86.4]	37.0[32.7-41.3]	21.0[16.9-25.0]	27.1[22.2-32.1]	35.8[31.4-40.1]	33.7[29.0-38.3]	0.4[0.0-1.2]	0.5[0.0-1.2]
Fourth	997	95.6[93.7-97.5]	90.3[87.5-93.1]	50.1[45.3-54.9]	15.8[12.4-19.1]	26.9[22.4-31.4]	49.0[44.1-53.8]	47.2[42.4-51.9]	0.4[0.0-0.9]	0.3[0.0-0.7]
Highest	970	97.4[96.1-98.7]	93.0[90.5-95.4]	63.2[57.8-68.6]	14.6[8.8-20.3]	18.0[14.4-21.5]	60.6[54.7-66.5]	58.1[52.3-64.0]	0.1[0.0-0.2]	1.1[0.0-2.3]

1 Number of respondents.
2 Sample weights are applied to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.

The proportion of households of the sampled non-pregnant women that consumed groundnut oil and palm olein as main type of vegetable oil was 51 percent and 44 percent respectively (**Figure 18**).

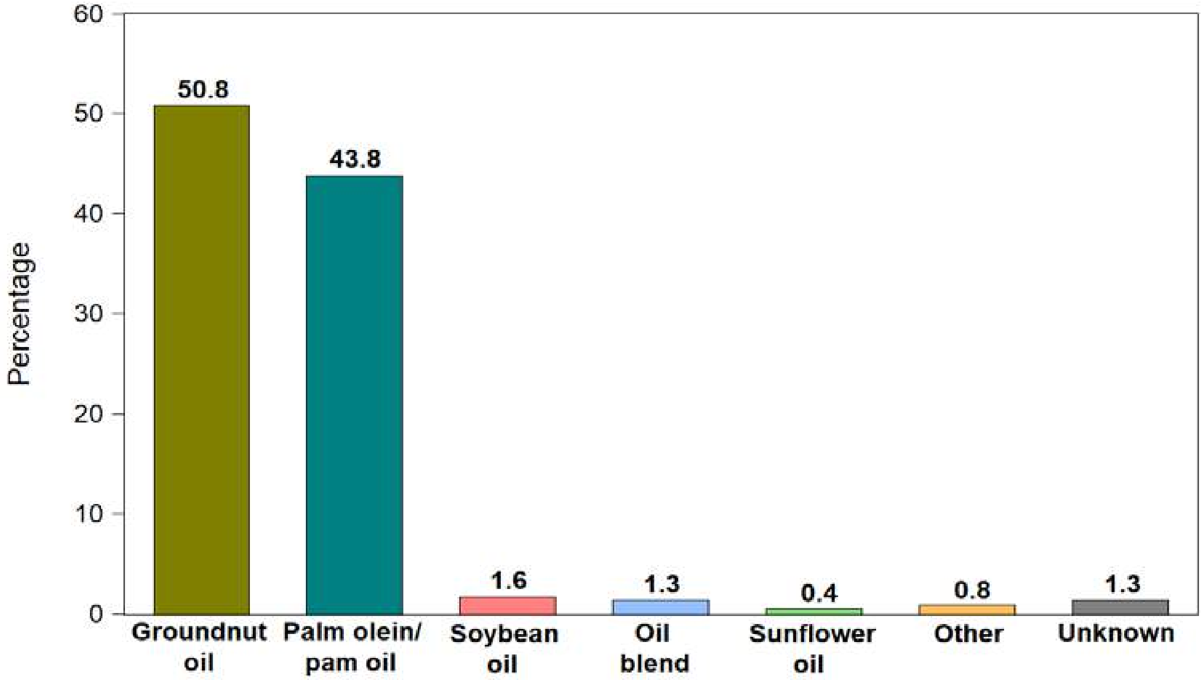


Figure 18. Main type of vegetable oil used in the household among consumers
Among non-pregnant women (aged 15-49 years) in the HH (unweighted sample size for women = 4749)
Data are weighted to account for survey design and non-response.
The type was classified as "unknown" when the respondent could not report the type of food vehicle used in the HH.
Oil blend is a mixture of seeds processed into oil (e.g. rapeseed and sunflower).

As shown in **Figure 19**, several brands of oil are available in Nigeria. The proportion of households of the sampled non-pregnant women consumed King's (100 percent vegetable oil) as their main brand of vegetable oil was 22 percent, followed by Power Oil - pure vegetable oil that was reported by 14 percent of the women.

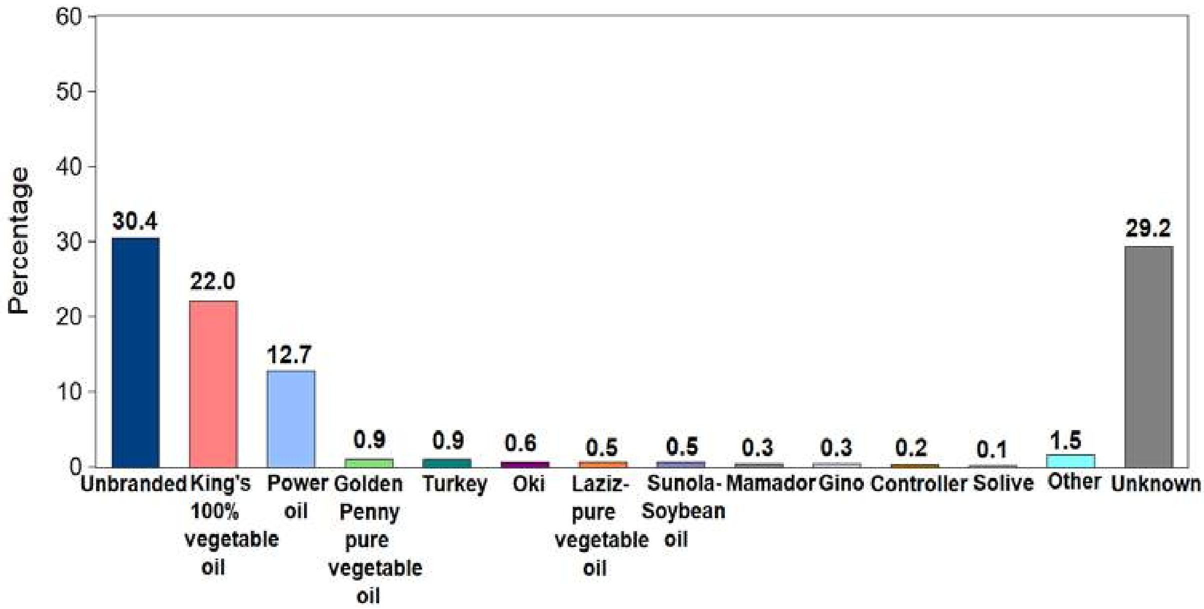


Figure 19. Brand of vegetable oil obtained the last time among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HH and the food vehicle was not "homemade" (unweighted sample size for women = 4320)
Data are weighted to account for survey design and non-response
The brand was classified as "unknown" when the respondent could not report the brand of food vehicle used in the HH.

Usual intake of Vegetable oil

As shown in **Table 142**, the mean usual intake of vegetable oil among all non-pregnant women is 26.8 grams. Pregnant women have a mean usual intake of 29.0 grams. There was a numerical difference between the vegetable oil intake of non-lactating women (26.0 grams) and lactating women (32.1 grams) respectively. Across the zones, women in the Northern zones had comparatively higher intake of vegetable oil as compared to women from the Southern zones. There was a substantial gap in the intake across the wealth quintile. The usual intake of vegetable oil among children aged 24-59 months is 18.7 grams (**Table 143)**.

Table 142. Usual intake of Vegetable oil (raw weight, grams) of women

	Vegetable oil (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	26.8 [25.2, 28.3]	0.8	25.7 [18.4, 34.0]
NPNL[3]	4544	26.0 [24.4, 27.6]	0.8	25.1 [18.1, 32.8]
Lactating women[4]	697	32.1 29.0, 35.2]	1.6	30.1 [20.5, 41.5]
Pregnant women	999	29.0 [25.7, 32.2]	1.6	28.7 [20.1, 37.4]
Residence				
Non-pregnant women				
Urban	2114	26.2 [23.2, 29.2]	1.5	25.1 [18.6, 32.6]
Rural	3127	27.3 [24.9, 29.6]	1.2	26.2 [18.3, 35.1]
Pregnant women				
Urban	402	28.9 [23.1, 34.7]	2.9	28.7 [20.0, 37.4]
Rural	597	29.0 [25.6, 32.4]	1.7	28.7 [20.2, 37.5]
Zone				
Non-pregnant women				
North Central	800	22.5 [20.3, 24.7]	1.1	21.8 [17.1, 27.2]
North East	824	32.7 [28.7, 36.8]	2.1	31.8 [26.0, 38.4]
North West	943	41.2 [38.6, 43.7]	1.3	40.1 [33.4, 47.8]
South East	871	17.6 [15.3, 19.9]	1.1	16.7 [11.9, 22.3]
South-South	892	14.2 [11.8, 16.6]	1.2	13.2 [9.1, 18.2]
South West	911	14.7 [12.5, 17.0]	1.1	13.9 [9.7, 18.7]
Wealth Quintile				
Non-pregnant women				
Lowest	921	31.6 [28.0, 35.2]	1.8	30.7 [23.2, 39.0]
Second	875	32.1 [28.8, 35.4]	1.7	31.1 [23.5, 39.7]
Middle	1061	24.9 [22.0, 27.7]	1.4	23.9 [16.7, 31.9]
Fourth	1193	23.2 [20.7, 25.7]	1.3	22.3 [15.6, 29.7]
Highest	1170	23.5 [21.1, 26.0]	1.2	22.6 [16.0, 30.1]

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
3 Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4 Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 143. Usual intake of Vegetable oil (raw weight, grams) of children

	Vegetable oil (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	18.7 [17.6, 19.8]	0.5	18.0 [12.9, 23.7]
Sex				
Male	1722	19.7 [18.2, 21.2]	0.8	18.8 [13.5, 25.0]
Female	1634	17.7 [16.4, 19.0]	0.6	17.1 [12.3, 22.4]
Residence				
Urban	1385	18.8 [16.7, 20.9]	1.1	17.3 [12.0, 24.0]
Rural	1971	18.7 [17.2, 20.1]	0.7	18.4 [13.5, 23.6]

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of Vegetable oil to energy intake

As shown in **Table 144**, the mean usual contribution of energy from vegetable oil to overall energy intake was found to be 13.2 percent for non-pregnant women and 13.6 percent for pregnant women. There was a higher contribution from women in the northern zones than in the southern zones and there was a reduction in the contribution of vegetable oil to dietary energy as the wealth quintile increased.

Table 144. Contribution of vegetable oil to total usual energy intake of women

	% Contribution to energy intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	13.2 [12.72, 13.62]	0.23	11.3 [6.9, 17.3]
NPNL[3]	4544	13.0 [12.55, 13.48]	0.24	11.2 [7.0, 17.1]
Lactating women[4]	697	14.0 [12.77, 15.27]	0.64	13.5 [9.2, 18.1]
Pregnant women	999	13.6 [12.48, 14.81]	0.59	11.5 [6.8, 18.2]
Residence				
Non-pregnant women				
Urban	2114	12.2 [11.00, 13.49]	0.63	12.0 [9.2, 15.0]
Rural	3127	13.5 [12.87, 14.26]	0.35	11.3 [6.7, 18.0]
Pregnant women				
Urban	402	12.8 [10.64, 15.04]	1.12	10.8 [6.3, 17.1]
Rural	597	14.1 [12.53, 15.62]	0.79	11.9 [7.1, 18.8]
Zone				
Non-pregnant women				
North Central	800	11.7 [10.42, 13.01]	0.66	11.1 [8.4, 14.3]
North East	824	17.9 [15.68, 20.09]	1.12	17.1 [13.4, 21.6]
North West	943	20.9 [19.47, 22.36]	0.73	20.1 [15.9, 25.0]
South East	871	6.3 [5.46, 7.20]	0.44	5.8 [4.2, 7.9]
South South	892	5.1 [4.18, 6.00]	0.46	4.6 [3.3, 6.4]
South West	911	5.9 [4.73, 7.12]	0.61	5.4 [3.9, 7.4]
Wealth Quintile				
Non-pregnant women				
Lowest	921	16.4 [14.66, 18.18]	0.90	14.5 [9.4, 21.3]
Second	875	15.8 [14.27, 17.40]	080	13.9 [9.0, 20.6]
Middle	1061	12.0 [10.50, 13.46]	0.75	10.3 [6.4, 15.7]
Fourth	1193	11.3 [10.03, 12.52]	0.63	9.6 [6.0, 14.7]
Highest	1170	11.0 [9.90, 12.17]	0.58	9.5 [5.8, 14.5]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

The contribution of vegetable oil to the total usual energy intake of children aged 24-59 months was similarly found to be 14.5 percent (**Table 145**).

Table 145. Contribution of vegetable oil to total usual energy intake of children

	% Contribution to energy intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	14.5 [13.90, 15.17]	0.32	12.4 [7.4, 19.2]
Sex				
Male	1722	14.4 [13.38, 15.41]	0.52	14.0 [10.0, 18.3]
Female	1634	13.8 [12.86, 14.68]	0.46	12.2 [7.9, 18.0]
Residence				
Urban	1385	12.8 [11.58, 14.06]	0.63	12.3 [9.0, 16.1]
Rural	1971	15.0 [14.15, 16.05]	0.48	12.8 [7.6, 20.1]

1For children, the denominator is usual energy intake
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Wheat Flour

Wheat flour is commonly used in the baking industry to make bread and other food products (e.g. biscuits, doughnuts, cakes, meat pies). According to Femi (2020), wheat flour is consumed everyday as bread, biscuits, cakes. Over five million tons of the product was consumed in 2020. However, in some households especially northern homes, wheat flour is used to make locally produced pasta (Taliya), fried pastries, and local foods, such as alkubus and guraza. This survey assessed the use of wheat flour at home and the results is provided in this report. The utilization of wheat flour to produce wheat-based confectionaries processed outside the home, usually by vendors was covered in the 24-hour recall section of the questionnaire and is presented in the format of usual intake and contribution to energy.

Figure 20 presents the coverage indicators for wheat flour nationally among non-pregnant WRA (15-49 years old). The proportion of households of the sampled non-pregnant women that consumed wheat flour in any form at home was 28 percent and those that purchased it was 25 percent. At the same time, only 13 percent of the households of the sampled women of reproductive age consumed wheat flour that was branded, labelled as fortified and fortified (in any amount). However, the result for these latter three indicators may be underestimated as 10 percent of the households of the respondents could not report the brand of the consumed wheat flour. Also, the remaining 72 percent that did not use it at home does not mean that the households did not consume wheat flour rather they consumed wheat flour products (i.e., bread, confectionaries) that are vendor processed.

These results reveal that fortification of wheat flour is currently reaching at least 13 percent of households of the sampled respondents but has potential to reach up to 28 percent if all the wheat flour consumed at home is known, branded, and fortified (**Figure 20**). It could also reach much more if wheat flour used in other vendor-prepared forms outside homes (pastries, confectionaries, etc) is fortified. However, while 13 percent of households of the sampled women consumed branded wheat flour (and 10 percent were unknown), 4 percent consumed unbranded wheat flour and thus could not be reached with large-scale food fortification.

Unknown and unbranded wheat flour could come from two sources. One is likely because of retailers downsizing and repackaging the common 50kg bag into local measures with no brand identity. At the point of sales of the repackaged wheat flour, brand identity is lost, and consumers could not tell which brand they buy and use. Also, in Nigeria, wheat flour is mainly processed at large industrial scale, but also at cottage scale in the north where it is locally grown although in small quantity. These products are usually unrefined and can also be processed at home for local dishes such as 'swallow', local pasta (Taliya), and guraza. With these findings, only wheat flour with brand information was linked to the fortification secondary data.

Furthermore, the similarity in the proportion of households of the sampled individuals that consumed food that is branded, labelled as fortified and fortified are indicators that most of the producers of wheat flours that are branded are in fact labelling and fortifying their products.

Across residence sector (**Table 146**), the proportion of households of the sampled non-pregnant women that consumed wheat flour was higher (40 percent) in urban than those from the rural (18 percent). The same trend was found for the proportion of households of sampled non-pregnant women that consumed wheat flour that was purchased, branded, labelled as fortified and fortified (**Table 146**). Contrarily, the proportion of households of the non-pregnant women that consumed unbranded wheat flour was higher in the rural than urban.

Within the zones, proportion of households of the sampled non-pregnant women that consumed wheat flour was found highest in the North East (44 percent) and North West (41 percent), followed by South West (29 percent). In the other zones, proportion households of the sampled non-pregnant women that consumed wheat flour was between 9 and 13 percent (**Table 146**).

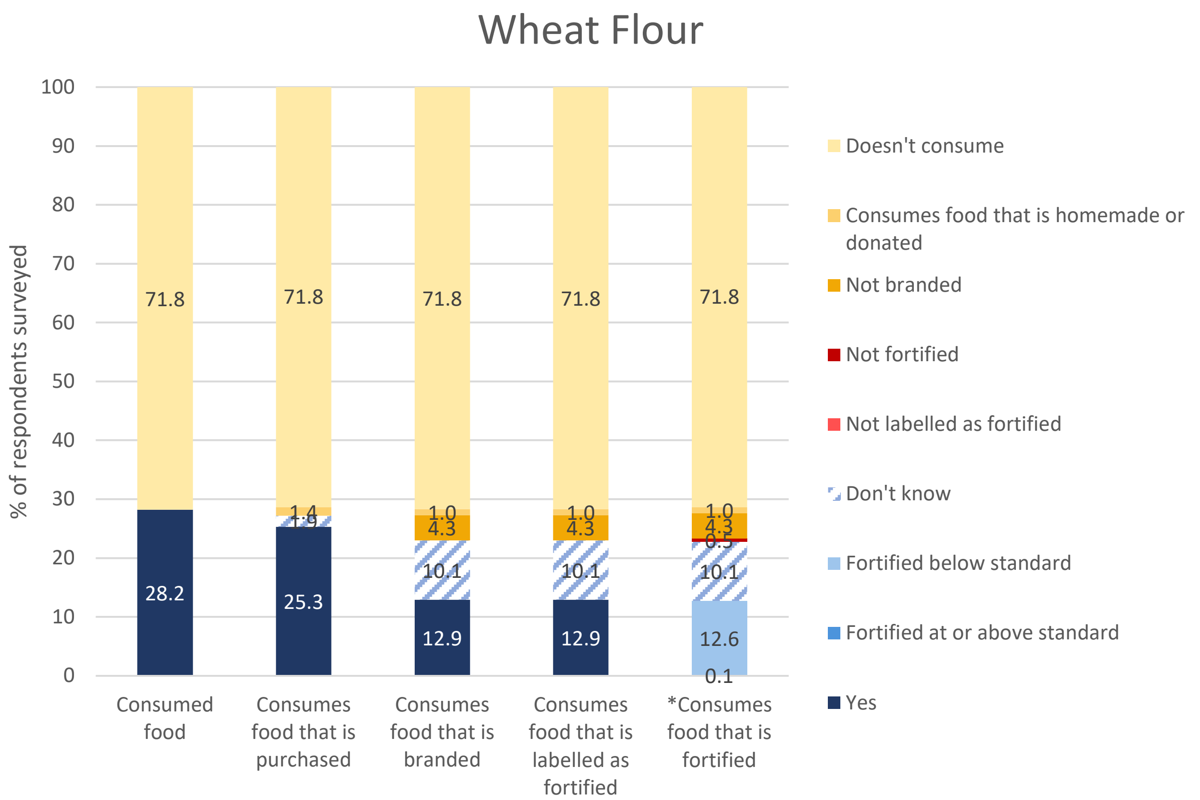


Figure 20. Percentage of Non-Pregnant Women Whose Households Consumed Wheat Flour (purchased, branded, labelled as fortified and fortified) at National Level
Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response
Unweighted sample size for all respondents
Differences across groups were not tested statistically.
Data is missing for 22 non-pregnant women.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status by brand

Table 146. Percentage of Non-Pregnant Women Whose Households Consumed Wheat Flour (purchased, branded, labelled as fortified and fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2, 4]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified[2, 4]		
					Consume food that is branded[2, 4]	Unbranded		At standard	Below standard	Not fortified
		% [95%CI]								
National[3]										
Non-pregnant women	5281	28.2[24.3, 32.2]	25.3[21.3, 29.3]	17.2[14.0, 20.3]	10.1[8.5, 11.7]	0	12.9[10.1, 15.8]	0.1[0.0, 0.2]	12.6[9.9, 15.4]	0
Residence		P<0.001***								
Urban	2156	40.1[33.5, 46.6]	36.5[29.8, 43.2]	27.2[21.9, 32.4]	11.5[9.2, 13.8]	0	21.2[16.3, 26.1]	0.2 [0.0, 0.4]	20.6[15.9, 25.4]	0
Rural	3125	18.0[14.6, 21.3]	15.6[12.1, 19.0]	8.5[6.4, 10.6]	8.9[6.6, 11.2]	0	5.7 [3.9, 7.4]	0	5.6[3.9, 7.4]	0
Zone		P<0.001***								
North Central	857	12.7[9.1, 16.4]	8.8[5.6, 12.1]	6.8[4.3, 9.4]	5.2[2.0, 8.5]	0	3.5[1.7, 5.2]	0	3.5 [1.7, 5.2]	0
North East	830	44.3[34.3, 54.2]	40.6[30.8, 50.4]	25.1[16.6, 33.6]	19.1[14.4, 23.7]	0	21.5[14.3, 28.7]	0	21.5[14.3, 28.7]	0
North West	944	40.5[30.2, 50.8]	38.6[27.9, 49.3]	26.0[17.6, 34.4]	13.6[9.6, 17.5]	0	21.7[14.0, 29.5]	0	21.3 [13.9, 28.8]	0
South East	855	9.9[7.2, 12.6]	7.7[5.3, 10.0]	4.7[2.9, 6.5]	4.8[3.2, 6.3]	0	2.0[1.1, 3.0]	0	1.7 [0.9, 2.6]	0
South South	888	9.2[5.7, 12.8]	7.1[3.9, 10.3]	6.0[3.1, 8.9]	2.5[1.3, 3.6]	0	4.8[2.2, 7.5]	0	4.7 [2.1, 7.2]	0
South West	907	28.7[24.3, 33.0]	24.6[20.4, 28.8]	17.9[14.7, 21.2]	8.2[6.1, 10.3]	0	9.0[6.9, 11.1]	0.6[0.1, 1.2]	8.2[6.2, 10.3]	0
Wealth quintile		P<0.001***								
Lowest	1081	19.1[14.3, 24.0]	17.1[12.2, 22.0]	7.6[5.1, 10.1]	10.3[6.7, 13.9]	0	5.6[3.6, 7.5]	0	5.6 [3.6, 7.5]	0
Second	1111	25.3[19.5, 31.2]	24.0[18.2, 29.8]	14.4[9.2, 19.7]	10.8[7.8, 3.8]	0	11.5[6.8, 16.2]	0.1 [0.0, 0.3]	11.4 [6.7, 16.1]	0
Middle	1100	30.5[24.6, 36.5]	26.9[20.7, 33.2]	20.1[14.6, 25.6]	9.9[7.3, 12.5]	0	15.2[9.8, 20.6]	0.0 [0.0, 0.1]	15.2 [9.8, 20.6]	0
Fourth	997	33.3[28.2, 38.5]	28.7[23.5, 33.9]	20.8[16.6, 25.1]	11.1[8.4, 13.7]	0	15.0[11.1, 19.0]	0.3 [0.0, 0.7]	14.2 [10.5, 17.9]	0
Highest	970	35.3[28.0, 42.6]	31.7[24.3, 39.1]	25.0[19.6, 30.4]	8.4[4.2, 12.5]	0	18.7[14.2, 23.3]	0.1 [0.0, 0.3]	18.0 [13.7, 22.4]	0

1 Number of respondents.
2 Sample weights are applied to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.

The proportion of households of sampled non-pregnant women that consumed all-purpose flour as their main type of flour was 59 percent followed by 16 percent and 15 percent of them that reported refined wheat flour and whole wheat flour respectively (**Figure 21**). Low proportion of households of the sampled non-pregnant women (6 percent) were unable to report the type of wheat flour used in their households.

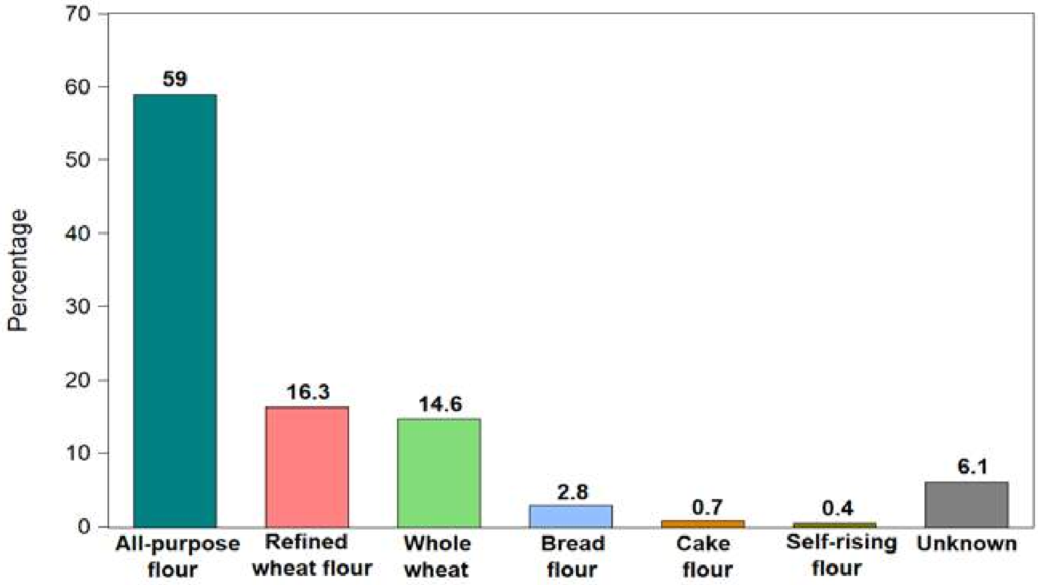


Figure 21. Main types of wheat flour used in the household among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HH (unweighted sample size for women = 1226)
Data are weighted to account for survey design and non-response
The type was classified as "unknown" when the respondent could not report the type of food vehicle used in the household.

The proportion of households of the sampled non-pregnant women that consumed Dangote wheat flour as their main brand was 22 percent while those that reported Bua wheat flour as their main brand was 15 percent (**Figure 22**).

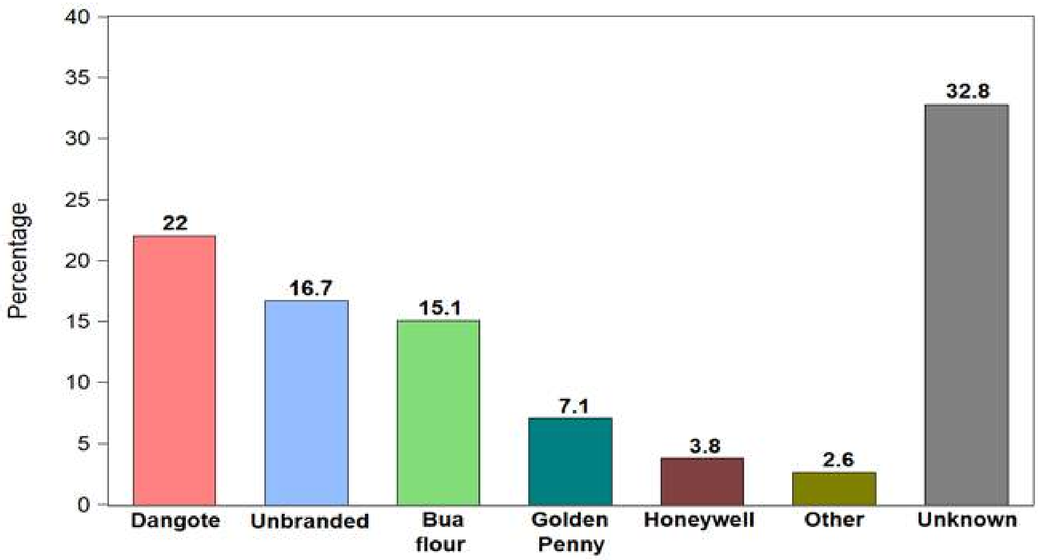


Figure 22. Brand of wheat flour obtained the last time among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HH and the food vehicle was not "homemade" (unweighted sample size for women = 1095)
The brand was classified as "unknown" when the respondent could not report the brand of food vehicle used in the HH.

Usual intake of Wheat Flour

As shown in **Table 147**, the mean usual intake of wheat flour among non-pregnant women is 39.0 grams. Pregnant women have a usual intake of 35.0 grams. A wide gap in consumption was observed between non-pregnant women living in urban (57.4 grams) and rural (25.2 grams) areas, as well as pregnant women living in urban (49.1 grams) and rural (27.5 grams) areas. Across the zones, women in the southern zones reported a comparatively higher intake of wheat flour when compared to women from the northern zones and generally, there was an increase in the usual intake of wheat flour as the wealth quintile increased.

Table 147. Usual intake of wheat flour (raw weight, grams) of women

	Wheat Flour (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	39.0 [35.1, 42.9]	2.0	32.0 [13.3, 57.1]
NPNL[3]	4544	38.6 [34.5, 42.6]	2.0	31.6 [13.3, 56.5]
Lactating women[4]	697	41.7 [34.7, 48.8]	3.6	34.2 [13.9, 61.3]
Pregnant women	999	35.0 [29.5, 40.6]	2.8	27.7 [11.5, 51.4]
Residence				
Non-pregnant women				
Urban	2114	57.4 [51.0, 63.7]	3.2	52.6 [33.0, 76.3]
Rural	3127	25.2 [22.0, 28.5]	1.6	18.5 [7.8, 36.4]
Pregnant women				
Urban	402	49.1 [38.7, 59.6]	5.3	44.7 [25.3, 67.7]
Rural	597	27.5 [21.6, 33.4]	3.0	19.7 [8.0, 39.9]
Zone				
Non-pregnant women				
North Central	800	29.0 [24.4, 33.5]	2.3	21.9 [9.5, 41.7]
North East	824	28.9 [21.9, 36.0]	3.6	21.6 [9.2, 41.6]
North West	943	35.8 [25.2, 46.4]	5.4	28.7 [13.0, 51.5]
South East	871	48.2 [39.4, 57.1]	4.5	43.5 [25.0, 66.0]
South-South	892	43.0 [33.6, 52.3]	4.7	37.4 [19.3, 60.4]
South West	911	55.6 [50.1, 61.0]	2.8	51.0 [31.5, 74.6]
Wealth Quintile				
Non-pregnant women				
Lowest	921	16.1 [12.6, 19.6]	1.8	10.4 [4.3, 22.2]
Second	875	23.4 [18.7, 28.2]	2.4	17.2 [7.6, 33.2]
Middle	1061	38.2 [31.5, 44.8]	3.4	32.1 [16.5, 53.6]
Fourth	1193	49.3 [43.0, 55.6]	3.2	44.3 [25.3, 67.6]
Highest	1170	62.4 [57.0, 67.7]	2.7	57.9 [37.7, 82.2]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

The usual wheat flour intake of children aged 24-59 months is 26.0 grams. There was also a wide difference in intake when data was disaggregated by residence as shown in urban (43.4 grams) and rural (17.1 grams) dwellers (**Table 148**).

Table 148. Usual intake of wheat flour (raw weight, grams) of children

	Wheat Flour (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	26.0 [22.9, 29.2]	1.6	20.3 [8.5, 37.4]
Sex				
Male	1722	26.9 [23.3, 30.4]	1.8	20.6 [7.5, 39.5]
Female	1634	25.1 [21.0, 29.1]	2.1	20.0 [9.5, 35.2]
Residence				
Urban	1385	43.4 [39.0, 47.9]	2.2	39.4 [25.9, 56.6]
Rural	1971	17.1 [14.2, 20.0]	1.5	11.8 [5.0, 23.8]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Contribution of Wheat Flour to energy intake

As shown in **Table 149**, the mean usual contribution of energy from wheat flour to overall dietary energy was found to be 8.2 percentfor non-pregnant women and 7.1 percent for pregnant women. There were wide differences in the contribution between non-pregnant women and pregnant women in urban and rural dwellers reflecting higher volume of utilization and consumption in urban areas irrespective of pregnancy status. There was comparatively higher contribution for women in the southern zones than in the northern zones. There was an increase in the contribution of wheat flour to dietary energy as the wealth quintile increased.

Table 149. Contribution of wheat flour to total usual energy intake of women

	% Contribution to energy intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	8.2 [7.4, 9.0]	0.4	6.7 [2.8, 12.0]
NPNL[3]	4544	8.2 [7.4, 9.1]	0.4	6.8 [2.8, 12.1]
Lactating women[4]	697	7.9 [6.6, 9.3]	0.7	6.5 [2.6, 11.7]
Pregnant women	999	7.1 [6.1, 8.2]	0.5	6.3 [2.6, 11.3]
Residence				
Non-pregnant women				
Urban	2114	12.2 [11.0, 13.4]	0.6	11.3 [7.1, 16.3]
Rural	3127	5.2 [4.5, 5.9]	0.3	3.8 [1.6, 7.5]
Pregnant women				
Urban	402	9.8 [8.1, 11.6]	0.9	10.3 [5.9, 13.9]
Rural	597	5.7 [4.5, 6.9]	0.6	4.5 [1.9, 8.7]
Zone				
Non-pregnant women				
North Central	800	6.5 [5.5, 7.4]	0.5	4.9 [2.1, 9.3]
North East	824	6.4 [4.7, 8.0]	0.8	4.8 [2.0, 9.2]
North West	943	7.3 [5.1, 9.4]	1.1	5.8 [2.6, 10.4]
South East	871	9.6 [7.8, 11.3]	0.9	8.6 [4.9, 13.1]
South South	892	8.6 [6.8, 10.4]	0.9	7.4 [3.8, 12.1]
South West	911	12.2 [10.8, 13.5]	0.7	11.2 [6.9, 16.3]
Wealth Quintile				
Non-pregnant women				
Lowest	921	3.5 [2.7, 4.2]	0.4	2.2 [0.9, 4.8]
Second	875	4.9 [3.9, 5.9]	0.5	3.6 [1.6, 7.0]
Middle	1061	8.2 [6.8, 9.5]	0.7	6.9 [3.5, 11.5]
Fourth	1193	10.5 [9.2, 11.8]	0.7	9.4 [5.3, 14.4]
Highest	1170	12.9 [11.9, 13.8]	0.5	11.9 [7.7, 17.0]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

As shown in **Table 150**, the contribution of wheat flour to the total usual energy intake of children aged 24-59 months was found to be 8.3 percent which is similar to that of women. There were only slight differences between boys and girls and wide differences in residence with higher contributions among children living in urban areas (13.9 percent) compared to rural dwellers (5.5 percent).

Table 150. Contribution of wheat flour to total usual energy intake of children

	% Contribution to energy intake[1]			
	N[2]	Mean [95% CI][3]	SE	Median [25-75th]
National	3356	8.3 [7.4, 9.3]	0.5	6.8 [2.8, 12.1]
Sex				
Male	1722	8.4 [7.3, 9.6]	0.6	6.9 [2.5, 12.6]
Female	1634	8.2 [7.1, 9.4]	0.6	6.7 [3.2, 11.7]
Residence				
Urban	1385	13.9 [12.6, 15.1]	0.6	13.0 [8.8, 18.0]
Rural	1971	5.5 [4.6, 6.5]	0.5	4.0 [1.7, 7.8]

1 For children, the denominator is usual energy intake
2 Number of respondents
3 Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Maize Flour

Maize is a staple in Nigeria, especially in the north where it is processed for both intermediate and finished diverse local dishes. In intermediate form, maize flour is commonly used in preparing local dishes like 'swallow' tuwo masara, pap, etc.

Figure 23 presents the coverage indicators for maize flour nationally among non-pregnant WRA (15-49 years old). The proportion of households of the sampled non-pregnant women that consumed maize flour in any form was 57 percent while those that purchased it was 29 percent and homemade 27 percent. At the same time, the proportion of households of the sampled non-pregnant women that consumed branded, labelled as fortified, and fortified at any level was very low, (between 0 and <1 percent) nationally. However, the proportion of households of the sampled respondent that reported that they consumed homemade, unbranded, and unknown was 27 percent, 16 percent and 13 percent respectively thus about all (56 percent) of the households of the sampled women that consumed maize flour would not be reached with large-scale food fortification with the target micronutrients (vitamin A, iron, and zinc).

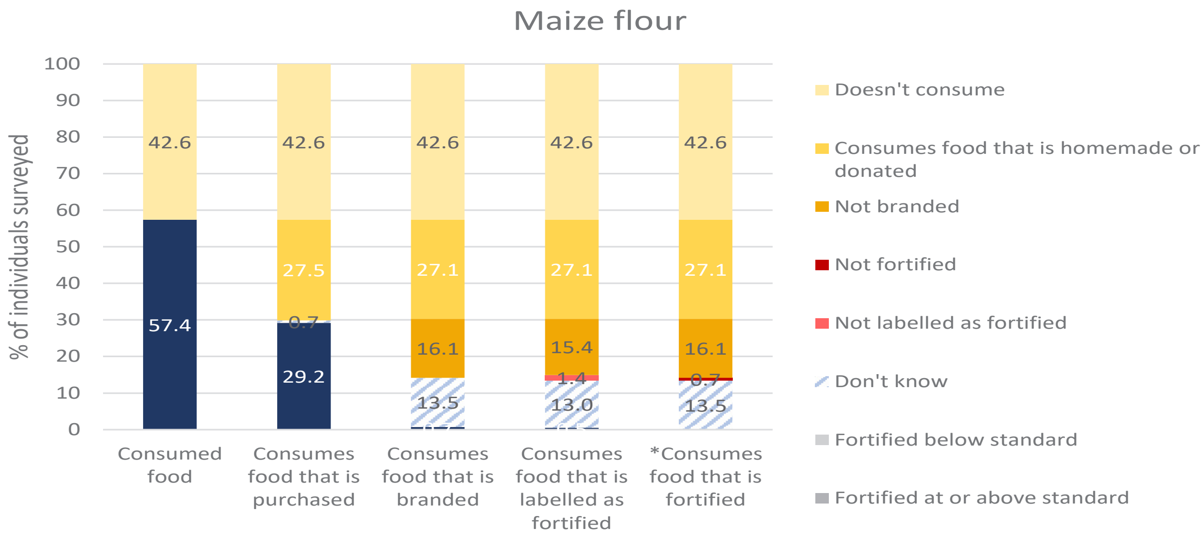


Figure 23. Percentage of Non-Pregnant Women Whose Households Consumed Maize Flour (purchased, branded, labelled as fortified and fortified) at National Level
Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Unweighted sample size for all respondents
Differences across groups were not tested statistically.
Data is missing for 22 non-pregnant women.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status by brand

Across the residence sector, the proportion of households of the sampled non-pregnant women that consumed maize flour as well as consumed homemade maize flour was higher in rural than urban (**Table 151**). Also, within the zones, the proportion of households of the sampled individuals that consumed maize flour was higher in the north (80 percent) than in the south (≤20 percent).

Large scale fortification of maize flour seems very low (almost nil) in Nigeria probably because most of the maize flour are processed either at home or small/cottage-scale, which makes them fall out of the large-scale food fortification programme. However, considering the high consumption (81-85 percent) in the north, where maize is a staple, other means of reaching the households with fortified maize flour may need to be considered. As observed in this survey, a possible route could be biofortified maize which holds promise especially in the northern part of the country (**Figure 14 and 15**).

Table 151. Percentage of Non-Pregnant Women Whose Households Consumed Maize Flour (purchased, branded, labelled as fortified and fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2,]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified[2, 4]		
					Unknown	Unbranded		At standard	Below standard	Not fortified
					% [95%CI]					
National[3]										
Non-pregnant women aged 15-49 years	5281	57.4[53.8, 61.0]	29.2[26.2, 32.3]	0.7[0.0, 1.4]	13.4[11.5, 15.3]	16.1[13.7, 18.6]	0.5[0.0, 1.1]	0	0.0[0.0-0.0]	0.7[0.0-1.3]
Residence		P=0.023*								
Urban	2156	51.2[44.6, 57.9]	30.4[25.2-35.7]	1.1[0.0, 2.5]	13.6[10.1, 17.1]	16.7[13.8, 19.7]	0.8[0.0-2.2]	0	0	1.1[0.0-2.5]
Rural	3125	62.7[56.9, 68.5]	28.2[24.0-32.4]	0.4[0.1, 0.6]	13.3[10.7-15.9]	15.6[11.7, 19.5]	0.2[0.0-0.3]	0	0	0.4[0.1-0.6]
Zone		P<0.001***								
North Central	857	84.4[78.6, 90.2]	40.2[30.8-49.6]	0.2[0.0, 0.4]	9.0[3.5-14.5]	32.1[22.1, 42.1]	0.1[0.0-0.4]	0	0	0.0[0.0-0.1]
North East	830	81.2[74.7, 87.8]	32.3[25.9-38.8]	4.0[0.3, 7.7]	15.0[11.4-18.7]	14.4[9.6, 19.1]	2.6[0.0-6.3]	0	0	4.0[0.3-7.7]
North West	944	84.8[80.0, 89.6]	49.4[43.3-55.6]	0	30.5[25.7-35.2]	20.7[16.9, 24.5]	0.0	0	0	0
South East	855	17.7[12.4, 22.9]	12.4[8.7-16.1]	0.1[0.0, 0.2]	3.1[1.3-4.8]	10.0[6.4, 13.6]	0.1[0.0-0.2]	0	0.1[0.0-0.2]	0
South South	888	7.0[4.7, 9.4]	5.1[3.0-7.2]	0	1.6[0.3-2.9]	3.6[2.0, 5.3]	0.0	0	0	0
South West	907	20.8[14.7, 26.8]	8.8[5.9-11.7]	0.0[0.0, 0.1]	0.8[0.1-1.4]	8.6[5.8, 11.5]	0.0	0	0	0.0[0.0-0.1]
Wealth quintile		P<0.001***								
Lowest	1081	75.7[69.5, 81.9]	32.6[27.7-37.4]	1.0[0.3, 1.8]	19.3[15.8-22.9]	13.3[9.8, 16.7]	0.6[0.0-1.2]	0	0	1.0[0.3-1.8]
Second	1111	67.4[60.8, 74.0]	32.4[27.0-37.8]	0.3[0.0, 0.8]	13.2[9.7-16.6]	20.0[14.9, 25.1]	0.3[0.0-0.7]	0	0	0.3[0.0-0.8]
Middle	1100	52.5[45.4, 59.6]	28.5[22.0-35.0]	1.1[0.0, 2.8]	12.2[8.4-16.0]	15.9[10.7, 21.1]	0.9[0.0-2.5]	0	0	1.1[0.0-2.7]
Fourth	997	49.6[43.1, 56.1]	29.0[23.6-34.4]	0.6[0.0, 1.3]	10.8[7.6-14.0]	19.1[14.5, 23.8]	0.3[0.0-0.9]	0	0	0.6[0.0-1.3]
Highest	970	36.6[28.4, 44.8]	22.3[16.0, 28.7]	0.5[0.0, 1.0]	11.2[6.0-16.3]	11.5[8.2, 14.7]	0.2[0.0-0.5]	0	0.0[0.0-0.1]	0.30.0-0.9]

1 Number of respondents.
2 Sample weights are applied to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.

A high proportion of households of the sampled non-pregnant women (92 percent) consumed white maize as their main type of maize. (**Figure 24**).

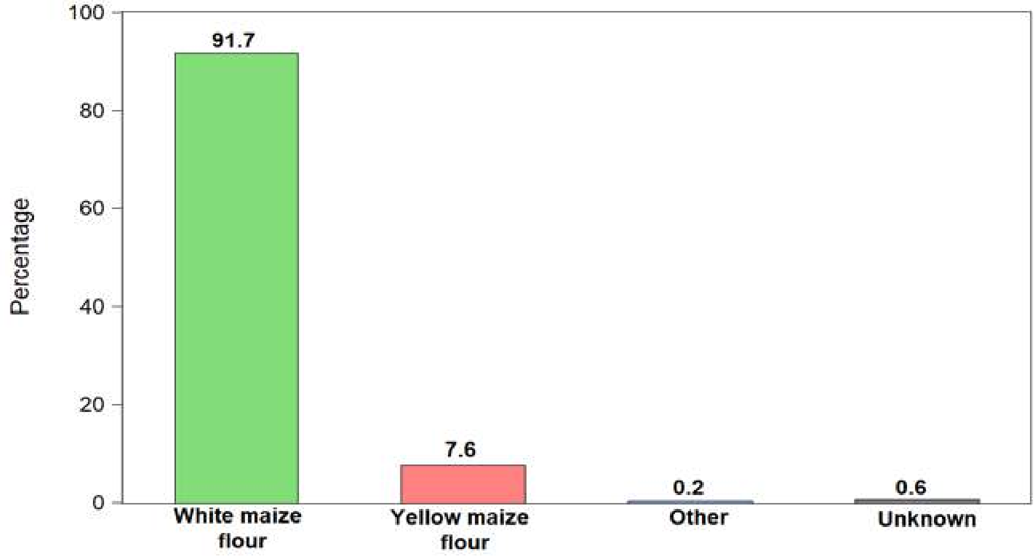


Figure 24. Main type of maize flour used in the household among consumers
Among non-pregnant women (aged 15-49 years) who used the food vehicle in the HH (unweighted sample size for women = 2573)
Data are weighted to account for survey design and non-response.
The type was classified as “unknown” when the respondent could not report the type of food vehicle used in the HH.

As shown in **Figure 25**, very low proportion of households of the sampled non-pregnant women (<2 percent) were able to report the brand of maize flour that they purchased. About 54 percent reported using unbranded maize flour, while 44 percent were unable to report a brand. Maize flour is not commonly produced on large-scale in Nigeria. However, cottage processing, which is unbranded, is widespread. As a result of the lack of information on brands, it will not be possible to link the brand of maize flour to the likely fortification status for almost all the households of the non-pregnant women.

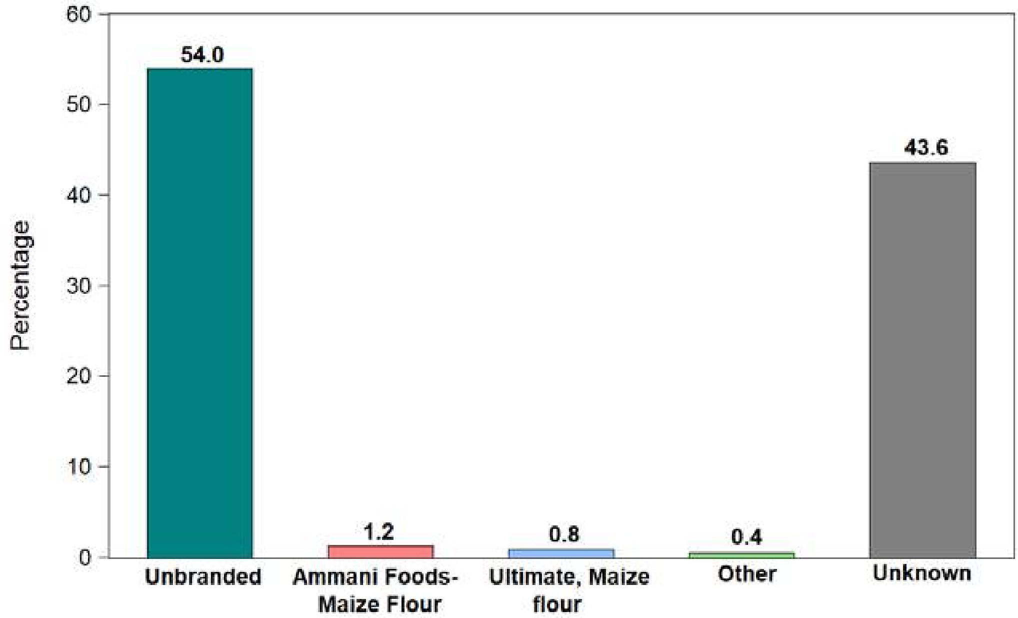


Figure 25. Brand of maize flour obtained the last time among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HH and the food vehicle was not “homemade” (unweighted sample size for women = 1231)
Data are weighted to account for survey design and non-response.
The brand was classified as “unknown” when the respondent could not report the brand of food vehicle used in the HH.

Mean intake of Maize Flour

As shown in **Table 152**, the mean intake of maize flour among non-pregnant women is 44.7 grams. Pregnant women have a usual intake of 49.6 grams, non-lactating women (42.6 grams) and lactating women (57.9 grams) respectively. High differences in maize flour intake were observed between non-pregnant women living in rural (60.5 grams) and urban (24.0 grams) areas, as well as pregnant women in rural (58.1 grams) and urban (33.7 grams) areas. Across the zones, women from northern zones had a higher utilization of maize flour (53.7- 81.8 grams) compared to the southern zones (0.4-2.5 grams). Intake of maize flour was shown to reduce with increased wealth status and thus lowest in the highest wealth quintile (12.6 grams) which implies that wealthier households relied less on maize flour.

Table 152. Mean intake of Maize flour (raw weight, grams) of women

	Maize Flour (grams)		
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	44.7 [39.1, 50.3]	2.8
NPNL[3]	4544	42.6 [37.1, 48.0]	2.8
Lactating women[4]	697	57.9 [46.3, 69.4]	5.9
Pregnant women	999	49.6 [38.2, 61.0]	5.8
Residence			
Non-pregnant women			
Urban	2114	24.0 [18.3, 29.7]	2.9
Rural	3127	60.5 [51.4, 69.6]	4.6
Pregnant women			
Urban	402	33.7 [11.3, 56.1]	11.4
Rural	597	58.1 [44.4, 71.8]	7.0
Zone			
Non-pregnant women			
North Central	800	53.7 [41.2, 66.1]	6.3
North East	824	81.8 [65.4, 98.1]	8.3
North West	943	76.1 [61.3, 90.9]	7.5
South East	871	2.5 [1.1, 3.8]	0.7
South South	892	0.4 [-0.1, 0.9]	0.3
South West	911	2.4 [1.1, 3.7]	0.7
Wealth Quintile			
Non-pregnant women			
Lowest	921	69.6 [57.6, 81.6]	6.1
Second	875	76.7 [63.0, 90.3]	6.9
Middle	1061	43.6 [33.8, 53.3]	5.0
Fourth	1193	28.5 [20.7, 36.3]	4.0
Highest	1170	12.6 [8.9, 16.3]	1.9

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

As shown in **Table 153**, the mean intake of maize flour among children aged 24-59 months was found to be 30.2 grams. There was a comparatively higher intake among children living in rural areas (38.1 grams) compared to urban dwellers (15.0 grams).

Table 153. Mean intake of Maize flour (raw weight, grams) of children

	Maize Flour (grams)		
	N[1]	Mean [95%CI][2]	SE
National	3356	30.2 [25.9, 34.4]	2.2
Sex			
Male	1722	30.5 [25.8, 35.1]	2.4
Female	1634	29.8 [24.7, 34.9]	2.6
Residence			
Urban	1385	15.0 [11.5, 18.6]	1.8
Rural	1971	38.1 [32.0, 44.1]	3.1

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Contribution of Maize Flour to energy intake

As presented in **Table 154 and 155**, the mean contribution of maize flour to overall energy intake was approximately 9 percent for women and children. There were wide differences in the contribution in urban and rural areas, with higher contributions from rural dwellers. For women, across the zones, women from the northern zones had a comparatively higher contribution than women from the southern zones with a general decrease in contribution with increasing wealth.

Table 154. Contribution of Maize flour to total usual energy intake of women

	% Contribution to energy intake		
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	8.6 [7.6, 9.7]	0.5
NPNL[3]	4544	8.4 [7.4, 9.5]	0.5
Lactating women[4]	697	10.0 [8.1, 11.9]	0.9
Pregnant women	999	9.4 [7.6, 11.2]	0.9
Residence			
Non-pregnant women			
Urban	2114	4.8 [3.6, 6.0]	0.6
Rural	3127	11.6 [9.9, 13.2]	0.8
Pregnant women			
Urban	402	5.8 [2.5, 9.1]	1.7
Rural	597	11.4 [9.1, 13.6]	1.2
Zone			
Non-pregnant women			
North Central	800	11.5 [9.0, 14.0]	1.3
North East	824	16.9 [13.6, 20.2]	1.7
North West	943	13.5 [10.9, 16.0]	1.3
South East	871	0.5 [0.2, 0.8]	0.1
South South	892	0.1 [-0.0, 0.1]	0.0
South West	911	0.5 [0.2, 0.8]	0.1
Wealth Quintile			
Non-pregnant women			
Lowest	921	13.5 [11.1, 15.9]	1.2
Second	875	14.3 [12.0, 16.6]	1.2
Middle	1061	8.7 [6.8, 10.6]	1.0
Fourth	1193	5.5 [4.0, 7.0]	0.8
Highest	1170	2.5 [1.7, 3.2]	0.4

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 155. Contribution of maize flour to total usual energy intake of children

		% Contribution to energy intake[1]	
	N[2]	Mean [95%CI][3]	SE
National	3356	9.3 [7.9, 10.6]	0.7
Sex			
Male	1722	9.0 [7.6, 10.3]	0.7
Female	1634	9.6 [8.0, 11.2]	0.8
Residence			
Urban	1385	4.2 [3.2, 5.2]	0.5
Rural	1971	11.9 [10.0, 13.8]	0.9

1For children, the denominator is usual energy intake
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Semolina Flour

Semolina flour is a highly industrialized wheat-based flour in Nigeria, it is commonly prepared as 'swallow' and consumed with choice soup. 'Swallow' is a commonly used term for common staples (cassava, yam, maize, etc.) cooked into thick 'swallowable' meal, and eaten with choice soup in Nigeria.

Figure 26 presents the coverage indicators for semolina flour nationally among non-pregnant WRA (15-49 years old). The proportion of households of the sampled non-pregnant women that consumed semolina flour in any form at home was 29 percent and those that purchased it was 26 percent. All the same, 23 percent of the households of the sampled individuals consumed semolina flour that was branded, labelled as fortified and fortified (in any amount). Contrarily, the proportion of households of the sampled women of reproductive age that consumed unbranded (<1 percent) and unknown semolina (5 percent) was relatively low. This is likely because all semolina flours are made in factories through an industrialized process on large scale basis with no home- or cottage-level production. Also, they come in 1 or 2 kg-packs that neither needs downsizing nor re-packing, hence there is low percentage of unknown or unbranded products. The few that reported unbranded could be that the respondents did not simply know the brands consumed.

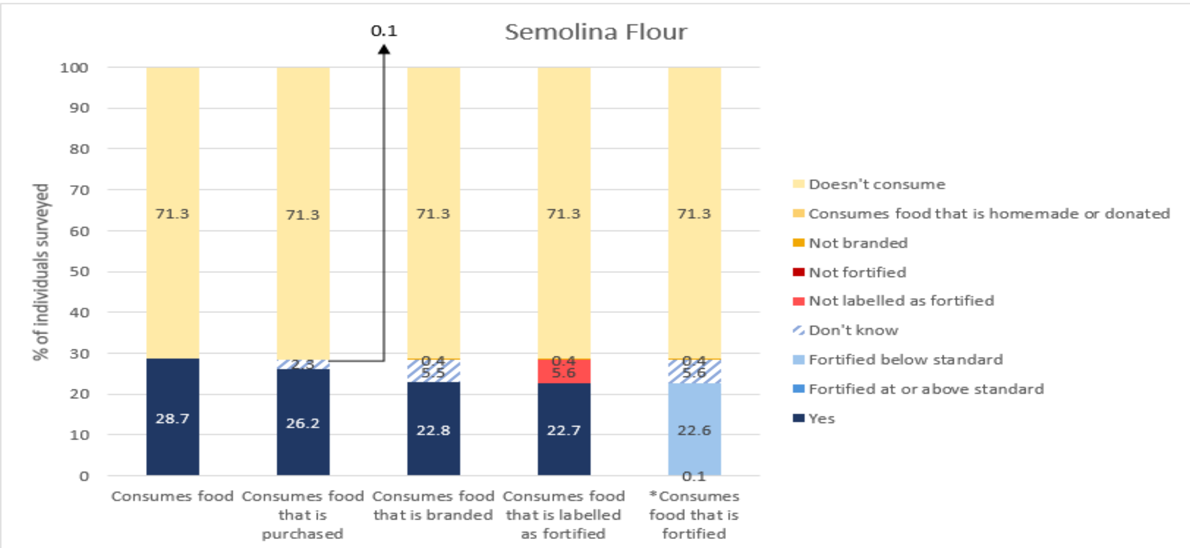


Figure 26. Percentage of Non-Pregnant Women Whose Households Consumed Semolina Flour (purchased, branded, labelled as fortified and fortified) at National Level
Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Unweighted sample size for all respondents.
Differences across groups were not tested statistically.
Data is missing for 22 non-pregnant women.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status by brand

Furthermore, the similarity in the proportion of households of the sampled women that consumed semolina flour that is branded, labelled as fortified and fortified are indicators that most of the producers of semolina flours that are branded are in fact labelling and fortifying their products.

Across the residence sector, semolina is predominantly an urban dwellers' food as the proportion of households of the sampled non-pregnant women from urban sector that consumed semolina was almost half (49 percent) compared to those from the rural sector, which was12 percent. It is also consumed more in households of the rich (57 percent) than those of the poor (5 percent) (**Table 156**).

Within the zones, the proportion of households of the sampled non-pregnant women that consumed semolina flour was highest (80 percent) in the South West followed by North Central (36 percent), and low in the other zones (10-24 percent). The high percentage in the South West may be because of easy access to the flour in cities, such as Lagos, where semolina meal ('swallow') is readily available in eateries and restaurants. The low coverage in other states could be due to competing 'swallows' prepared from root and tubers (i.e., fufu and gari).

These results reveal that fortification of semolina is currently reaching 23 percent of households with likely limited potentials to reach more because there are other alternatives to semolina consumption at home. In the north, where the consumption was found low, the common swallow is Tuwo. Also, in the south-south and South East, cassava-based swallows like fufu, Garri are the most common swallows hence, the people are not likely to consider semolina. In terms of cost and affordability, semolina is more expensive and may not be affordable by all.

Table 156 shows that consumption was found more among the households of the rich and the urban dwellers. Fortification of these alternative swallows (Tuwo, fufu, garri, and pounded yam) from other crops may be worth considering, which could come from biofortification of the base crops, especially cassava and maize. These are already in place in Nigeria, but the value chain may need to be strengthened for household reach.

Table 156. Percentage of Non-Pregnant Women Whose Households Consumed Semolina Flour (purchased, branded, labelled as fortified and fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2, 4]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified[2, 4]		
					Unknown	Unbranded		At standard	Below standard	Not fortified
						% [95%CI]				
National[3]										
Non-pregnant women aged15- 49 years	5281	28.7[25.4, 32.1]	26.2[23.2, 29.3]	22.8[19.9, 25.7]	5.5[4.3, 6.7]	0.5[0.2, 0.7]	22.7[19.8, 25.6]	0.1[0.0, 0.2]	22.6[19.7, 25.5]	0
Residence		P<0.001***								
Urban	2156	48.5[42.4, 54.6]	45.2[39.5, 50.9]	40.5[34.8, 46.2]	7.5[5.3, 9.6]	0.5[0.2, 0.8]	40.3[34.6, 46.0]	0.1[0.0, 0.2]	40.2[34.5, 45.9]	0
Rural	3125	11.5[8.5, 14.6]	9.7[6.9, 12.5]	7.3[5.0, 9.6]	3.7[2.6, 4.8]	0.4[0.1, 0.8]	7.3[5.0, 9.6]	0.1[0.0, 0.2]	7.2[5.0, 9.5]	0
Zone		P<0.001***								
North Central	857	36.4[28.0, 44.8]	33.4[25.0, 41.7]	26.9[19.5, 34.3]	8.0[4.8, 11.1]	1.5[0.3, 2.8]	26.9[19.5, 34.3]	0.1[0.0, 0.2]	26.8[19.5, 34.2]	0
North East	830	17.0[4.3, 29.7]	12.7[3.4, 22.1]	10.4[2.3, 18.4]	6.6[1.8, 11.5]	0.0	10.4[2.3, 18.4]	0	10.4[2.3, 18.4]	0
North West	944	10.3[5.8, 14.8]	9.7[5.4, 14.0]	8.1[3.9, 12.3]	2.0[0.4, 3.7]	0.2[0.0, 0.4]	7.8[3.9, 11.8]	0	7.8[3.9, 11.8]	0
South East	855	23.5[17.6, 29.4]	19.2[13.8, 24.6]	15.5[11.6, 19.3]	7.8[4.5, 11.1]	0.2[0.0, 0.5]	15.2[11.4, 19.1]	1.3[0.4, 2.3]	14.1[10.4, 17.8]	0
South South	888	13.6[9.2, 18.1]	10.3[6.1, 14.4]	8.5[4.5, 12.5]	4.9[3.3, 6.6]	0.2[0.0, 0.5]	8.5[4.5, 12.5]	0	8.5[4.5, 12.5]	0
South West	907	79.5[71.5, 87.5]	77.5[69.3, 85.7]	71.2[63.4, 79.1]	7.4[4.9, 9.9]	0.8[0.1, 1.4]	71.2[63.4, 79.1]	0	71.2[63.3, 79.0]	0
Wealth quintile		P<0.001***								
Lowest	1081	4.7[2.8, 6.5]	3.8[2.1, 5.5]	2.8[1.4, 4.2]	1.8[0.9, 2.7]	0.1[0.0, 0.2]	2.8[1.4, 4.2]	0.0[0.0, 0.2]	2.7[1.4, 4.1]	0
Second	1111	11.8[8.4, 15.2]	10.3[7.1, 13.5]	8.1[5.5, 10.7]	3.4[2.1, 4.6]	0.3[0.0, 0.6]	8.1[5.5, 10.7]	0[0.0, 0.1]	8.1[5.5, 10.7]	0
Middle	1100	33.4[28.8, 37.9]	31.2[26.6, 35.7]	26.0[21.9, 30.2]	6.4[4.5, 8.4]	0.9[0.2, 1.5]	26.0[21.9, 30.2]	0.2[0.0, 0.4]	25.8[21.7, 30.0]	0
Fourth	997	45.7[40.5, 50.9]	40.8[35.6, 46.0]	36.4[31.4, 41.3]	8.6[5.5, 11.8]	0.7[0.0, 1.4]	36.3[31.4, 41.2]	0.1[0.0, 0.3]	36.2[31.3, 41.2]	0
Highest	970	57.0[50.9, 63.1]	53.2[47.2, 59.3]	48.3[41.6, 55.0]	8.1[5.1, 11.2]	0.4[0.0, 0.9]	47.8[41.2, 54.4]	0.2[0.0, 0.5]	47.6[41.0, 54.2]	0

1 Number of respondents.
2 Sample weights are applied to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.

The proportion of households of the sampled non-pregnant women that consumed wheat-based type of wheat flour as the main type was over half (65 percent) while wheat-maize based was reported by 27 percent of the women (**Figure 27**). Processing of semolina flour is highly industrialized and there is no cottage-level processing. Thus, there is not much unbranded flour in the market.

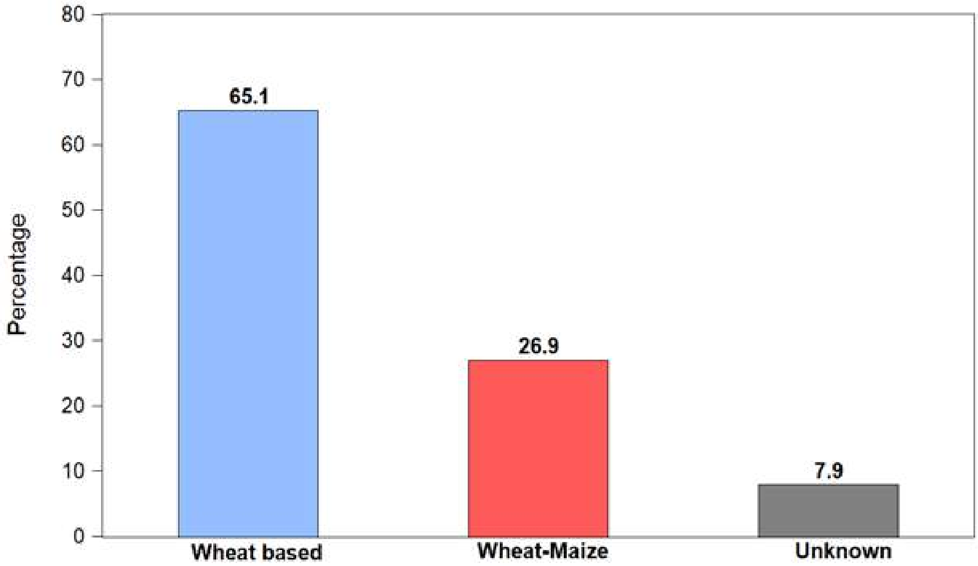


Figure 27. Main type of semolina flour used in the household among consumers
Among non-pregnant women (aged 15-49 years) who used the food vehicle in the HH (unweighted sample size for women = 1578)
Data are weighted to account for survey design and non-response
The type was classified as "unknown" when the respondent could not report the type of food vehicle used in the HH.

Over half of the households of the sampled non-pregnant women (55 percent) consumed mainly Golden penny brand of semolina flour (**Figure 28**). This was followed by 13 percent of the women that reported Dangote and Honey well each. Low proportion of households of the sampled non-pregnant women (<1 percent) reported consumption of unbranded semolina. This is likely because semolina flour processing is highly industrialized and packaged in sizes that do not need to be downsized or re-packaged. It gets to the consumers in its original packages with the label.

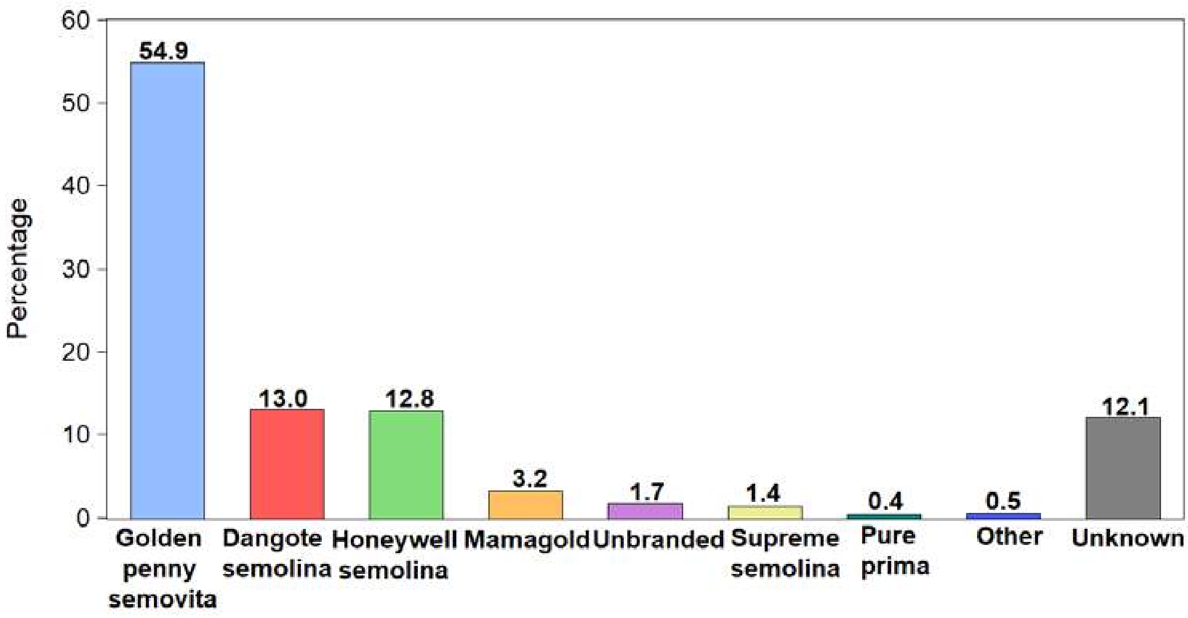


Figure 28. Brand of semolina flour obtained the last time among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HH and the food vehicle was not "homemade" (unweighted sample size for women = 1460)
Data are weighted to account for survey design and non-response
The brand was classified as "unknown" when the respondent could not report the brand of food vehicle used in the HH.

Mean intake of Semolina Flour

As shown in **Table 157**, the mean intake of semolina flour of women in was approximately 4 grams across all groups. Wide differences were observed between women living in urban or rural areas irrespective of their pregnancy status with more utilization among urban dwellers. However pregnant and non-pregnant women living in the urban areas had more semolina flour intake. Women from southwest consumed the highest amount of semolina (13.8 grams). There was generally an increase in semolina flour intake as the wealth quintile increased with women in the lowest and highest quintiles having the smallest (0.04 grams) and highest (8.9 grams) intake respectively.

Table 157. Usual intake of Semolina flour (raw weight, grams) of women

		Semolina Flour (grams)	
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	4.1 [3.2, 5.1]	0.5
NPNL[3]	4544	4.2 [3.2, 5.2]	0.5
Lactating women[4]	697	3.6 [1.7, 5.5]	1.0
Pregnant women	999	4.0 [1.5, 6.5]	1.3
Residence			
Non-pregnant women			
Urban	2114	7.5 [5.5, 9.5]	1.0
Rural	3127	1.5 [0.6, 2.4]	0.5
Pregnant women			
Urban	402	10.1 [3.3, 16.9]	10.1
Rural	597	0.7 [0.2, 1.3]	0.3
Zone			
Non-pregnant women			
North Central	800	4.9 [2.1, 7.7]	1.4
North East	824	1.3 [-0.3, 2.8]	0.8
North West	943	0.8 [-0.0, 1.6]	0.4
South East	871	6.1 [3.1, 9.1]	1.5
South South	892	0.7 [0.1, 1.2]	0.3
South West	911	13.8 [9.5, 18.0]	2.1
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.0 [-0.01, 0.10]	0.03
Second	875	1.4 [0.1, 2.6]	0.6
Middle	1061	2.8 [1.6, 4.0]	0.6
Fourth	1193	6.5 [4.2, 8.7]	1.2
Highest	1170	8.9 [6.5, 11.4]	1.2

1 Number of respondents
2 Sample weights are applied to account for survey design and non-response.
3 Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4 Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

As shown in **Table 158**, the usual semolina flour intake of children aged 24-59 months was found to be 1.7 grams. There were no differences in the contribution by both sex and wide differences in residence, higher contributions were observed in urban areas (3.7 grams).

Table 158. Mean intake of Semolina flour (raw weight, grams) of children.

	Maize Flour (grams)		
	N[1]	Mean [95%CI][2]	SE
National	3356	1.7 [1.0, 2.4]	0.4
Sex			
Male	1722	1.7 [1.1, 2.3	0.3
Female	1634	1.7 [0.3, 3.0]	0.7
Residence			
Urban	1385	3.7 [2.1, 5.4]	0.9
Rural	1971	0.6 [0.2, 1.0]	0.2

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of Semolina Flour to energy intake

The contribution of semolina flour to overall energy intake was found to be less than 1 percent for women across all categories. This was similar for children (**Table 159 and 160**).

Table 159. Contribution of Semolina Flour to total usual energy intake of women

	Semolina Flour (grams)		
	N[1]	Mean [95%CI][2]	SE
National			
Non-pregnant women	5241	0.8 [0.6, 1.0]	0.1
NPNL[3]	4544	0.8 [0.6, 1.0]	0.1
Lactating women[4]	697	0.7 [0.3, 1.0]	0.2
Pregnant women	999	0.6 [0.3, 1.0]	0.2
Residence			
Non-pregnant women			
Urban	2114	1.4 [1.0, 1.8]	0.2
Rural	3127	0.3 [0.1, 0.5]	0.1
Pregnant women			
Urban	402	1.6 [0.7, 2.5]	0.5
Rural	597	0.1 [0.0, 0.2]	0.1
Zone			
Non-pregnant women			
North Central	800	1.0 [0.4, 1.6]	0.3
North East	824	0.4 [-0.1, 1.0]	0.3
North West	943	0.1 [-0.0, 0.3]	0.1
South East	871	1.0 [0.5, 1.6]	0.3
South South	892	0.1 [0.0, 0.19]	0.04
South West	911	2.4 [1.7, 3.1]	0.4
Wealth Quintile			
Non-pregnant women			
Lowest	921	0.0 [-0.00, 0.02]	0.00
Second	875	0.3 [0.04, 0.56]	0.13
Middle	1061	0.7 [0.3, 1.1]	0.2
Fourth	1193	1.2 [0.8, 1.6]	0.2
Highest	1170	1.5 [1.1, 1.9]	0.2

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 160. Contribution of Semolina flour to total usual energy intake of children

		% Contribution to energy intake[1]	
	N[1]	Mean [95%CI][2]	SE
National	3356	0.4 [0.3, 0.6]	0.1
Sex			
Male	1722	0.5 [0.3, 0.6]	0.1
Female	1634	0.4 [0.1, 0.7]	0.1
Residence			
Urban	1385	1.0 [0.6, 1.3]	0.2
Rural	1971	0.2 [0.0, 0.3]	0.1

1For children, the denominator is usual energy intake
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Sugar

Sugar is one of the essential HH food items, highly industrialized, and in the list of mandatory fortifiable vehicles in Nigeria.

Figure 29 presents the coverage indicators for sugar nationally among non-pregnant WRA (15-49 years old). There was a high proportion of households of the sampled non-pregnant women that consumed sugar in any form (88 percent) and purchased it (87 percent). Contrarily, only 22 percent of households of the sampled women consumed sugar that was branded and labelled as fortified while 21 percent fortified (at any level). However, the result for these latter three indicators may be underestimated as over 60 percent of the women came from households where this information was unknown.

High percentage of unbranded and unknown brands of sugar is more likely due to re-packaging in local containers and smaller packs that low-income consumers can afford. Sugars are usually branded because they are industrially produced at large scale. However, at the point of sales, brands are unknown due to repackaging without the label. As a result, it is not possible to link the brand of sugar to the fortification status for over 60 percent of the respondents.

Furthermore, the similarity in the proportion of households of the sampled women that consumed food that is branded, labelled as fortified and fortified are indicators that most of the producers of sugar that are branded are in fact labelling and fortifying the products.

These results reveal that fortification reach with sugar is available for about 22 percent households of the sampled individuals but has the potential to reach over 80 percent of households of the sampled individuals if all the consumed sugar brands are known and confirmed fortified. However, while 22 percent of the households of the sampled women consumed branded sugar (and 28 percent were unknown), 38 percent consumed unbranded sugar and thus their reach with large-scale food fortification could not be assessed.

Across residence sectors and zones, even though the proportion of households of the sampled women that consumed sugar was found high nationally, the proportion was still higher among urban dwellers compared to rural (92 percent vs. 85 percent) with the same trend found for the proportion of households of the sampled women that consumed sugar that was purchased, branded, labelled as fortified and fortified (**Table 161**). Contrarily, the proportion of households of the sampled women that consumed unknown sugar was higher in rural areas compared to urban (32 percent vs. 23 percent) This may be explained by the fact that rural households are more likely to purchase the down-sized and re-packaged sugar that are cheaper and more affordable.

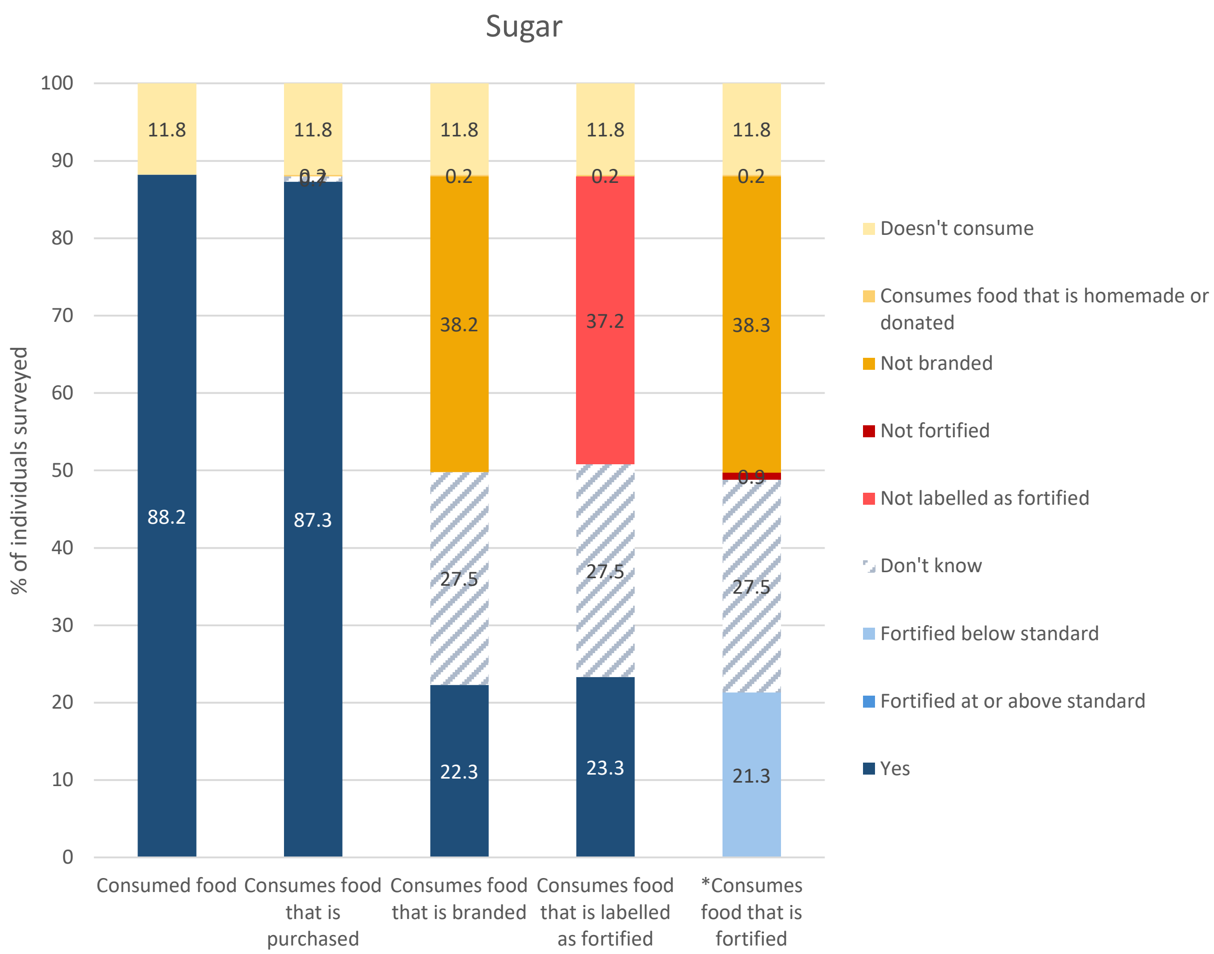


Figure 29. Percentage of Non-Pregnant Women Whose Households Consumed Sugar (purchased, branded, labelled as fortified and fortified) at National Level
Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Unweighted sample size for all respondents.
Differences across groups were not tested statistically.
Data is missing for 22 non-pregnant women.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status by brand

Table 161. Percentage of non-Pregnant Women Whose Households Consumed Sugar (purchased, branded, labelled as fortified and fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2, 4]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified[2, 4]		
					Unknown	Unbranded		At standard	Below standard	Not fortified
		% [95%CI]								
National[3]										
Non-pregnant women aged 15-49 years	5281	88.2[86.3, 90.2]	87.3[85.2, 89.3]	22.3[19.7, 24.9]	27.5[25.2, 29.7]	38.2[35.4, 41.1]	22.2[20.6, 26.0]	0	21.3[18.7, 23.9]	0.9[0.5, 1.2]
Residence		P < 0.0001***								
Urban	2156	92.2[90.3, 94.0]	91.6[89.7, 93.6]	30.8[26.9, 34.7]	22.9[18.9, 26.8]	38.5[34.3,42.7]]	30.7[26.8, 34.6]	0	29.2[25.2, 33.3]	1.4[0.8, 2.1]
Rural	3125	84.8[81.9, 87.8]	83.5[80.5, 86.5]	14.9[12.3, 17.5]	31.5[28.1, 34.9]	38.0[33.5, 42.6]	14.8[12.2, 17.4]	0	14.4[11.9, 17.0]	0.4[0.1, 0.7]
Zone		P = 0.0008***								
North Central	857	95.8[93.8, 97.9]	94.9[92.7, 97.0]	17.2[10.2, 24.2]	13.4[9.7, 17.0]	64.7[56.2, 73.1]	17.9[10.0, 25.8]	0	17.0[10.0, 24.0]	0
North East	830	88.0[83.9, 92.2]	86.3[82.0, 90.6]	27.0[20.9, 33.0]	44.8[39.5, 50.1]	16.1[11.6, 20.7]	27.0[20.9, 33.0]	0	26.8[20.8, 32.8]	0
North West	944	84.0[78.7, 89.2]	82.4[76.9, 87.9]	23.1[16.9, 29.3]	40.9[36.6, 45.3]	19.6[16.1, 23.1]	23.1[16.9, 29.3]	0	23.0[16.8, 29.2]	0.1[0.0, 0.4]
South East	855	93.5[91.5, 95.5]	93.3[91.3, 95.3]	22.8[17.0, 28.6]	26.3[21.4, 31.3]	44.3[37.1, 51.5]	22.1[16.7, 27.6]	0	17.9[13.2, 22.6]	4.4[2.2, 6.7]
South South	888	90.1[86.6, 93.6]	90.0[86.5, 93.5]	19.9[15.9, 23.9]	24.7[20.1, 29.3]	45.5[40.1, 51.0]]	19.9[15.9, 23.9]	0	18.8[15.3, 22.3]	1.1[0.1, 2.1]
South West	907	85.1[82.0, 88.3]	85.1[82.0, 88.3]	22.5[18.1, 27.0]]	2.7[1.5, 3.9]	59.9[55.8, 64.0]	22.4[18.0, 26.8]	0	20.4[15.8, 25.0]	2.1[0.7, 3.5]
Wealth quintile[6]		P < 0.001***								
Lowest	1081	78.7[74.9, 82.5]	77.6[73.3, 81.9]	12.4[9.1, 15.7]	40.5[36.2, 44.8]	25.6[21.7, 29.5]	12.4[9.1, 15.7]	0	12.3[9.0, 15.7]	0.1[0.0, 0.3]
Second	1111	87.0[83.3, 90.7]	85.4[81.5, 89.3]	13.6[10.6, 16.6]	32.7[27.2, 38.3]	40.0[34.1, 45.9]	13.6[10.6, 16.6]	0	13.6[10.6, 16.6]	0
Middle	1100	91.9[89.2, 94.6]	91.1[88.3, 94.0]	24.9[20.0, 29.9]	21.8[18.4, 25.3]	45.1[39.0, 51.2]	24.8[19.8, 29.7]	0	23.7[18.8, 28.6]	1.1[0.4, 1.8]
Fourth	997	93.8[91.8, 95.8]	93.0[90.8, 95.1]	28.0[24.1, 31.8]	21.7[18.0, 25.3]	44.1[39.0, 49.3]	27.8[23.9, 31.7]	0	26.3[22.4, 30.2]	1.5[0.6, 2.4]
Highest	970	91.0[88.7, 93.4]	90.9[88.5, 93.2]	36.7[32.3, 41.1]	17.6[13.2, 21.9]	36.7[32.2, 41.3]	36.6[32.2, 40.9]	0	34.5[30.1, 39.0]	2.0[0.7, 3.4]

1 Number of respondents.
2 Sample weights are applied to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.

A high proportion of households of the sampled non-pregnant women (87 percent) consumed white granulated sugar as their main type of sugar while white cube was reported by 11 percent. (**Figure 30**).

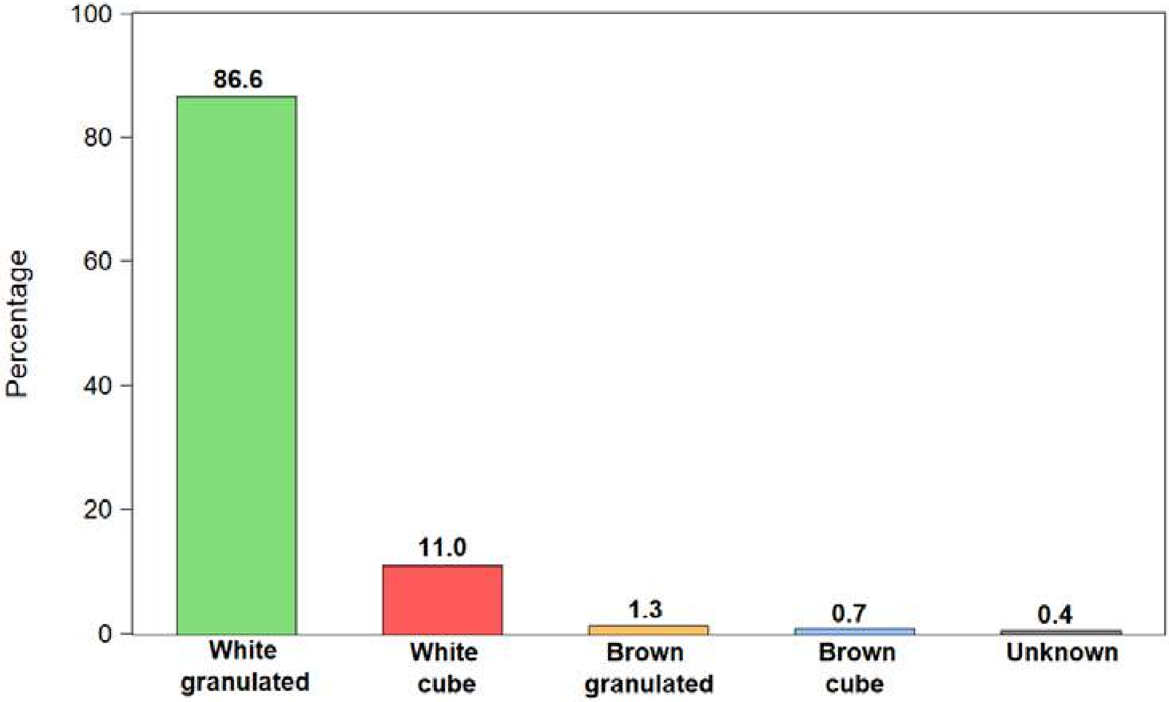


Figure 30. Main type of sugar used in the household among consumers
Among non-pregnant women (aged 15-49 years) who used the food vehicle in the HH (unweighted sample size for women = 4715)
Data are weighted to account for survey design and non-response.
The type was classified as "unknown" when the respondent could not report the type of food vehicle used in the HH.

As shown in **Figure 31**, several brands of sugar are available in Nigeria. However, 20 percent of the households of the sampled women reported consumption of Dangote granulated sugar, as their main brand.

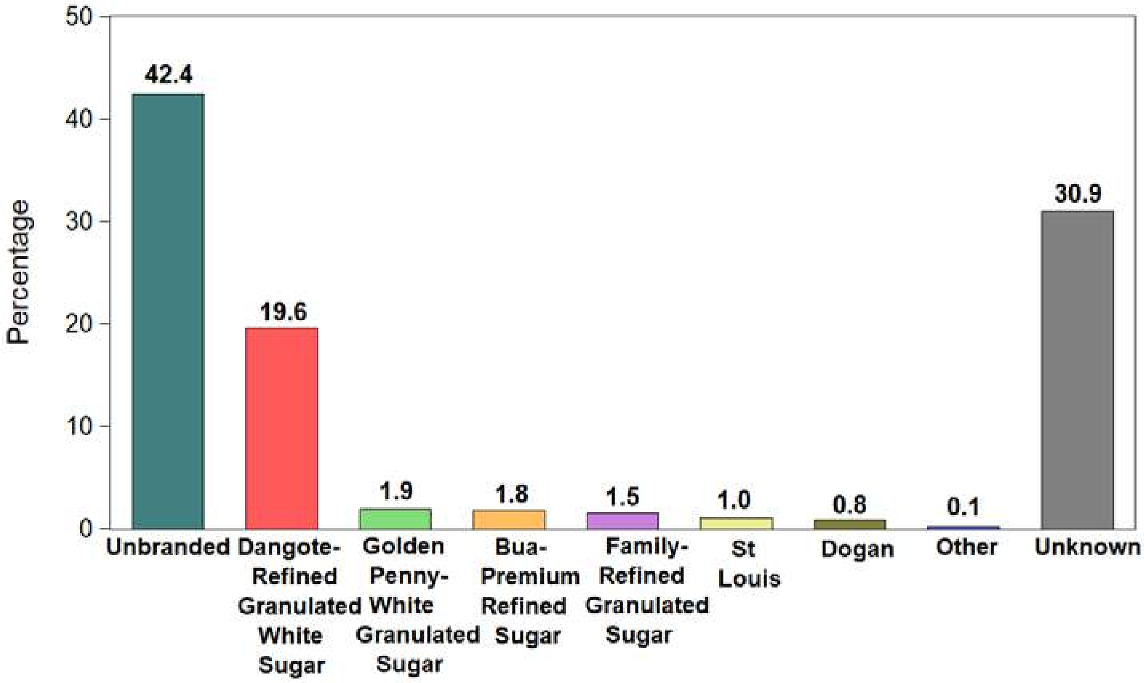


Figure 31. Brand of sugar obtained the last time among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HH and the food vehicle was not "homemade" (unweighted sample size for women = 4696)
Data are weighted to account for survey design and non-response.
The brand was classified as "unknown" when the respondent could not report the brand of food vehicle used in the HH.

Usual intake of Sugar

As shown in **Table 162**, the mean usual sugar intake of non-pregnant women in Nigeria is 12.3 grams. Pregnant women had a usual intake of 11.0 grams, non-lactating women (12.2 grams) and lactating women (12.6 grams) respectively. Across the zones, women from the northern zones have a comparatively higher intake of sugar as compared to women in the southern zones which ranged from a low of 5.7 grams among South south women to a high of 17.2 grams in North West. Children had a mean usual sugar intake of 11.5 grams (**Table 163**).

Table 162. Usual intake of Sugar (raw weight, grams) of women

	Sugar (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	12.3 [10.92, 13.61]	0.68	10.6 [5.9, 16.8]
NPNL[3]	4544	12.2 [10.96, 13.56]	0.66	10.7 [6.0, 16.9]
Lactating women[4]	697	12.6 [9.57, 15.65]	1.54	9.6 [5.1, 16.8]
Pregnant women	999	11.0 [8.89, 13.08]	1.06	8.1 [3.1, 16.1]
Residence				
Non-pregnant women				
Urban	2114	12.7 [10.88, 14.63]	0.95	11.3 [6.6, 17.3]
Rural	3127	11.9 [10.07, 13.70]	0.92	10.1 [5.5, 16.4]
Pregnant women				
Urban	402	12.9 [9.65, 16.10]	1.64	10.6 [4.7, 18.5]
Rural	597	10.0 [7.43, 12.53]	1.30	6.8 [2.5, 14.5]
Zone				
Non-pregnant women				
North Central	800	11.5 [8.99, 14.02]	1.28	9.9 [5.6, 15.8]
North East	824	13.4 [10.80, 15.95]	1.31	12.0 [7.1, 18.2]
North West	943	17.2 [13.95, 20.54]	1.67	16.1 [10.2, 22.8]
South East	871	9.2 [8.03, 10.32]	0.58	8.0 [4.6, 12.5]
South-South	892	5.7 [4.25, 7.15]	0.74	4.5 [2.3, 7.9]
South West	911	10.1 [8.48, 11.77]	0.84	8.9 [5.2, 13.8]
Wealth Quintile				
Non-pregnant women				
Lowest	921	12.7 [9.61, 15.82]	1.58	10.9 [5.9, 17.5]
Second	875	12.1 [9.50, 14.79]	1.35	10.4 [5.7, 16.7]
Middle	1061	11.7 [9.54, 13.79]	1.08	10.0 [5.5, 16.0]
Fourth	1193	12.7 [10.92, 14.59]	0.93	11.2 [6.3, 17.5]
Highest	1170	12.0 [9.92, 14.13]	1.07	10.6 [6.1, 16.3]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 163. Usual intake of Sugar (raw weight, grams) of children

	Sugar (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	11.5 [10.17, 12.80]	0.67	10.8 [6.9, 15.3]
Sex				
Male	1722	11.5 [10.16, 12.80]	0.67	10.8 [6.9, 15.2]
Female	1634	11.5 [10.16, 12.81]	0.68	10.8 [6.9, 15.3]
Residence				
Urban	1385	14.4 [12.72, 16.02]	0.84	13.8 [10.1, 18.0]
Rural	1971	10.0 [8.36, 11.60]	0.83	9.2 [5.7, 13.3]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of Sugar to energy intake

As shown in **Table 164**, the mean usual contribution of sugar intake to overall energy intake was found to be 4.7 percent for non-pregnant women and 4.1 percent for pregnant women, while it was 4.7 percent for non-lactating women and (2.4 percent) for lactating women. It was similar for children at 3.7 percent (**Table 165**).

Table 164. Contribution of Sugar to total usual energy intake of women

	% Contribution to energy intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	4.7 [3.5, 5.8]	0.6	2.1 [0.9, 5.0]
NPNL[3]	4544	4.7 [3.6, 5.9]	0.6	2.2 [0.9, 5.1]
Lactating women[4]	697	2.4 [1.9, 2.9]	0.2	1.8 [0.9, 3.2]
Pregnant women	999	4.1 [2.3, 5.9]	0.9	1.0 [0.3, 3.1]
Residence				
Non-pregnant women				
Urban	2114	5.6 [3.9, 7.2]	0.8	2.6 [1.1, 6.0]
Rural	3127	4.0 [2.8, 5.1]	0.6	1.8 [0.8, 4.3]
Pregnant women				
Urban	402	6.1 [3.2, 8.9]	1.4	1.6 [0.5, 4.7]
Rural	597	3.0 [1.6, 4.5]	0.7	0.7 [0.2, 2.3]
Zone				
Non-pregnant women				
North Central	800	3.6 [2.3, 4.8]	0.6	1.8 [0.8, 4.0]
North East	824	4.8 [3.2, 6.3]	0.7	2.4 [1.1, 5.3]
North West	943	7.1 [4.2, 10.0]	1.5	3.6 [1.6, 7.9]
South East	871	3.5 [2.8, 4.3]	0.4	1.8 [0.8, 3.9]
South South	892	1.9 [1.3, 2.4]	0.3	0.9 [0.4, 2.1]
South West	911	3.9 [2.8, 5.1]	0.6	2.0 [0.9, 4.4]
Wealth Quintile				
Non-pregnant women				
Lowest	921	4.2 [2.3, 6.0]	0.9	1.9 [0.8, 4.5]
Second	875	4.1 [2.7, 5.6]	0.7	1.9 [0.8, 4.4]
Middle	1061	4.3 [5.9, 5.9]	0.8	2.0 [0.9, 4.6]
Fourth	1193	5.2 [3.8, 6.7]	0.7	2.4 [1.0, 5.5]
Highest	1170	5.4 [3.7, 7.0]	0.8	2.5 [1.1, 5.8]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women

Table 165. Contribution of Sugar to total usual energy intake of children

	% Contribution to energy intake[1]			
	N[2]	Mean [95% CI][3]	SE	Median [25-75th]
National	3356	3.7 [3.4, 4.1]	0.2	3.4 [2.1, 5.0]
Sex				
Male	1722	3.7 [3.4, 4.1]	0.2	3.5 [2.2, 5.0]
Female	1634	3.7 [3.4, 4.1]	0.2	3.4 [2.1, 5.0]
Residence				
Urban	1385	4.6 [4.2, 5.0]	0.2	4.3 [3.0, 5.8]
Rural	1971	3.3 [2.8, 3.8]	0.2	2.9 [1.8, 4.4]

1For children, the denominator is usual energy intake
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval

Salt

Figure 32 presents the coverage indicators for salt nationally among non-pregnant WRA (15-49 years old). There was a high proportion of households of the sampled non-pregnant women that consumed salt in any form (99 percent) and purchased it (85 percent). Contrarily, less than half (47 percent) of the households of the sampled women consumed salt that was branded while 46 percent labelled as fortified and fortified (at any level). However, the result for these latter three indicators may be underestimated as over 50 percent of the households of the sampled women did not know the information.

These results reveal that fortification reach with salt is available for less than half of households of the sampled women of reproductive age but has the potential to reach over 90 percent of households if all the consumed salt is known and confirmed fortified. However, while 47 percent of the household of the sampled women of reproductive age that consumed branded salt (and 35 percent were unknown), 17 percent consumed unbranded salt (**Figure 32**).

The unknown and unbranded salt could have originated from the practice of downsizing and repackaging in local measures. Salt is usually packed in 50-kg or 25-kg branded bags that are downsized, repacked salt in smaller local measures, which are cheaper and more affordable by low-income households in the rural sector.

Furthermore, the similarity in the proportion of households of the sampled non-pregnant women that consumed food that is branded, labelled as fortified and fortified are indicators that most of the producers of salt that are branded are in fact labelling and fortifying their products.

Across residence sectors and zones, the proportion of households of the sampled non-pregnant women that consumed salt was as high as that found nationally. On the other hand, the proportion of households of the sampled non-pregnant women that consumed branded, labelled as fortified and fortified (at any level) salt was higher in the urban than rural (**Table 166**). Contrarily, the proportion of households of the sampled non-pregnant women that consumed unknown and unbranded salt was higher in rural areas compared to urban. This may be explained by the fact that this type of salt is often cheaper and therefore may be more affordable in rural areas. Thus, fortification status of over half of the salt consumed could not be assessed.

Salt seems an essential commodity in every HH and an opportunistic vehicle for fortification, which Nigeria taps into in its fortification programme since 1993.

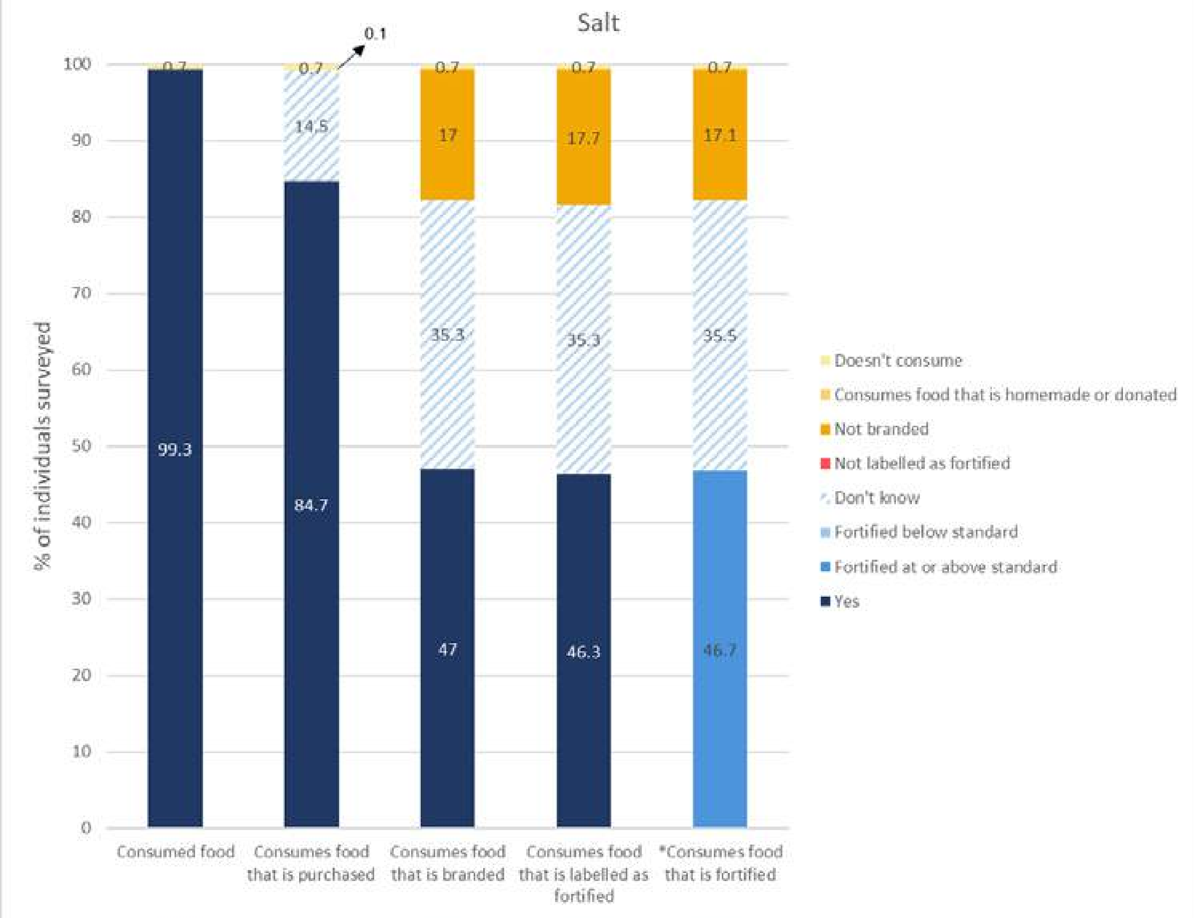


Figure 32. Percentage of Non-Pregnant Women Whose Households Consumed Salt (purchased, branded, labelled as fortified and fortified) at National Level

Among non-pregnant women (15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Unweighted sample size for all respondents
Differences across groups were not tested statistically.
Data is missing for 22 non-pregnant women.
*Based on linking reported brand to secondary data from GAIN Market assessment 2021 on fortification status by brand

Table 166. Percentage of Non-Pregnant Women Whose Households Consumed Salt (purchased, branded, labelled as fortified and fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2, 4]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified[2, 4]		
					Unknown	Unbranded		At standard	Below standard	Not fortified
		% [95%CI]								
National[3]										
Non-pregnant women aged 15-49 years	5281	99.3[99.0, 99.6]	84.7[82.6, 86.7]	47.0[43.5, 50.1]	35.3[32.1, 38.4]	17.4 [15.1, 16.7]	46.3[42.7, 49.8]	46.7[43.2, 50.2]	0.0[0.0, 0.0]	0
Residence		P = 0.0175*								
Urban	2156	98.9[98.3, 99.5]	89.6[87.7, 91.5]	58.7[52.3, 65.1]	25.4[20.9, 29.9]	14.8[11.8, 17.9]	58.1[51.8, 64.4]	58.4[52.0, 64.8]	0.0[0.0, 0.0]	0
Rural	3125	99.7[99.4, 99.9]	80.4[77.3, 83.4]	36.8[32.5, 41.1]	43.9[39.0, 48.7]	18.9[15.8, 22.1]	36.0[31.6, 40.3]	36.5[32.2, 40.8]	0	0
Zone										
North Central	857	99.4[98.9, 100.0]	94.3[92.0, 96.5]	54.6[43.6, 65.7]	17.8[13.3, 22.3]	26.9[18.5, 35.4]	52.9[41.8, 64.1]	54.4[43.4, 65.4]	0.0[0.0, 0.1]	0
North East	830	99.0[98.1, 100.0]	83.6[79.4, 87.9]	37.5[29.2, 45.8]	47.4[39.8, 54.9]	14.2[10.3, 18.1]	36.2[27.9, 44.4]	37.3[29.0, 45.7]	0	0
North West	944	99.0[98.3, 99.8]	76.0[70.8, 81.1]	20.5[14.7, 26.3]	60.6[53.9, 67.3]	17.8[13.8, 21.9]	20.3[14.6, 26.1]	20.3[14.6, 26.1]	0	0
South East	855	99.9[99.8, 100.0]	91.9[89.5, 94.4]	78.5[74.2, 82.7]	15.0[12.0, 17.9]	6.5[3.4, 9.7]	76.9[72.0, 81.7]	76.6[71.7, 81.5]	0	0
South South	888	100.0[100.0, 100.0]	89.6[86.1, 93.1]	71.4[64.7, 78.2]	18.2[13.3, 23.2]	10.3[7.0, 13.7]	71.2[64.4, 78.0]	71.2[64.4, 78.0]	0	0
South West	907	99.2[98.4, 99.9]	84.7[81.4, 88.0]	61.5[57.1, 65.8]	18.2[14.7, 21.6]	19.5[14.7, 24.3]	61.2[56.9, 65.6]	61.4[57.0, 65.7]	0	0
Wealth quintile		P = 0.234								
Lowest	1081	99.5[98.9, 100.0]	73.2[69.2, 77.1]	19.6[15.4, 23.8]	61.3[55.6, 67.1]	18.5[14.8, 22.1]	18.8[14.7, 22.9]	19.2[15.1, 23.4]	0	0
Second	1111	99.7[99.4, 100.0]	82.5[78.3, 86.7]	34.7[29.1, 40.2]	43.3[37.6, 48.9]	21.7[17.0, 24.9]	33.7[28.1, 39.3]	34.3[28.8, 39.9]	0	0
Middle	1100	99.5[99.0, 99.9]	89.7[86.8, 92.5]	52.5[47.0, 58.0]	26.8[22.3, 31.4]	20.1[15.3, 24.9]	52.2[46.7, 57.7]	52.2[46.8, 57.7]	0	0
Fourth	997	99.4[98.7, 100.0]	90.8[88.4, 93.3]	62.6[57.1, 68.1]	21.3[17.6, 25.0]	15.4[11.8, 19.0]	61.7[56.2, 67.2]	62.4[56.9, 67.9]	0	0
Highest	970	98.5[97.1, 99.9]	88.7[85.8, 91.7]	72.8[66.7, 78.8]	18.5[13.2, 23.8]	7.1[4.4, 9.9]	72.2[66.2, 78.2]	72.4[66.4, 78.5]	0.0[0.0, 0.1]	0

1 Number of respondents.
2 Sample weights are applied to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.
6 Data is missing for 22 non-pregnant women.

The proportion of households of the sampled non-pregnant women that reported fine table salt as the main type of salt consumed was 66 percent while those whose households consumed coarse cooking salt as their main type of salt was 29 percent. (**Figure 33**).

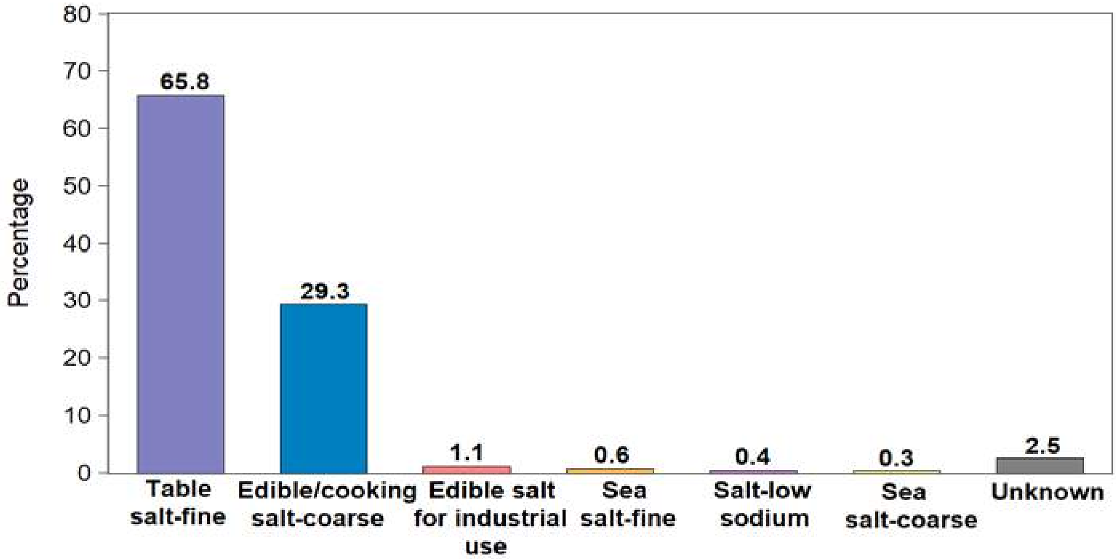


Figure 33. Main types of salt used in the household among consumers
Among non-pregnant women (aged 15-49 years) who used the food vehicle in the HH (unweighted sample size for women = 4715)
Data are weighted to account for survey design and non-response
The type was classified as "unknown" when the respondent could not report the type of food vehicle used in the HH.

The proportion of households of the sampled non-pregnant women that consumed Dangote salt as their main brand of salt was 30 percent and those that consumed Mr. Chef was19 percent (**Figure 34**). However, 20 percent of the households of the sampled non-pregnant women purchased unbranded salt and 25 percent unknown brands. Purchase of unbranded and unknown brands are likely due to re-packaging without label. Also, salt is highly industrialized in production; thus, brands truly exist for them. However, re-packaging denies consumers access to the brand names. As a result of the high use of unbranded and unknown salt, it is not possible to link the brand of salt to the fortification status for almost half of the respondents.

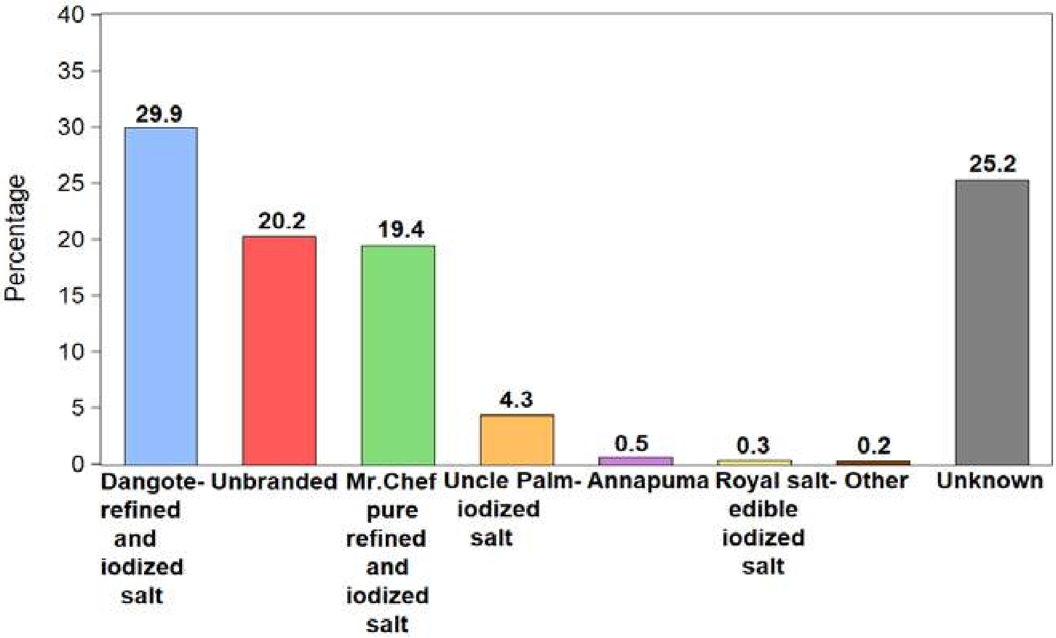


Figure 34. Brands of salt obtained the last time among consumers
Among non-pregnant women (15-49 years) among respondents who used the food vehicle in the HH and the food vehicle was not "homemade" (unweighted sample size for women = 4620)
Data are weighted to account for survey design and non-response.
The brand was classified as "unknown" when the respondent could not report the brand of food vehicle used in the HH.

Usual intake of Salt

As shown in **Table 167**, the mean usual salt intake of non-pregnant women in Nigeria is 3.9 grams which was similar across all categories but slightly higher among rural dwellers and women from southern zones. As for children, salt intake of children was 2.6 grams (**Table 168**). The salt intake presented in this survey does not account for salt added at the table since the intake relied on the ingredient information supplied with the recipes encountered during data collection.

Table 167. Usual intake of Salt (raw weight, grams) of women

	Salt (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	3.9 [3.7, 4.1]	0.1	3.7 [2.9, 4.7]
NPNL[3]	4544	3.9 [3.7, 4.1]	0.1	3.7 [2.9, 4.7]
Lactating women[4]	697	4.0 [3.7, 4.4]	0.1	3.7 [2.7, 5.1]
Pregnant women	999	4.2 [3.8, 4.5]	0.2	3.9 [2.8, 5.2]
Residence				
Non-pregnant women				
Urban	2114	3.5 [3.2, 3.8]	0.1	3.4 [2.6, 4.2]
Rural	3127	4.2 [4.0, 4.4]	0.1	4.0 [3.1, 5.0]
Pregnant women				
Urban	402	3.5 [3.2, 3.8]	0.1	3.4 [2.7, 4.1]
Rural	597	4.6 4.0, 5.1]	0.3	4.1 [2.8, 5.8]
Zone				
Non-pregnant women				
North Central	800	3.5 [3.2, 3.8]	0.1	3.4 [2.8, 4.1]
North East	824	3.3 [2.9, 3.7]	0.1	3.1 [2.3, 4.1]
North West	943	3.7 [3.3, 4.1]	0.2	3.5 [2.8, 4.4]
South East	871	5.4 [4.9, 5.9]	0.2	5.2 [4.2, 6.4]
South-South	892	4.8 [4.2, 5.4]	0.3	4.7 [3.9, 5.6]
South West	911	3.6 [3.3, 3.9]	0.1	3.5 [2.9, 4.2]
Wealth Quintile				
Non-pregnant women				
Lowest	921	4.2 [3.8, 4.6]	0.2	3.9 [2.9, 5.1]
Second	875	4.0 [3.5, 4.4]	0.2	3.7 [2.8, 4.9]
Middle	1061	3.8 [3.5, 4.2]	0.2	3.7 [3.0, 4.5]
Fourth	1193	3.7 [3.4, 4.0]	0.1	3.5 [2.8, 4.4]
Highest	1170	3.8 [3.5, 4.0]	0.1	3.7 [2.9, 4.5]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 168. Usual intake of Salt (raw weight, grams) of children

	Salt (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	2.6 [2.4, 2.9]	0.1	2.4 [1.8, 3.3]
Sex				
Male	1722	2.7 [2.4, 3.0]	0.1	2.4 [1.6, 3.5]
Female	1634	2.5 [2.2, 2.8]	0.1	2.4 [1.9, 3.0]
Residence				
Urban	1385	2.3 [2.0, 2.5]	0.1	2.1 [1.5, 2.9]
Rural	1971	2.8 [2.5, 3.1]	0.2	2.6 [1.9, 3.5]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Bouillon

Bouillons are taste enhancers added to food, to improve their palatability. Commercial bouillons are composed of ingredients such as salt, sugar, flavour enhancers (monosodium glutamate), herbs, spices, pieces of vegetables, dyes and fragrances. (Mejia et al. 2015). Bouillon is primarily used for seasoning soups and stews, and dishes in cube or granular form and commonly used in Nigeria as a flavour enhancer. One of the main ingredients of bouillon is salt, which if iodized, presents a quick reach to households with iodine, a micronutrient of public health significance.

Figure 35 presents the coverage indicators for bouillon nationally among non-pregnant WRA (15-49 years old). There was a high proportion of households of the sampled non-pregnant women that consumed bouillon in any form (98 percent), purchased it (97 percent) and consumed branded bouillon (96 percent). Bouillon processing is industrialized at large scale; thus, there is low percentage of unknown (2 percent) and unbranded (0 percent) bouillon products as there is no cottage level production. Additionally, bouillon comes in micro packages that are affordable to all regardless of socio-economic status.

Across residence, zones, and wealth quintile, the proportion of households of the sampled non-pregnant women that consumed bouillon is generally high as 100 percent of the households of the sampled individuals consumed and purchased it. (**Table 169**). The high HH consumption of bouillon could make it a suitable target for fortification in Nigeria. Currently, bouillon is voluntarily fortified by few industries in Nigeria. Despite this, 61 percent of the non-pregnant women from households consumed bouillons that are labelled as fortified with iodine and/or iron.

There is no available secondary data to determine bouillon fortification status as it is currently on voluntary basis in Nigeria.

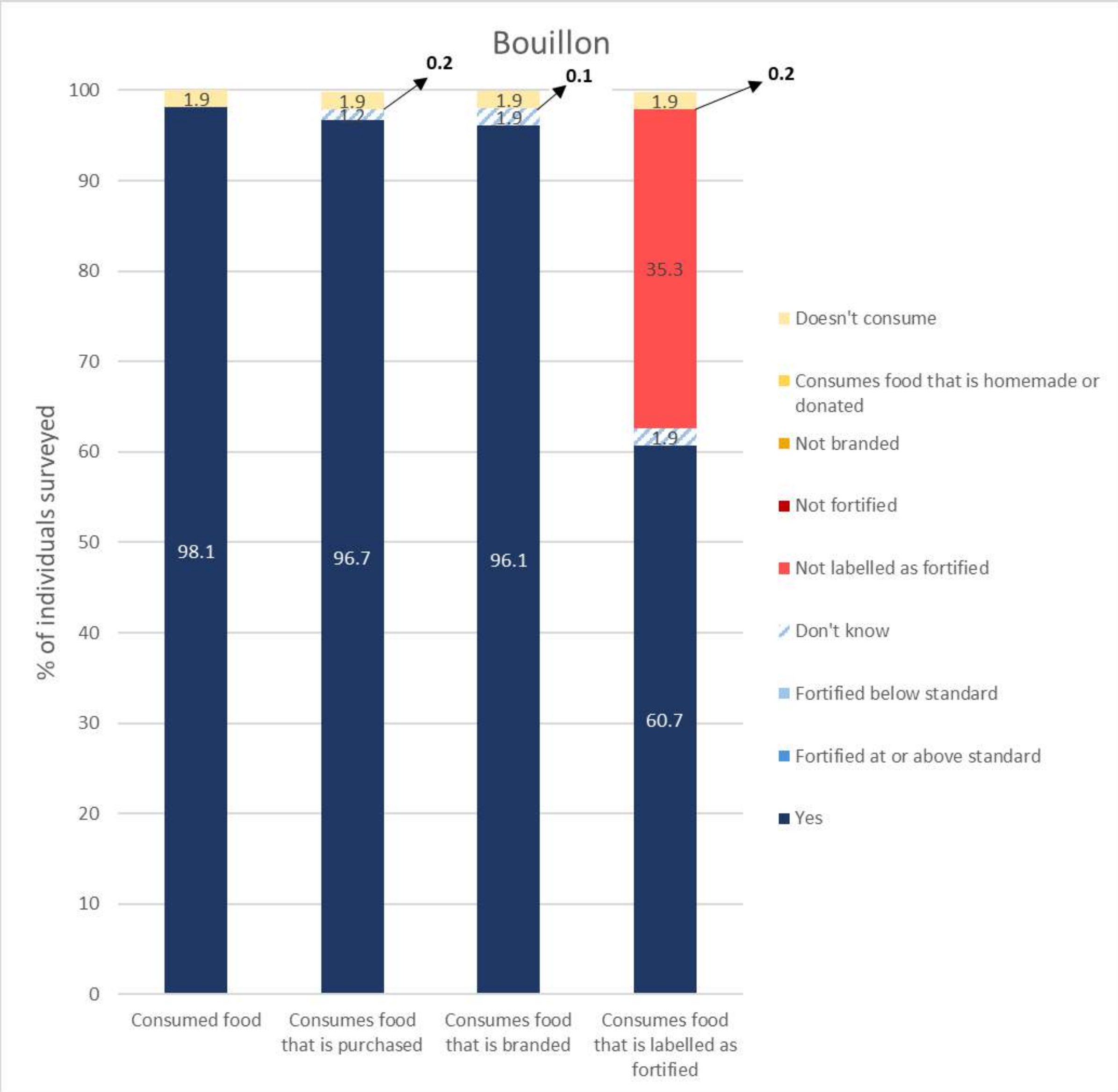


Figure 35. Percentage of Non-Pregnant Women Whose Households Consumed Bouillon (purchased, branded, labelled as fortified and fortified) at National Level

Among non-pregnant women (aged 15-49 years) (unweighted sample size = 5281)
Data are weighted to account for survey design and non-response.
Unweighted sample size for all respondents
Differences across groups were not tested statistically.
Data is missing for 22 non-pregnant women.

Table 169. Percentage of Non-Pregnant Women Whose Households Consumed Bouillon (purchased, branded, and labelled as fortified) by Residence, Zone, and Wealth Quintile

	N[1]	Consumed food[2, 3]	Consumed food that is purchased[2, 4]	Consume food that is branded[2,4]	Food brand is unknown, or product is unbranded[2, 4, 5]		Consumed food that is labelled as fortified[2, 4]	Consume food that is fortified
					Unknown	Unbranded		
		% [95%CI]						
National[3]								
Non-pregnant women aged 15-49 years	5281	98.1[97.5, 98.8]	96.7[95.8, 97.5]	96.1[95.2, 97.0]	1.9[1.3, 2.4]	0	60.7[57.2, 64.3]	No secondary data available
Residence		P = 0.4351	P=0.431	P=0.186			P=0.0144	
Urban	2156	98.4[97.5, 99.3]	97.3[96.1, 98.5]	97.0[95.8, 98.2]	1.3[0.4, 2.21	0	65.8[61.1, 70.5]	
Rural	3125	97.9[96.9, 98.8]	96.1[94.9, 97.4]	95.3[94.0, 96.6]	2.4[1.6, 3.2]	0	56.3[51.2, 61.5]	
Zone[3]		P=0.0161						
North Central	857	99.6[99.1, 100.0]	99.5[99.0, 100.0]	99.1[98.2, 100.0]	0.4[0.0, 1.0]	0	76.9[71.9, 81.9]	
North East	830	95.9[93.5, 98.4]	95.2[92.6, 97.8]	94.7[92.1, 97.4]	1.0[0.2, 1.9]	0	81.9[77.0, 86.9]	
North West	944	98.1[96.7, 99.5]	94.3[92.2, 96.4]	93.8[91.7, 95.9]	3.9[2.3, 5.5]	0	49.0[41.3, 56.7]	
South East	855	96.8[94.5, 99.0]	96.7[94.4, 99.0]	96.6[94.4, 98.9]	0.1[0.0, 0.3]	0	77.7[69.8, 85.5]	
South South	888	99.8[99.6, 100.0]	99.8[99.6, 100.0]	99.4[98.9, 99.9]	0.4[0.0, 0.9]	0	64.7[53.1, 76.2]	
South West	907	98.2[97.3, 99.2]	97.1[95.8, 98.4]	95.8[94.1, 97.4]	2.4[1.2, 3.7]	0	34.9[28.8, 41.1]	
Wealth quintile		P = 0.0441						
Lowest	1081	96.3[94.2, 98.4]	93.9[91.7, 96.1]	93.0[90.7, 95.2]	2.8[1.5, 4.2]	0	50.0[43.3, 56.8]	
Second	1111	98.1[96.8, 99.3]	96.5[95.0, 98.1]	96.0[94.5, 97.6]	2.0[1.0, 3.1]	0	57.3[50.7, 64.0]	
Middle	1100	99.2[98.5, 99.8]	98.3[97.3, 99.3]	97.3[96.0, 98.6]	1.8[0.6, 2.9]	0	63.3[57.4, 69.1]	
Fourth	997	98.6[97.8, 99.4]	97.8[96.8, 98.9]	97.5[96.4, 98.7]	1.1[0.2, 1.9]	0	66.0[61.2, 70.9]	
Highest	970	98.6[97.5, 99.7]	97.0[94.7, 99.2]	97.0[94.8, 99.2]	1.5[0.0, 3.6]	0	69.0[64.1, 74.0]	

1 Unweighted sample size.
2 Data are weighted to account for survey design and non-response.
3 Differences between groups were compared using Chi-square test (*signifies P<0.05, **signifies P<0.01, ***signifies P<0.001).
4 Differences across groups were not tested statistically
5 When the food brand was unknown or an unbranded product was used, it was not possible to link data to label information.
6 Data is missing for 22 non-pregnant women.

High proportion of the households of the sampled non-pregnant women (91 percent) consumed cube type of bouillon in their households (**Figure 36**).

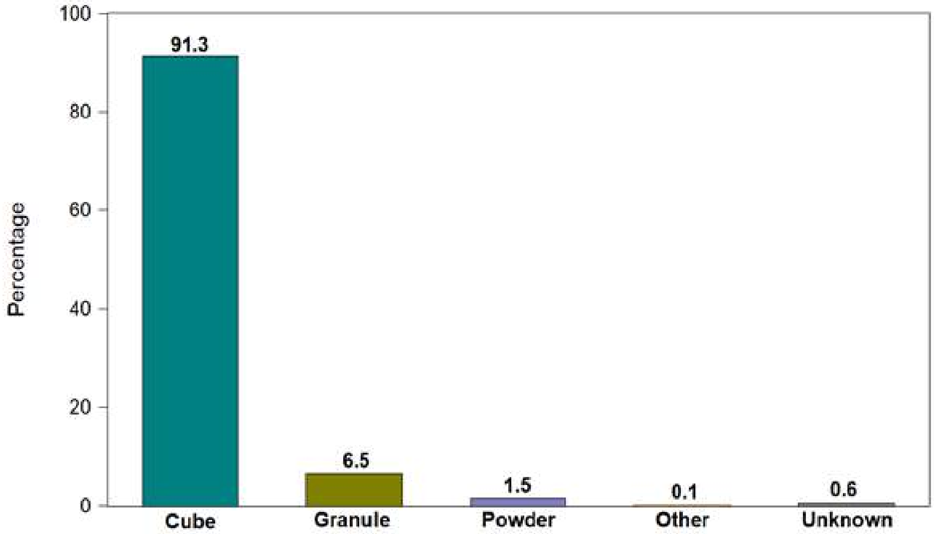


Figure 36. Main types of bouillon used in the household among consumers
Among non-pregnant women (aged 15-49 years) who used the food vehicle in the HH (unweighted sample size for women = 5178)
Data are weighted to account for survey design and non-response.
The type was classified as "unknown" when the respondent could not report the type of food vehicle used in the HH.

More than half (55 percent) of the non-pregnant women stated that their households use Maggi as the main brand of bouillon, followed by Ajinomoto (10 percent), Onga (10 percent), Knorr (8 percent), and Tasty (7 percent) (**Figure 37**). Few women were not able to report the brand of bouillon used in their HHs (<1 percent); thus, unbranded and unknown brands are not an issue in this sector. This is so since they are highly industrialized and available in micro packages that all HHs can afford.

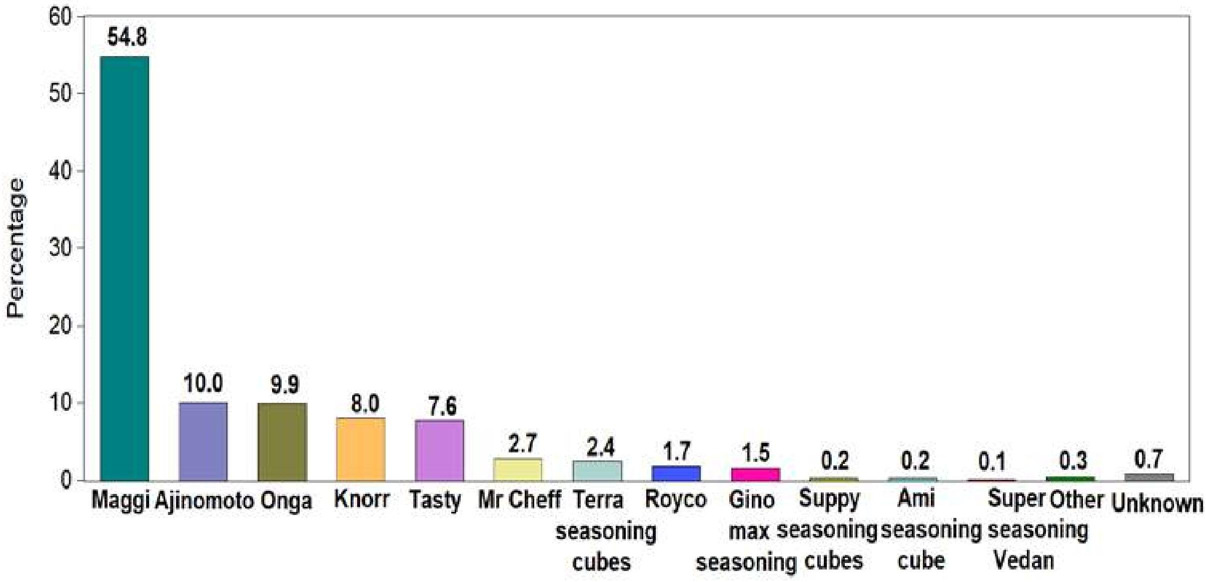


Figure 37. Brand of bouillon obtained the last time among consumers
Among non-pregnant women (aged 15-49 years) among respondents who used the food vehicle in the HHs and the food vehicle was not "homemade" (unweighted sample size for women = 5135)
Data are weighted to account for survey design and non-response.

Usual intake of Bouillon

As shown in **Table 170**, the mean usual bouillon intake of women is approximately 6 grams (across the categories) with the exception of lactating women (8.0 grams). Across zones, women from northern zones had comparatively higher intake. There was a decrease in bouillon use as the wealth quintile increased. As shown in **Table 171**, the usual bouillon intake of Nigerian children aged 24-59 months is 4.2 grams. Similar from the intake of salt, it is important to note that the intake levels were derived using recipe information as collected during the recall interview.

Table 170. Usual intake of Bouillon (raw weight, grams) of women

	Bouillon (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	6.3 [6.0, 6.6]	0.1	5.7 [3.9, 8.0]
NPNL[3]	4544	6.0 [5.7, 6.3]	0.1	5.4 [3.7, 7.7]
Lactating women[4]	697	8.0 [7.3, 8.7]	0.3	7.3 [5.1, 10.1]
Pregnant women	999	6.7 [6.0, 7.3]	0.3	6.0 [3.9, 8.6]
Residence				
Non-pregnant women				
Urban	2114	5.3 [4.7, 5.8]	0.3	4.7 [3.2, 6.7]
Rural	3127	7.1 [6.5, 7.5]	0.2	6.5 [4.5, 9.0]
Pregnant women				
Urban	402	5.3 [4.5, 6.1]	0.4	4.8 [3.3, 6.8]
Rural	597	7.4 [6.4, 8.3]	0.5	6.6 [4.3, 9.6]
Zone				
Non-pregnant women				
North Central	800	4.8 [4.2 5.4]	0.3	4.6 [3.5, 5.8]
North East	824	8.5 [7.6, 9.3]	0.4	8.0 [5.8, 10.6]
North West	943	9.1 [8.5, 9.6]	0.3	8.8 [7.1, 10.7]
South East	871	3.9 [3.4, 4.4]	0.2	3.7 [2.9, 4.6]
South-South	892	4.8 [3.8, 5.8]	0.5	4.6 [3.8, 5.6]
South West	911	2.7 [2.5, 2.9]	0.1	2.6 [2.1, 3.2]
Wealth Quintile				
Non-pregnant women				
Lowest	921	8.4 [7.7, 9.0]	0.3	7.8 [5.6, 10.5]
Second	875	8.0 [7.3, 8.7]	0.3	7.6 [5.7, 9.9]
Middle	1061	5.9 [5.3, 6.5]	0.3	5.3 [3.6, 7.6]
Fourth	1193	4.9 [4.3, 5.4]	0.3	4.3 [2.9, 6.2]
Highest	1170	4.6 [4.1, 5.2]	0.3	4.3 [3.3, 5.6]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 171. Usual intake of Bouillon (raw weight, grams) of children

	Bouillon (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	4.2 [4.0, 4.5]	0.1	3.8 [2.5, 5.5]
Sex				
Male	1722	4.3 [4.0, 4.6]	0.1	3.8 [2.5, 5.6]
Female	1634	4.1 [3.8, 4.4]	0.1	3.7 [2.4, 5.4]
Residence				
Urban	1385	3.4 [3.0, 3.8]	0.2	3.0 [2.0, 4.3]
Rural	1971	4.7 [4.3, 5.0]	0.1	4.2 [2.8, 6.0]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Rice

Rice (Oryza sativa) is one of the popular staples massively consumed in Nigeria and is currently an essential for most households in the country. Despite the sophisticated and costly production of its fortified premix, it offers an excellent window for massive health impact through its nutritional enhancement. Credible evidence on household consumption and coverage suggest that rice fortification has significant opportunity for Nigeria to address major micronutrient deficiencies across the entire population (WFP and GAIN, 2022).

In Nigeria, fortification of rice is not currently occurring but efforts are in progress. The interest to introduce rice fortification in Nigeria started recently and is anchored by WFP, supported by GAIN through the Promoting Rice Fortification in Nigeria (PRiFN) project. The project aims to generate knowledge and evidence to build a feasible business case and roadmap for adopting rice fortification as part of nutrition policy in Nigeria. The initiative is premised on the need to prevent micronutrient deficiency and contribute to the reduction of the country's high mortality rate of under-5 and maternal persons (WFP and GAIN, 2022). When it is deployed, there are two recommended technologies for rice fortification. The dominant consensus amongst experts is that two methods may be considered:

Extrusion (Extrusion kernels): In this process, rice flour (from broken rice) is mixed with a concentrated vitamin-mineral mix to create a dough, which is shaped into rice-shaped kernels, by an extrusion machine, and then dried. Fortified kernels are blended with non-fortified milled rice to create fortified rice.

Coating (coated kernels): Milled rice is coated with a concentrated liquid vitamin-mineral premix, suspended in a wax or gum. The fortified kernels are then dried. Fortified kernels are blended with non-fortified milled rice to create fortified rice.

Rice is primarily consumed as a kernel, not in flour form (like other grains like wheat and maize) and may significantly be more challenging to implement on a large scale. In this report we present the usual intake of rice as utilized from its raw form.

Usual intake of Rice

As shown in **Table 172**, the mean usual rice intake of non-pregnant and pregnant women is 61.2 grams and 59.1 grams respectively. There was a numerical difference between non-pregnant women living in urban (78.4 grams) or rural (48.5 grams) areas as well as pregnant women living in urban (77.3 grams) and rural (49.3 grams) areas too. Across zones, women from southwest had an intake of 73 grams while women from northeast had an intake of 48.7 grams. There was generally an increase in rice intake as the wealth quintile increased with women in the lowest and highest quintiles having intakes of 34.2 grams and 79.5 grams respectively.

As shown in **Table 173**, the usual intake of rice among all children aged 24-59 months was 38.3 grams which was higher among urban dwellers (53.1 grams) compared to rural dwellers (30.7 grams).

Table 172. Usual intake of Rice (raw weight, grams) of women

	Rice (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	61.2 [56.4, 66.1]	2.5	55.0 [30.5, 84.6]
NPNL[3]	4544	61.2 [56.2, 66.2]	2.5	55.5 [32.1, 83.5]
Lactating women[4]	697	62.2 [54.7, 69.6]	3.8	52.0 [22.2, 91.1]
Pregnant women	999	59.1 [52.2, 65.9]	3.5	54.5 [27.6, 84.2]
Residence				
Non-pregnant women				
Urban	2114	78.4 [71.6, 85.1]	3.4	73.8 [52.9, 98.7]
Rural	3127	48.5 [43.4, 53.6]	2.6	40.3 [19.8, 68.6]
Pregnant women				
Urban	402	77.3 [67.6, 86.9]	4.9	74.9 [48.9, 102.4]
Rural	597	49.3 [41.2, 57.5]	4.1	43.2 [20.8, 71.6]
Zone				
Non-pregnant women				
North Central	800	67.0 [59.3, 74.7]	3.9	61.5 [37.4, 90.3]
North East	824	48.7 [34.8, 62.7]	7.1	42.4 [22.8, 67.7]
North West	943	58.4 [46.3, 70.5]	6.1	51.6 [27.7, 81.3]
South East	871	64.8 [58.3, 71.4]	3.3	57.9 [31.8, 89.9]
South-South	892	59.8 [51.7, 68.0]	4.1	53.4 [29.3, 82.7]
South West	911	73.0 [67.5, 78.4]	2.8	68.0 [44.3, 96.3]
Wealth Quintile				
Non-pregnant women				
Lowest	921	34.2 [26.2, 42.2]	4.1	26.9 [13.7, 47.2]
Second	875	52.4 [43.8, 61.0]	4.4	45.9 [26.4, 71.4]
Middle	1061	60.7 [53.4, 67.9]	3.7	54.9 [33.8, 81.1]
Fourth	1193	73.7 [68.5, 78.9]	2.6	68.4 [45.3, 96.3]
Highest	1170	79.5 [72.2, 86.9]	3.7	74.1 [50.4, 103.1]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 173. Usual intake of Rice (raw weight, grams) of children 24-59 months

	Rice (grams)			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National	3356	38.3 [35.1, 41.6]	1.7	35.4 [19.0, 53.6]
Sex				
Male	1722	41.0 [37.2, 44.8]	1.9	38.6 [20.7, 57.6]
Female	1634	35.5 [31.7, 39.3]	1.9	32.0 [17.1, 49.5]
Residence				
Urban	1385	53.1 [49.1, 57.1]	2.0	50.7 [36.0, 67.4]
Rural	1971	30.7 [27.1, 34.4]	1.9	26.7 [12.4, 44.4]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Contribution of rice to energy intake

As shown in **Table 174**, the mean usual contribution of rice intake to overall energy intake was found to be 25.2 percent for non-pregnant women and 18.3 percent for pregnant women, while it was (22.3 percent) for non-lactating women and (11 percent) for lactating women. High differences in the contribution of rice intake to energy intake were observed between women living in urban or rural areas irrespective of their pregnancy status. Specifically, urban non-pregnant women consumed less than their rural counterparts and this trend was opposite with pregnant women. Across the zones, contributions ranged from 40.7 percent in southwest to 18.7 percent in northeast. There was generally an increase in rice intake as the wealth quintile increased from 8.6 percent – 38.6 percent among those in lowest and highest quintiles respectively.

Table 174. Contribution of Rice to total usual energy intake of women and children

	% Contribution to energy intake			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	25.2 [15.9, 34.6]	4.7	12.2 [5.2, 28.2]
NPNL[3]	4544	22.3 [15.5, 29.2]	3.5	12.4 [5.7, 26.4]
Lactating women[4]	697	11.0 [9.5, 12.4]	0.7	9.2 [3.9, 16.1]
Pregnant women	999	18.3 [14.7, 21.9]	1.8	9.1 [4.1, 20.3]
Residence				
Non-pregnant women				
Urban	2114	15.3 [14.0, 16.6]	0.7	14.9 [11.3, 18.9]
Rural	3127	20.2 [14.5, 25.9]	2.9	7.9 [3.1, 19.8]
Pregnant women				
Urban	402	27.9 [20.2, 35.5]	3.9	15.2 [7.1, 31.8]
Rural	597	13.2 [9.8, 16.6]	1.7	7.0 [3.3, 14.9]
Zone				
Non-pregnant women				
North Central	800	32.5 [16.3, 48.7]	8.2	17.0 [7.6, 37.3]
North East	824	18.7 [10.6, 26.8]	4.1	9.3 [4.1, 21.0]
North West	943	19.7 [13.0, 26.5]	3.4	9.9 [4.3, 22.3]
South East	871	20.9 [11.8, 30.0]	4.6	10.7 [4.6, 23.8]
South South	892	21.0 [12.1, 29.8]	4.5	10.7 [4.7, 23.8]
South West	911	40.7 [17.9, 63.5]	11.6	21.3 [9.4, 47.1]
Wealth Quintile				
Non-pregnant women				
Lowest	921	8.6 [6.0, 11.1]	1.3	4.6 [2.1, 10.0]
Second	875	15.6 [10.8, 20.3]	2.4	8.5 [4.0, 18.2]
Middle	1061	23.5 [14.8, 32.2]	4.4	13.3 [6.2, 27.9]
Fourth	1193	34.9 [19.3, 50.5]	7.9	19.7 [9.4, 40.9]
Highest	1170	38.6 [20.5, 56.7]	9.2	22.4 [10.6, 46.0]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

As shown in **Table 175**, the contribution of rice to the total usual energy intake of children aged 24-59 months was found to be 15.5 percent.

Table 175. Contribution of Rice to total usual energy intake of children 24-59 months

	% Contribution to energy intake[1]			
	N[2]	Mean [95% CI][3]	SE	Median [25-75th]
National	3356	15.5 [13.6, 17.5]	1.0	9.9 [5.0, 19.1]
Sex				
Male	1722	11.8 [10.6, 12.9]	0.6	11.0 [5.9, 16.5]
Female	1634	16.2 [13.9, 18.6]	1.2	10.1 [5.2, 19.6]
Residence				
Urban	1385	15.6 [14.4, 16.8]	0.6	15.4 [11.4, 19.5]
Rural	1971	13.0 [10.0, 16.0]	1.5	7.3 [3.6, 15.1]

1For children, the denominator is usual energy intake
2Number of respondents
3Sample weights are applied to account for survey design and non-response.
CI= Confidence Interval, SE= Standard Error

Fortification Status of Household Food Samples

Box 9. Key Findings on Fortification Status of Household Food Samples

Fortification of food vehicles collected in a sub-sample of non-pregnant women: Most samples were fortified at any level. For vitamin A in sugar (74 percent), iodine in salt (100 percent), iron and zinc in wheat flour (100 percent each) while iron and zinc in semolina flour was also 100 percent. Conversely, about one third was fortified at any level with vitamin A in vegetable oil (31 percent) and vitamin A in wheat flour (26 percent).

Mean amounts of fortificants in food vehicles collected in a sub-sample of non-pregnant women: 2.6 mg/kg vitamin A in vegetable oil, 3.1mg retinyl palmitate/kg vitamin A in sugar, 60 mg/kg iodine in salt, 0.8 mg retinyl palmitate/kg vitamin A, 53.9 mg/kg iron, and 42.2 mg/kg zinc in wheat flour, and 0.8 mg retinyl palmitate/kg vitamin A, 38.6 mg/kg iron, and 36.0 mg/kg zinc in semolina flour.

Fortification status of the food samples collected from households.

A total of 2031 food samples (salt, sugar, vegetable oil, wheat, and semolina flour) were collected from the homes of sub-sampled non-pregnant WRA at the repeat interview. **Table 176** shows the food samples collected for analysis and parameters analyzed. to determine their fortification status by Nigerian standards. Salt was analyzed for iodine; vegetable oil and sugar were analyzed for vitamin A; and wheat and semolina flours were analyzed for vitamin A, iron, and zinc.

All food samples produced are at large scale and are expected to be fortified with vitamin A, except salt, according to Nigerian law. Vitamin A supports the immune system and plays an important role in maintaining the epithelial tissue in the body. Severe vitamin A deficiency VAD can cause eye damage and is the leading cause of childhood blindness. VAD also increases the severity of infections, such as measles and diarrheal disease, and slows recovery from illness.

In addition to vitamin A fortification, all flours in Nigeria (wheat, semolina, cassava, composite flour) are expected to be fortified with iron and zinc, which are also considered as micronutrients of public health significance. Iron plays an important role in numerous biological systems and iron deficiency is one of the primary causes of anaemia, which has serious health consequences for children (Nigeria: DHS, 2018).

Table 176. Food vehicle samples collected and analyzed

Food vehicles	*Total collected	Total analyzed	Micronutrients analyzed
Vegetable oil	338	229	Vitamin A
Sugar	400	273	Vitamin A
Salt	1153	1135	Iodine
Wheat flour	51	38	Vitamin A
		37	Iron
		37	Zinc
Semolina flour	89	81	Vitamin A
		77	Iron
		78	Zinc
Total 2031	2031		

*Not all the samples collected were analyzed because some quantities were too small for analysis while few missing.
Food sample analysis

All food samples, by parameters, were sent to the selected laboratories in and outside the country after conducting due diligence of the lab in terms of capacity, facility, and accreditation for the analysis of interest. **Annex 44** shows the food samples sent to all the participating laboratories with their quantities and parameters for analysis.

All the food sample results, upon receipt, were compiled by labs, units harmonized, and averages calculated for the samples run by more than one laboratory. Where needed, standard deviation was run between the labs to get the average. All results were compared with Nigerian standards (shown below in **Table 177** to determine fortification status using the following variables:

1. Fortified at or above standard- defined as the proportion of samples whose fortificant content meet the minimum national standard (**Table 177**).
2. Fortified below standard - defined as the proportion of samples whose fortificant content does not meet the minimum national standard (**Table 177**).
3. Not fortified- the fortificant content was too small in quantity to be detected from the analysis. This means the food vehicle was not fortified at all.

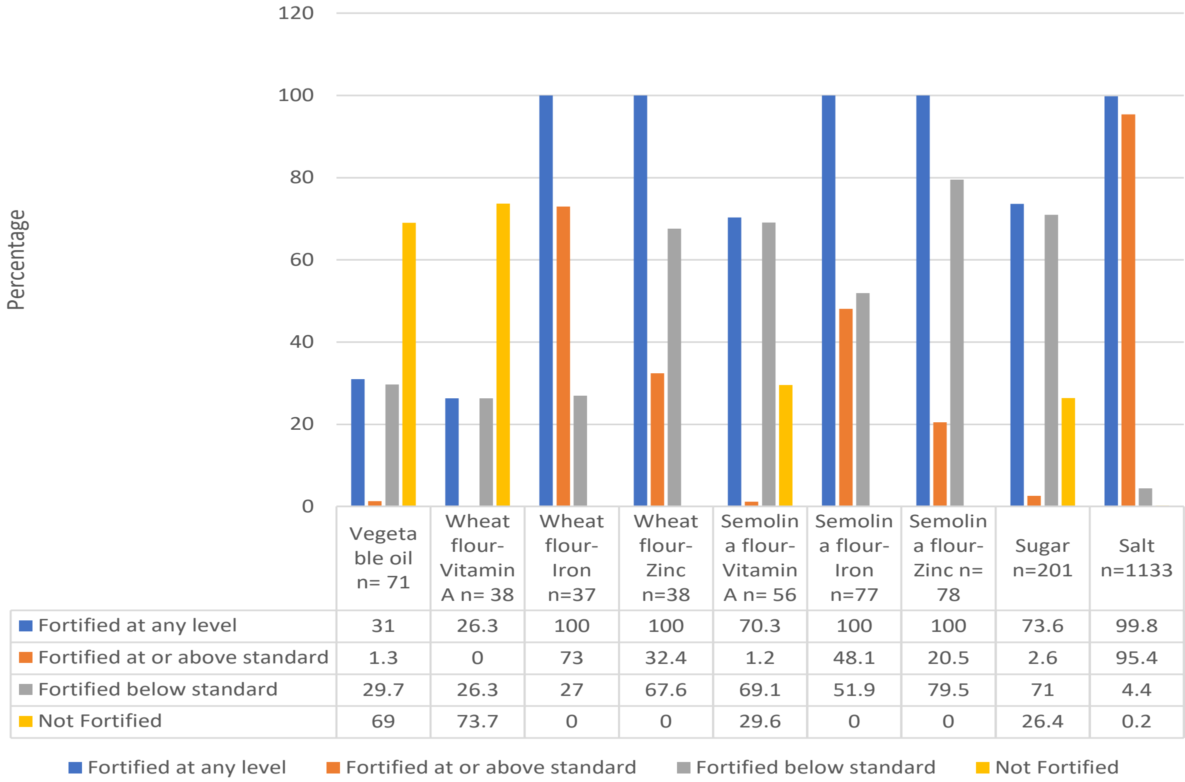
Table 177. Minimum National Industrial Requirements (NIS)-Expected Value in the Mandatory Vehicles

S/N	Food Vehicles	VA (mg/kg)	Iron (mg/kg)	Zinc (mg/kg)	Iodine (mg/Kg)
1	*Wheat flour	2.0	40.0	50.0	
2	*Semolina Wheat flour	2.0	40.0	50.0	
3	*Maize flour	2.0	40.0	50.0	
4	*Whole maize meal	2.0	40.0	50.0	
5	*Composite (Wheat-Cassava) flour	2.0	40.0	50.0	
6	**Vegetable oil	6.0			
7	**Sugar	7.5			
8	Margarine	7.8			
9	***Salt				15ppm

Source: NIS 168 FOOD GRADE SALT (2004)
*Values at all levels-factory, market and HH
**Values for factory level only
***Value for HH level

Overview of the food sample results

Based on the analysis of food samples that were collected in a sub-sample of households of the sampled non-pregnant WRA and analysed for micronutrient contents, it was revealed that the majority of samples were fortified at any level for vitamin A in sugar (74 percent), iodine in salt (100 percent), iron and zinc in wheat flour (100 percent each) while iron and zinc in semolina flour was also 100 percent (**Figure 38**). Conversely, about one third was fortified at any level with vitamin A in vegetable oil (31 percent) and vitamin A in wheat flour (26 percent).



	Vegeta ble oil n= 71	Wheat flour-Vitamin A n= 38	Wheat flour-Iron n=37	Wheat flour-Zinc n=38	Semolin a flour-Vitamin A n= 56	Semolin a flour-Iron n=77	Semolin a flour-Zinc n= 78	Sugar n=201	Salt n=1133
Fortified at any level	31	26.3	100	100	70.3	100	100	73.6	99.8
Fortified at or above standard	1.3	0	73	32.4	1.2	48.1	20.5	2.6	95.4
Fortified below standard	29.7	26.3	27	67.6	69.1	51.9	79.5	71	4.4
Not Fortified	69	73.7	0	0	29.6	0	0	26.4	0.2

Figure 38. Fortification status of food vehicle samples collected from non-pregnant women at the repeat interview

The measured mean amounts of micronutrients (**Table 178**) in the fortified samples were 2.6 mg/kg vitamin A in vegetable oil, 3.1mg retinyl palmitate/kg vitamin A in sugar, 60 mg/kg iodine in salt, 0.8 mg retinyl palmitate/kg vitamin A, 53.9 mg/kg iron, and 42.2 mg/kg zinc in wheat flour, and 0.8 mg retinyl palmitate/kg vitamin A, 38.6 mg/kg iron, and 36.0 mg/kg zinc in semolina flour.

Table 178. Descriptive statistics of Fortificant contents (at any level) of the Food samples collected from the households of Non-pregnant Women at repeat interview.

Food vehicles	Fortificants	N	Mean	Median	SD	Min	Max
Vegetable oil	Vitamin A (mg retinyl palmitate kg-1)	71	2.6	2.4	1.76	0.2	11.3
Wheat flour	Vitamin A (mg retinyl palmitate kg-1)	38	0.8	0.8	0.23	0.4	1.0
Wheat flour	Iron (mg/kg)	37	*53.9	48.9	26.90	19.1	176.0
Wheat flour	Zinc (mg/kg)	37	*42.2	38.9	24.10	4.7	109.4
Semolina flour	Vitamin A (mg retinyl palmitate kg-1)	56	0.8	0.7	0.40	0.2	2.0
Semolina flour	Iron (mg/kg)	77	*38.6	38.1	16.35	8.4	83.2
Semolina flour	Zinc (mg/kg)	78	*36.0	39.4	17.58	2.4	87.0
Sugar	Vitamin A (mg retinyl palmitate kg-1)	201	3.1	2.7	2.20	0.2	13.6
Salt	Iodine (mg/kg)	1133	60.0	53.1	35.02	2.7	251.5

*Intrinsic values inclusive

From the mean contents of the fortificants in the food samples shown in **Table 178**, all the samples fortified with vitamin A are below the minimum standard. This could be due to losses during food vehicle distribution, from factory to homes, especially during transportation, retail display and handling in open markets, as well as in storage. Vitamin A is photo and thermal sensitive thus the need for further studies on vitamin A retention in the food vehicle value chain to be able to determine where losses lie and fully explore the contribution of large-scale food fortification in the reduction of vitamin A deficiency. Also, for flours, the iron and zinc values may be over quantified as intrinsic iron and zinc were inclusive. Further study may therefore be necessary to quantify actual fortification levels.

Diet Quality

Box 10. Key Findings on Diet Quality

Minimum Dietary Diversity Score: *T*he diversity score of non-pregnant women in Nigeria is 3.6 out of a possible score of 10 (3.0 in the North West and 4.6 in the South West).

Minimum Dietary Diversity for Women (MDD-w): 27.7 percent of non-pregnant and 28.8 percent of pregnant women achieved minimum dietary diversity. The proportion of non-lactating and lactating women who achieved minimum diversity were 28 percent and 25 percent respectively (13.3 percent in North West and 53.8 percent in South West).

Global Diet Quality Score (GDQS): More than two-thirds of women (72.2 percent of non-pregnant women and 69.9 percent of pregnant women) had a GDQS between 15 and 23, which corresponds to a moderate risk of poor diet quality outcomes.

Global Diet Recommendations (GDR): The GDR Protect score reflects adherence to global dietary recommendations on healthy components of the diet, and scores can range between 0 and 9. The higher the GDR score, the more recommendations are likely to be met and vice-versa. The mean score was 4.0 for non-pregnant women and 4.1 for pregnant women.

The GDR Risk score: The GDR Risk score is used as a proxy for ultra-processed food intake and scores can range between 0 and 9. Across all categories, the score was below 2 ranging between 0.6-1.5.

Diet Quality Metrics

There are varied definitions of diet quality but generally it has been described as a concept of a diet that contains foods grouped into healthy and unhealthy components whereby an individual (or population) should consume adequate amounts of healthy foods and nutrients e.g. fruits, vegetables, whole grains, fiber etc. and also moderate (or very limited) consumption of unhealthy foods and nutrients e.g. saturated fat, sugar, sodium etc. (Guenther et al. 2013). An array of diet quality metrics is available for use (Miller et al 2020), yet there are important differences to consider when using a metric for a particular context. Key considerations include the validity of the metric for use in the given context, and the type of information and level of detail the metric provides about the diet consumed (WHO 2021). In this report, Minimum Dietary Diversity (MDD-W), Global Diet Quality Score (GDQS) and Global Dietary Recommendations (GDR) are presented for pregnant and non-pregnant women, and disaggregated by lactation status, residence, zone and wealth quintile for non-pregnant women.

Given the differences between metrics, direct comparisons of the three metrics reported are not possible. Specifically, the MDD-W is an indicator for likelihood of adequate micronutrient intake which relies on the consumption of 10 food groups. It can be presented as a proportion of women (in a population) who achieved minimum diversity (at least 5 food groups) or as a quantitative mean value of number of food groups consumed. The GDQS is an indicator to assess risk of poor diet quality outcomes, both in terms of nutrient adequacy and risk factors for NCDs which relies on 25 food groups and considers ranges of consumption. It also has quantitative scores and qualitative categories of presentations. The GDR score is presented as a combination of an overall score, the NCD-Protect score (previously GDR-Healthy) which reflects adherence to global dietary recommendations on healthy components of the diet and the NCD-Risk score (GDR-Limit) which is a proxy for ultra-processed food intake.

Minimum Dietary Diversity for Women.

Since its development in 2015 and subsequent revision (FAO 2021), the MDD-W has served as a population–level indicator that measures the proportion of women 15-49 years of age who consumed food items (at least 15g) from at least five out of the ten defined food groups the previous day or night (see section on data processing). The higher the MDD-W, the higher the probability of nutrient adequacy for most key micronutrients needed for sustenance of health. It can also be presented as Minimum Dietary Diversity for Women Score which is a population average calculation of food groups consumed.

Only about a third of non-pregnant and pregnant women achieved minimum dietary diversity (Table 179). The proportion of non-lactating and lactating women who achieved minimum diversity were 28 percent and 25 percent respectively. Women in urban areas when compared with their rural counterparts had a higher proportion of those who achieved minimum diversity. Across the zones, women from the southern zones had a comparatively higher diversity than women from the northern zones and generally there was an increase in the minimum diversity as wealth quintile increased from a low (14 percent) to high (44 percent) among women in the lowest and highest quintiles respectively.

Table 179. Percentage of women who achieved Minimum Dietary Diversity for Women (MDD-W)

	% who achieved MDD		
	N[1]	% [95% CI][2]	SE
National			
Non-pregnant women	5241	27.7 [25.5, 29.9]	1.1
NPNL[3]	4544	28.2 [25.9, 30.5]	1.2
Lactating women[4]	697	24.6 [20.4, 28.8]	2.1
Pregnant women	999	28.8 [24.4, 32.7]	2.0
Residence			
Non-pregnant women			
Urban	2114	37.2 [32.8, 41.6]	2.2
Rural	3127	20.4 [17.7, 23.2]	1.4
Pregnant women			
Urban	402	41.8 [35.3, 48.2]	3.3
Rural	597	21.8 [17.3, 26.3]	2.3
Zone			
Non-pregnant women			
North Central	800	25.0 [18.3, 31.6]	3.4
North East	824	17.2 [13.5, 20.8]	1.8
North West	943	13.3 [9.8, 16.9]	1.8
South East	871	35.9 [31.9, 40.0]	2.1
South South	892	36.4 [30.9, 41.8]	2.8
South West	911	53.8 [48.8, 58.7]	2.5
Wealth Quintile			
Non-pregnant women			
Lowest	921	14.3 [10.3, 18.3]	2.0
Second	875	16.9 [13.2, 20.7]	1.9
Middle	1061	24.1 [20.2, 27.9]	1.9
Fourth	1193	35.6 [30.9, 40.3]	2.4
Highest	1170	44.3 [39.2, 49.5]	2.6

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

As shown in **Table 180**, the diversity score of non-pregnant women in Nigeria is 3.6 out of a possible score of 10. While women living in urban areas had a one-point advantage than their rural counterparts, a similar advantage was observed for women from Southern zones compared to Northern zones. Wealth status also had a similar trend when lowest to highest quintile were compared.

Overall, the results show that the diversity of diet is relatively low among women in Nigeria which suggests a low probability of achieving and maintaining micronutrient adequacy for health. This agrees with the high proportion of inadequacy of most micronutrients from the nutrient intake results and thus indicates that the dietary intake of women is insufficient to maintain adequacy for health. Also, the factors of location and wealth status provide an insight into these results and could be included in food systems innovations for sustainable healthy diets.

Table 180. Mean score of Minimum Dietary Diversity for Women (MDD-W).

	MDD-W Score			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	3.6 [3.5, 3.7]	0.0	3.0 [2.0, 4.2]
NPNL[3]	4544	3.6 [3.5, 3.7]	0.0	3.0 [2.0, 4.2]
Lactating women[4]	697	3.5 [3.4, 3.7]	0.1	3.0 [2.1, 4.0]
Pregnant women	999	3.6 [3.4, 3.7]	0.1	3.0 [2.0, 4.2]
Residence				
Non-pregnant women				
Urban	2114	4.0 [3.8, 4.1]	0.1	3.4 [2.4, 4.6]
Rural	3127	3.3 [3.2, 3.4]	0.0	2.7 [1.7, 3.8]
Pregnant women				
Urban	402	4.0 [3.8, 4.3]	0.1	3.5 [2.4, 4.7]
Rural	597	3.4 [3.2, 3.5]	0.1	2.7 [1.8, 3.8]
Zone				
Non-pregnant women				
North Central	800	3.6 [3.4, 3.8]	0.1	2.9 [2.1, 4.0]
North East	824	3.1 [3.0, 3.3]	0.1	2.6 [1.1, 3.6]
North West	943	3.0 [2.9, 3.2]	0.1	2.4 [1.6, 3.4]
South East	871	4.0 [3.8, 4.1]	0.1	3.5 [2.4, 4.5]
South South	892	4.0 [3.7, 4.2]	0.1	3.5 [2.4, 4.5]
South West	911	4.6 [4.5, 4.8]	0.1	4.1 [3.2, 5.1]
Wealth Quintile				
Non-pregnant women				
Lowest	921	3.0 [2.8, 3.2]	0.1	2.4 [1.4, 3.5]
Second	875	3.2 [3.1, 3.4]	0.1	2.6 [1.7, 3.6]
Middle	1061	3.5 [3.4, 3.7]	0.1	2.9 [2.0, 4.0]
Fourth	1193	3.9 [3.8, 4.1]	0.1	3.4 [2.3, 4.5]
Highest	1170	4.3 [4.1, 4.4]	0.1	3.8 [2.7, 4.7]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Global Diet Quality Score (GDQS)

The GDQS is a food-based metric of diet quality for assessing nutrient adequacy and also risk factors for non-communicable diseases (NCDs). The score is presented as a combination of an overall score, GDQS+ and GDQS- which are all expressed as mean scores at the population level. For both the GDQS positive and the GDQS negative, a higher score is desired and reflective of more healthy food consumption patterns for the GDQS metric. Another method of presentation is the categories presented based on cut-offs. The cut-offs for risk of poor diet quality outcomes are GDQS < 15 (high risk of poor diet quality outcomes), GDQS ≥15 and <23 (moderate risk of poor diet quality outcomes) and GDQS ≥ 23 (low risk of poor diet quality outcomes.

The overall GDQS, which has a possible range of 0 to 49, was 18.7 for non-pregnant women and 19.2 for pregnant women (**Table 181**). Mean scores were similar across residence, zone and wealth quintiles. The GDQS+, which is the total score aggregated from the 16 healthy GDQS food groups with a possible range of 0 to 32, was a mean of 7.7 for non-pregnant women and 7.9 for pregnant women. Mean scores were similar across residence, zone and wealth quintiles. The GDQS−, which is the total score across the 7 unhealthy GDQS food groups and the 2 GDQS food groups that are unhealthy when consumed in excessive amounts with a possible range of 0 to 17, was a mean of 11.1 for non-pregnant women and 11.3 for pregnant women. Some variations in GDQS− were observed between residence, zone and wealth quintiles groups.

The categorical classifications of risk of poor diet quality outcomes are presented in **Table 182**. More than two-thirds of women (72.2 percent of non-pregnant women and 69.9 percent of pregnant women) had a GDQS between 15 and 23, which corresponds to a moderate risk of poor diet quality outcomes. The proportion of women with a high risk of poor diet quality outcomes, which is defined as GDQS < 15 was 15.0 percent for non-pregnant women and 12.9 percent for pregnant women. Some variations in risk or poor outcomes were observed between residence, zone and wealth quintiles groups. A trend towards higher risk of poor diet quality outcomes was observed by wealth quintiles, with 11 percent of women having a high risk of poor diet quality outcomes for the lowest wealth quintile and versus 18 percent for the highest wealth quintile.

Although two-thirds of women had a moderate risk of poor outcomes in terms of nutrient adequacy and NCD risk, the GDQS data show a less than optimal consumption of healthy foods, and a concern for a potential increase in the consumption of unhealthy foods. These data call for an improvement in the dietary diversity of healthy food groups, whilst limiting the consumption of unhealthy food groups by means of food-based dietary recommendation relevant to the Nigerian context.

Table 181. Global Diet Quality Score (Overall, GDQS+ and GDQS-)

		Mean GDQS		
	N[1]	GDQS+ [95% CI][2]	GDQS- [95% CI][2]	GDQS [95% CI][2]
National				
Non-pregnant women	5241	7.7 [7.5, 7.8]	11.1 [10.9, 11.1]	18.7 [18.6, 18.9]
NPNL[3]	4544	7.6 [7.4, 7.8]	11.1 [11.0, 11.1]	18.7 [18.5, 18.9]
Lactating women[4]	697	8.0 [7.7, 8.4]	11.1 [10.9, 11.3]	19.1 [18.8, 19.5]
Pregnant women	999	7.9 [7.6, 8.2]	11.3 [11.2, 11.4]	19.2 [18.9, 19.6]
Residence				
Non-pregnant women				
Urban	2114	7.7 [7.4, 7.9]	10.7 [10.5, 10.9]	18.4 [18.1, 18.6]
Rural	3127	7.7 [7.4, 7.9]	11.3 [11.2, 11.5]	19.0 [18.8, 19.2]
Zone				
Non-pregnant women				
North Central	800	7.3 [6.9, 7.7]	11.3 [11.1, 11.5]	18.7 [18.2, 19.1]
North East	824	7.3 [6.9, 7.7]	11.7 [11.6, 11.9]	19.0 [18.5, 19.4]
North West	943	7.6 [7.2, 7.9]	11.6 [11.4, 11.7]	19.2 [18.7, 19.6]
South East	871	7.6 [7.3, 8.0]	10.4 [10.3, 10.6]	18.1 [17.7, 18.4]
South South	892	7.5 [7.1, 7.9]	10.4 [10.1, 10.6]	17.9 [17.4, 18.3]
South West	911	8.7 [8.3, 9.0]	10.1 [10.0, 10.3]	18.8 [18.5, 19.2]
Wealth Quintile				
Non-pregnant women				
Lowest	921	7.7 [7.3, 8.1]	11.7 [11.5, 11.9]	19.4 [19.0, 19.8]
Second	875	7.8 [7.5, 8.1]	11.5 [11.4, 11.6]	19.3 [19.0, 19.6]
Middle	1061	7.5 [7.2, 7.8]	11.1 [10.9, 11.2]	18.6 [18.3, 18.8]
Fourth	1193	7.6 [7.3, 7.9]	10.7 [10.6, 10.9]	18.3 [18.0, 18.6]
Highest	1170	7.8 [7.5, 8.1]	10.5 [10.3, 10.6]	18.2 [17.9, 18.5]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 182. Global Diet Quality Score categories

		% at risk of poor diet quality		
	N[1]	High [95% CI][2]	Moderate [95% CI][2]	Low [95% CI][2]
National				
Non-pregnant women	5241	15.0 [13.8, 16.3]	72.2 [70.7, 73.7]	12.8 [11.4, 14.1]
NPNL[3]	4544	15.9 [14.5, 17.2]	71.4 [69.8, 73.0]	12.7 [11.3, 14.1]
Lactating women[4]	697	9.7 [7.1, 12.2]	77.0 [73.5, 80.5]	13.3 [10.3, 16.3]
Pregnant women	999	12.9 [10.2, 15.7]	69.9 [66.2, 73.5]	17.2 [14.2, 20.1]
Residence				
Non-pregnant women				
Urban	2114	17.0 [15.4, 18.7]	71.2 [69.0, 73.4]	11.7 [10.0, 13.4]
Rural	3127	13.4 [11.6, 15.3]	73.0 [70.9, 75.1]	13.6 [11.6, 15.5]
Zone				
Non-pregnant women				
North Central	800	15.5 [12.4, 18.6]	72.3 [69.0, 75.5]	12.2 [9.3, 15.1]
North East	824	14.0 [10.8, 17.2]	72.4 [67.9, 76.9]	13.6 [10.1, 17.2]
North West	943	10.9 [8.5, 13.2]	76.4 [73.2, 79.5]	12.7 [9.7, 15.8]
South East	871	17.9 [15.2, 20.5]	71.3 [68.8, 73.8]	10.8 [8.6, 13.0]
South South	892	22.8 [19.2, 26.4]	66.3 [63.1, 69.5]	10.9 [7.6, 14.1]
South West	911	14.9 [11.7, 18.0]	70.2 [66.9, 73.6]	14.9 [12.1, 17.6]
Wealth Quintile				
Non-pregnant women				
Lowest	921	11.0 [8.3, 13.7]	73.2 [69.8, 76.5]	15.9 [12.3, 19.4]
Second	875	13.5 [10.7, 16.3]	72.2 [67.9, 76.5]	14.3 [10.9, 17.6]
Middle	1061	13.3 [10.7, 15.9]	74.8 [71.6, 78.0]	11.9 [9.4, 14.3]
Fourth	1193	18.6 [15.7, 21.6]	69.3 [66.2, 72.4]	12.1 [9.6, 14.5]
Highest	1170	17.9 [15.4, 20.4]	71.5 [68.8, 74.1]	10.6 [8.5, 12.7]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Global Diet Recommendations (GDR)

The GDR score is a metric expressed as an overall score from its constituent scores- GDR protect score minus GDR risk score (ref: DQQ Project). The overall score has a range from 0 to 18 that indicates adherence to global dietary recommendations, which include dietary factors protective against or contributory to non-communicable diseases. The higher the GDR score, the more recommendations are likely to be met and vice-versa. The GDR score is presented as a summation of GDR protect score minus GDR risk score + 9 which is then expressed as the mean score for the population (**Table 183**).

The GDR Protect score reflects adherence to global dietary recommendations on healthy components of the diet (i.e., consumption of whole grains, pulses, nuts and seeds, fruits and vegetables), and scores can range between 0 and 9. The mean score was 4.0 for non- pregnant women and 4.1 for pregnant women (**Table 184**). There were slight differences in urban-rural and wealth quintile comparisons which showed that rural and poorer dwellers had comparatively higher scores. The GDR Risk score is used as a proxy for ultra-processed food intake (i.e., consumption of soft drinks, sweets, processed meat, unprocessed red meat, deep fried food fast food and packaged ultra-processed salty snacks), and scores can range between 0 and 9. Across all categories, the score was below 2 ranging between 0.6-1.5 (**Table 185**). Yet, there were slight differences in urban-rural and wealth quintile comparisons which show that urban and richer dwellers had comparatively higher scores.

Overall, the GDR metric shows that the diet of Nigerian women is not optimally adhering to global recommendations on healthy components, yet it is indicating a low preference for ultra-processed foods which suggests that even though the diet may be lacking in adequacy, it has not shifted to a diet reliant of ultra-processed foods. However, these trends are clearly identifiable when the location and wealth status is considered which indicates that economic affluence may be exposing Nigerian women to a higher risk of non-adherence to global recommendations.

Table 183. Global Diet Recommendation Overall Score

	Overall GDR Score			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	11.9 [11.8, 12.0]	0.0	11.6 [10.1, 12.8]
NPNL[3]	4544	11.9 [11.8, 12.0]	0.0	11.5 [10.1, 12.8]
Lactating women[4]	697	12.2 [12.0, 12.4]	0.1	12.0 [10.5, 13.0]
Pregnant women	999	12.2 [12.0, 12.4]	0.1	11.9 [10.5, 13.1]
Residence				
Non-pregnant women				
Urban	2114	11.4 [11.2, 11.6]	0.1	10.9 [9.6, 12.3]
Rural	3127	12.3 [12.2, 12.5]		12.0 [10.7, 13.2]
Pregnant women				
Urban	402	11.5 [11.2, 11.8]	0.1	11.0 [9.8, 12.2]
Rural	597	12.6 [12.4, 12.7]	0.1	12.3 [11.0, 13.3]
Zone				
Non-pregnant women				
North Central	800	12.0 [11.7, 12.3]	0.1	11.6 [10.4, 12.7]
North East	824	12.7 [12.4, 13.0]	0.2	12.5 [11.2, 13.4]
North West	943	12.6 [12.4, 12.9]	0.1	12.5 [11.2, 13.4]
South East	871	11.1 [10.1, 11.2]	0.1	10.6 [9.5, 11.7]
South South	892	10.9 [10.7, 11.2]	0.1	10.5 [9.3, 11.6]
South West	911	11.0 [10.9, 11.2]	0.1	10.6 [9.4, 11.7]
Wealth Quintile				
Non-pregnant women				
Lowest	921	12.9 [12.7, 13.1]	0.1	12.7 [11.4, 13.5]
Second	875	12.5 [12.4, 12.7]	0.1	12.2 [11.0, 13.2]
Middle	1061	12.0 [11.8, 12.2]	0.1	11.6 [10.2, 12.9]
Fourth	1193	11.4 [11.2, 11.6]	0.1	10.9 [9.7, 12.2]
Highest	1170	11.0 [10.8, 11.2]	0.1	10.5 [9.2, 11.8]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 184. Global Diet Recommendation (NCD-Protect score)

	GDR Healthy Score			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	4.0 [3.9, 4.1]	0.0	3.6 [2.4, 4.6]
NPNL[3]	4544	4.0 [3.9, 4.0]	0.0	3.5 [3.5, 4.6]
Lactating women[4]	697	4.2 [4.1, 4.4]	0.1	4.0 [2.8, 4.7]
Pregnant women	999	4.1 [4.0, 4.3]	0.1	3.9 [2.6, 4.7]
Residence				
Non-pregnant women				
Urban	2114	3.7 [3.6, 3.8]	0.1	3.2 [2.1, 4.3]
Rural	3127	4.2 [4.1, 4.4]	0.0	4.0 [2.7, 4.7]
Pregnant women				
Urban	402	3.7 [3.5, 3.9]	0.1	3.3 [2.1, 4.3]
Rural	597	4.4 [4.2, 4.5]	0.1	4.1 [3.0, 4.8]
Zone				
Non-pregnant women				
North Central	800	4.0 [3.8, 4.1]	0.1	3.5 [2.5, 4.5]
North East	824	4.5 [4.3, 4.7]	0.1	4.2 [3.2, 5.0]
North West	943	4.6 [4.4, 4.8]	0.1	4.4 [3.3, 5.0]
South East	871	3.4 [3.3, 3.5]	0.1	2.9 [2.0, 3.8]
South South	892	3.2 [3.1, 3.3]	0.0	2.7 [1.8, 3.6]
South West	911	3.6 [3.4, 3.7]	0.1	3.1 [2.2, 3.9]
Wealth Quintile				
Non-pregnant women				
Lowest	921	4.5 [4.3, 4.7]	0.1	4.3 [3.2, 4.9]
Second	875	4.4 [4.3, 4.6]	0.1	4.2 [3.0, 4.8]
Middle	1061	4.0 [3.9, 4.2]	0.1	3.6 [2.5, 3.6]
Fourth	1193	3.8 [3.6, 3.9]	0.0	3.3 [2.2, 4.4]
Highest	1170	3.5 [3.4, 3.6]	0.0	3.0 [2.1, 4.0]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Table 185. Global Diet Recommendation (Risk score)

	GDR Limit Score			
	N[1]	Mean [95% CI][2]	SE	Median [25-75th]
National				
Non-pregnant women	5241	1.1 [1.0, 1.1]	0.0	0.4 [0, 1.2]
NPNL[3]	4544	1.1 [1.0, 1.2]	0.0	0.5 [0, 1.3]
Lactating women[4]	697	1.0 [0.9, 1.1]	0.0	0.4 [0, 1.2]
Pregnant women	999	0.9 [0.9, 1.0]	0.0	0.4 [0, 0.9]
Residence				
Non-pregnant women				
Urban	2114	1.4 [1.3, 1.4]	0.0	0.7 [0.1, 1.6]
Rural	3127	0.9 [0.8, 1.0]	0.0	0.3 [0, 0.9]
Pregnant women				
Urban	402	1.2 [1.1, 1.3]	0.0	0.6 [0.1, 1.3]
Rural	597	0.8 [0.7, 0.9]	0.0	0.2 [0, 0.8]
Zone				
Non-pregnant women				
North Central	800	1.0 [0.8, 1.1]	0.1	0.4 [0, 1.0]
North East	824	0.8 [0.7, 1.0]	0.1	0.2 [0, 0.8]
North West	943	0.9 [0.8, 1.0]	0.0	0.3 [0, 1.0]
South East	871	1.3 [1.2, 1.5]	0.0	0.7 [0.0, 1.6]
South South	892	1.3 [1.1, 1.5]	0.1	0.6 [0, 1.5]
South West	911	1.5 [1.4, 1.6]	0.0	0.9 [0.8, 1.8]
Wealth Quintile				
Non-pregnant women				
Lowest	921	0.6 [0.6, 0.7]	0.0	0.0 [0, 0.7]
Second	875	0.9 [0.8, 1.0]	0.0	0.3 [0, 0.9]
Middle	1061	1.0 [0.9, 1.1]	0.0	0.4 [0, 1.1]
Fourth	1193	1.3 [1.2, 1.4]	0.0	0.7 [0.0, 1.5]
Highest	1170	1.5 [1.4, 1.6]	0.0	0.9 [0.2, 1.7]

1Number of respondents
2Sample weights are applied to account for survey design and non-response.
3Non-lactating women are defined as not breastfeeding or breastfeeding an infant ≥12 months of age
4Lactating women are defined as breastfeeding an infant <12 months of age
CI= Confidence Interval, NPNL = Non pregnant and non-lactating women, SE= Standard Error

Characteristics of respondents: Micronutrient survey

Figure 39 depicts the order for data and biological sample collection in the field and breaks down the micronutrient component of the National Food Consumption and Micronutrient Survey (NFCMS), 2021 into its key aspects; namely, biomarker questionnaire, anthropometry, and measurements from the six laboratories.

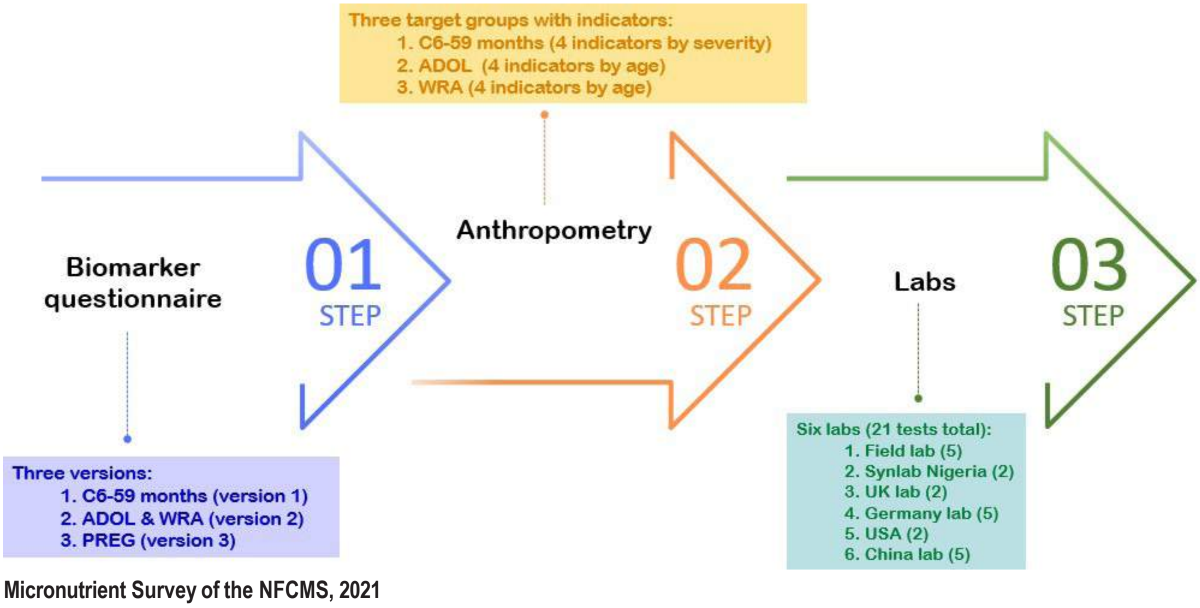


Figure 39: The three components of the micronutrient survey of the National Food Consumption and Micronutrient Survey (NFCMS), 2021

Tables 186 - 189 summarize respondents' characteristics for the micronutrient component of the survey at the national level and by target group. **Table 190** unpacks the measurements from the six labs and also shows a summary of the variables available for each target group and the completeness of the respective datasets.

1. Children aged 6-59 months (C6-59 months) - Table 186 and 190
2. Adolescent girls aged 10-14 years (ADOL) - Table 187 and 190
3. Women of reproductive age aged 15-49 years (WRA) - Table 188 and 190
4. Pregnant women aged 15-49 years (PREG) - Table 189 and 190

Children (aged 6-59 months)

Table 186. Characteristics of children (aged 6-59 months), Nigeria 2021

Background characteristics	Anthropometry		Biomarker questionnaire		Venipuncture blood collection	
National	4912		4952		5030	
Age category	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
6-11 months	535	10.5 [9.4, 11.8]	536	11.1 [10.1, 12.4]	549	11.8 [10.2, 12.5]
12-23 months	1078	22.2 [20.4, 24.1]	1150	23.5 [21.6, 25.5]	1166	23.4 [21.5, 25.5]
24-35 months	1141	22.3 [20.7, 24.1]	1263	25.0 [23.5, 26.6]	1271	24.7 [23.2, 26.3]
36-47 months	1229	25.6 [23.7, 27.6]	1180	24.3 [22.8, 26.0]	1184	24.0 [22.5, 25.6]
48-59 months	929	19.3 [18.0, 20.6]	823	16.0 [14.8, 17.4]	860	16.6 [15.3, 17.9]
Sex						
Male	2466	50.2 [48.3, 52.1]	2480	50.0 [48.1, 52.0]	2521	50.0 [48.1, 52.0]
Female	2446	49.8 [47.9, 51.7]	2472	50.0 [48.1, 52.0]	2509	50.0 [48.0, 51.9]
Residence						
Urban	2011	32.9 [26.6, 40.0]	2008	34.7 [28.5, 41.6]	2033	34.7 [28.4, 41.5]
Rural	2901	67.1 [60.0, 73.4]	2944	65.3 [58.4, 71.5]	2997	65.3 [58.5, 71.6]
Zone						
North Central	771	14.3 [10.9, 18.5]	772	14.0 [10.8, 18.1]	781	13.9 [10.7, 17.9]
North East	833	19.4 [15.3, 24.3]	841	19.9 [16.2, 24.1]	865	20.0 [16.4, 24.1]
North West	905	34.0 [28.6, 40.0]	919	34.1 [30.0, 39.0]	950	34.5 [30.0, 39.4]
South East	716	6.2 [5.2, 7.0]	721	6.2 [5.2, 7.3]	726	6.1 [5.1, 7.2]
South South	833	11.8 [9.8, 14.3]	837	11.7 [9.7, 14.0]	842	11.6 [9.6, 13.8]
South West	854	14.2 [11.8, 17.0]	862	14.1 [11.8, 16.8]	866	13.9 [11.6, 16.6]
Wealth quintile						
Poorest	895	20.7 [17.2, 24.6]	903	21.8 [18.3, 25.6]	936	22.1 [18.6, 26.0]
Second	848	22.9 [19.7, 26.4]	854	22.7 [19.7, 26.1]	866	22.6 [19.6, 25.9]
Middle	923	19.0 [17.0, 21.3]	929	19.2 [17.1, 21.5]	943	19.2 [17.1, 21.5]
Fourth	1139	19.6 [17.4, 22.1]	1149	19.1 [16.7, 21.6]	1155	18.9 [16.6, 21.5]
Richest	1087	17.8 [14.3, 22.0]	1097	17.2 [13.9, 21.2]	1110	17.1 [13.8, 21.0]
Level of education completed by caregiver						
None	1117	30.3 [27.1, 33.8]	1130	31.1 [27.8, 34.7]	1158	31.4 [28.1, 34.9]
Primary	771	14.0 [21.2, 16.0]	776	13.9 [12.2, 15.7]	782	13.8 [12.2, 15.6]
Secondary	2395	48.0 [45.2, 50.8]	2417	47.4 [44.7, 50.2]	2443	47.4 [44.6, 50.1]
Post-secondary	430	7.7 [6.1, 9.6]	445	7.5 [6.1, 9.3]	446	7.4 [6.0, 9.2]

N, number of respondents in the sub-group (unweighted)
%, Data are weighted to account for survey design and non-response CI, Confidence Interval

Adolescent girls (aged 10-14 years)

Table 187. Characteristics of adolescent girls (aged 10-14 years), Nigeria 2021

Background characteristics	Anthropometry		Biomarker questionnaire		Venipuncture blood collection	
National	999		993		995	
Age category	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
10 years	263	26.3 [22.8, 30.2]	266	30.0 [23.5, 30.8]	266	26.9 [23.4, 30.8]
11 years	156	14.2 [11.5, 17.5]	159	14.7 [12.1, 17.8]	159	14.7 [12.1, 17.8]
12 years	193	20.5 [17.2, 24.4]	195	20.6 [17.3, 24.3]	196	20.6 [17.5, 24.3]
13 years	192	19.5 [16.6, 22.7]	195	19.7 [16.9, 23.0]	196	19.9 [17.0, 23.1]
14 years	195	19.5 [16.6, 22.7]	178	18.0 [15.3, 21.0]	178	17.9 [15.3, 21.0]
Residence						
Urban	417	36.4 [30.2, 43.0]	407	40.8 [34.3, 47.7]	408	40.9 [34.4, 47.8]
Rural	582	63.6 [57.0, 69.8]	586	59.2 [52.3, 65.7]	587	59.1 [52.2, 65.6]
Wealth quintile						
Poorest	179	19.8 [15.9, 24.4]	178	20.4 [16.4, 25.2]	178	20.4 [16.3, 25.1]
Second	164	19.6 [15.9, 24.0]	162	19.4 [15.7, 23.6]	162	19.3 [15.7, 23.6]
Middle	187	20.4 [16.3, 25.3]	186	20.5 [16.4, 25.4]	188	20.7 [16.5, 25.6]
Fourth	216	19.1 [16.1, 22.6]	215	19.1 [16.1, 22.5]	215	19.0 [16.0, 22.4]
Richest	246	21.0 [17.4, 25.1]	248	20.6 [17.1, 24.6]	248	20.6 [17.1, 24.6]

N, number of respondents in the sub-group (unweighted)
%, Data are weighted to account for survey design and non-response CI, Confidence Interval

Women of Reproductive Age (aged 15-49 years)

Table 188. Characteristics of women of reproductive age (aged 15-49 years), Nigeria 2021

Background characteristics	Anthropometry		Biomarker questionnaire		Venipuncture blood collection	
National	5349		5467		5537	
Age category	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
15-19 years	1137	22.1 [20.5, 23.9]	1172	22.3 [20.6, 24.0]	1187	22.3 [20.6, 24.0]
20-29 years	1681	32.3 [30.6, 34.1]	1694	32.2 [30.5, 34.1]	1714	32.2 [30.4, 34.0]
30-39 years	1471	25.9 [24.3, 27.6]	1560	27.0 [25.6, 28.5]	1574	27.0 [25.5, 28.4]
40-49 years	1060	19.6 [18.4, 20.9]	1041	18.4 [17.1, 19.8]	1062	18.5 [17.3, 19.9]
Residence						
Urban	2169	39.5 [33.1, 46.2]	2148	43.5 [37.1, 50.1]	2179	43.5 [37.1, 50.1]
Rural	3180	60.5 [53.8, 66.9]	3319	56.5 [49.9, 62.9]	3358	56.5 [50.0, 62.9]
Zone						
North Central	881	15.5 [12.5, 19.0]	895	15.4 [12.4, 19.0]	907	15.5 [12.5, 19.1]
North East	864	17.5 [14.0, 21.6]	883	17.4 [14.5, 20.8]	892	17.4 [14.5, 20.7]
North West	929	28.3 [24.1, 32.8]	949	28.2 [24.6, 32.1]	963	28.2 [24.6, 32.1]
South East	881	7.6 [6.3, 9.2]	901	7.6 [6.3, 9.1]	910	7.6 [6.3, 9.0]
South South	883	13.7 [11.5, 16.2]	909	13.9 [11.7, 16.4]	923	14.0 [11.8, 16.5]
South West	911	17.4 [14.7, 20.4]	930	17.4 [14.8, 20.5]	942	17.4 [14.8, 20.4]
Wealth quintile						
Poorest	960	17.0 [14.0, 20.5]	979	17.7 [14.6, 21.3]	991	17.8 [14.7, 21.3]
Second	912	19.0 [16.4, 21.9]	926	18.7 [16.2, 21.5]	938	18.7 [16.2, 21.5]
Middle	1090	21.5 [19.2, 23.9]	1122	21.3 [19.0, 23.8]	1134	21.3 [19.0, 23.8]
Fourth	1200	21.4 [19.0, 24.1]	1229	21.4 [18.9, 24.1]	1241	21.3 [18.8, 24.0]
Richest	1167	21.1 [18.1, 24.4]	1191	20.8 [17.9, 24.1]	1213	20.9 [18.0, 24.2]
Level of education completed						
None	1057	22.4 [19.6, 25.5]	1088	22.7 [19.8, 25.9]	1094	22.7 [19.8, 25.9]
Primary	870	15.5 [14.0, 17.0]	888	15.2 [13.7, 16.9]	893	15.3 [13.7, 16.9]
Secondary	2798	53.8 [51.1, 56.5]	2881	53.8 [51.1, 56.5]	2895	53.8 [51.1, 56.4]
Post-secondary	448	8.3 [7.0, 9.9]	460	8.3 [7.0, 9.8]	461	8.3 [7.0, 9.8]

N, number of respondents in the sub-group (unweighted)
%, Data are weighted to account for survey design and non-response CI, Confidence Interval

Pregnant women (aged 15-49 years)

Table 189. Characteristics of pregnant women (aged 15-49 years), Nigeria 2021

Background characteristics	Biomarker questionnaire		Venipuncture blood collection	
National	813		817	
Age category	N	% (95% CI)	N	% (95% CI)
15-19 years	71	9.3 [6.8, 12.6]	72	9.4 [6.9, 12.7]
20-29 years	436	53.5 [48.4, 58.6]	438	53.4 [48.3, 58.6]
30-39 years	267	32.5 [28.3, 36.9]	268	32.5 [28.3, 36.9]
40-49 years	39	4.7 [3.0, 7.3]	39	4.7 [3.0, 7.2]
Residence				
Urban	328	33.6 [26.7, 41.4]	329	33.6 [26.7, 41.4]
Rural	485	66.4 [58.6, 73.3]	488	66.4 [58.6, 73.3]
Wealth quintile				
Poorest	164	24.6 [18.7, 31.6]	165	24.6 [18.7, 31.6]
Second	141	23.0 [18.2, 28.7]	142	23.1 [18.2, 28.7]
Middle	148	18.9 [15.4, 23.1]	148	18.9 [15.3, 23.0]
Fourth	180	19.0 [14.9, 24.0]	181	19.0 [14.9, 24.0]
Richest	178	14.4 [11.5, 17.9]	179	14.5 [11.6, 17.9]
Level of education completed				
None	170	33.0 [26.8, 39.9]	171	33.1 [26.9 4.0]
Primary	123	13.5 [10.6, 17.1]	124	13.6 [10.6, 17.2]
Secondary	425	47.5 [41.7, 53.3]	425	47.4 [41.6, 53.3]
Post-secondary	70	6.0 [4.3, 8.2]	70	6.0 [4.0, 8.1]

Table 190. Measurements and number of respondents from the six survey laboratories analysed in the final survey report by target group

Respondents	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Measurements Lab 1. Field lab	Malaria - 4758 Haemoglobin - 4754 Helicobacter pylori (H. pylori) - 4751 Helminth - 3496	Malaria - 981 Haemoglobin - 983 H. pylori - 968	Malaria - 5392 Haemoglobin - 5396 H. pylori - 5391 Plasma glucose - 5262 Helminth - 3942	Malaria - 796 Haemoglobin - 795 H. pylori - 796 Helminth - 552
Measurements Lab 2. Synlab Nigeria	Haemoglobin genotype - 4631	---	Haemoglobin genotype - 5288 HbA1c - 5233	---
Measurements Lab 3. Germany lab	Ferritin - 4504 C-reactive protein (CRP) - 4504 Alpha 1-acid glycoprotein (AGP) - 4504	Ferritin - 950 CRP - 950 AGP - 950	Ferritin - 5234 CRP - 5234 AGP - 5234	Ferritin - 764 CRP - 764 AGP - 764
Measurements Lab 4. UK Lab	---	---	ETKac - 907 EGRac – 1020	---
Measurements Lab 5. USA Lab	Serum retinol - 4438 MRDR - 1170	Serum retinol - 936	Serum retinol – 5148 MRDR - 1217	Serum retinol - 750
Measurements Lab 6. China Lab	Vitamin B12 - 4653 Zinc - 4501	Vitamin B12 - 977 Red Blood Cell (RBC) folate - 947 Zinc - 955	Vitamin B12 - 5394 (RBC) folate - 5370 Zinc - 5230 Iodine - 5230	Vitamin B12 - 798 (RBC) folate - 789 Iodine - 750

Prevalence, severity, and distribution of anthropometry Indicators [9]

This section[10] reports on the anthropometric status[11, 12, 13] of children (aged 6-59 months), adolescent girls (aged 10-14 years), and Women of Reproductive Age (WRA, aged15-49 years).

Anthropometric measurements are non-invasive, quantitative measurements of the body that provide a valuable assessment of nutrition status in children and adults. They are typically used in the pediatric population to evaluate general health status, nutritional adequacy, and growth and developmental patterns. In adults, body measurements can help assess health and dietary status and determine body composition, which can help determine underlying nutritional status and diagnose obesity (Fryar et al., 2016). The core measurements of anthropometry in the National Food Consumption and Micronutrient Survey of 2021 (NFCMS 2021) were age, length/height, and weight. Although age is not specifically an anthropometric measurement, it is used in anthropometric indicators, it is included as a measurement because the survey had challenges establishing true age of especially children 6-59 months and had to undertake an additional age verification exercise.

Box 11. Key Findings for Anthropometry

Children aged 6-59 months.

Stunting: Nationally, stunting is very high (33.8 percent) in children 6-59 months, and differs by age category (lowest in the 6-11-months (16.8 percent) and more than double at 39.8 percent in the 24-35-months, residence (rural is 40.0 percent and 20.8 percent in urban areas), zones (14.2 percent in the South East and 48.6 percent North West zone), wealth (47.9 percent among poor and 13.2 percent among wealthy), and level of education completed by caregiver (45.6 percent with none and 14.6 percent with post-secondary education).

Severe Stunting: One in six (17.1 percent) children 6-59 months is severely stunted nationally and differs by age (21 percent among 24-35 months and 7 percent among 6-11 months), residence (21.3 percent in rural and 8.4 percent in urban areas), zone (28.1 percent in North West and 5.3 percent in South West), wealth (29.4 percent among poor and 3.7 percent among rich), and level of education completed by the caregiver (25.9 percent with none and 4.8 percent with post-secondary).

Wasting: Overall, wasting is high (11.5 percent) and differs by age (25.4 percent in 6-11-months and 5.1 percent in 36-47 months), zones (17.1 percent in North East and 6.8 percent in South West), and wealth (14.3 percent among poor and 8.6 percent among rich).

Severe Wasting: Nationally, severe wasting is high (3 percent) and differs by age (6.5 percent in 6-11 months and 1 percent in 36-47 months), and zones (6.3 percent in North East and 1.2 percent in South West).

Underweight: One in four children aged 6-59 months (25.5 percent) is underweight, and differs by sex (27.3 percent among males and 23.7 percent among females), residence (29.4 percent in rural

9 The premise of the NFCMS aligns with the UNICEF conceptual framework of determinants of undernutrition (UNICEF, 2013). Individual nutritional status measured by indicators such as those of anthropometry and micronutrient biomarkers is determined by two immediate factors - high quality diets and optimal health. Three underlying factors influence these: access to sufficient, safe, and nutritious food; adequate care practices for especially women and children; and access to health services including healthy environments, water, and sanitation. Finally, at a basic level, political, economic, and institutional determinants underpin all of these factors.

10 For scope of final report for the anthropometry component, see Annex 5.

11 See Annex 4 for the anthropometry questionnaire.

12 See Annex 6 for a summary of the data quality assessment from Anthro Survey Analyzer.

13 The anthropometry indices were built using the Stata Software (version 14.0) using the command “zanthro” (Vidmar et al., 2013)

and 17.4 percent in urban areas), zone (35.8 percent in North West and 9.6 percent in South East), wealth (36.8 percent among poor and 13.9 percent among rich) and level of education completed by caregiver (33.3 percent with no education and 13.5 percent with post-secondary education).

Severe Underweight: Overall, the prevalence of severe underweight in children (aged 6-59 months) was 9.3 percent and differs by age, (11.4 percent among 6-11 months and 6.5 percent among 36-47 months), residence (11.1 percent in rural and 5.4 percent in urban areas), zone (13.7 percent in North West and 2.4 percent in South East), wealth (15.7 percent among poor and 4 percent among rich), and level of education completed by caregiver (14.8 percent with no education and 2.4 percent with post-secondary education).

Overweight: Overweight in children 6-59 months was low (1.5 percent) and no significant variation across the background characteristics.

Obesity: Overall, obesity in children (6-59 months old) was 0.6 percent and differs by zone (1.7 percent in South East and 0.1 percent in South West and South South).

Adolescent girls (aged 10-14 years)

Stunting: Overall, one in five (21.7 percent) younger adolescent girls aged 10-14 years are stunted and differs by residence (25.8 percent in rural areas and 14.5 percent in urban areas), and wealth (33.2 percent among poor and 9.6 percent among rich).

Thinness: Nationally, 15.4 percent are thin and there is no significant variation in the prevalence of thinness in younger adolescent girls (aged 10-14 years old) across the background characteristics.

Overweight: Overweight is very low (3.1 percent) nationally among younger adolescent girls (aged 10-14 years old) and differs by residence (4.4 percent in urban and 2.3 percent in rural areas) and wealth (5.6 percent among rich and 1.8 percent among poor).

Obesity: Overall, obesity is 1.1 percent and there was no significant variation across the background characteristics.

Women of Reproductive Age (WRA, aged 15-49 years)

Thinness: Overall, the prevalence of thinness is 14.2 percent and differs by age (18.4 percent among 20-29 years and 9.9 percent among 15-19 years), residence (16.1 in rural and 11.1 percent in urban areas), zones (21.7 percent in North West and 6.4 percent in South East), wealth quintile (27.3 percent among poor and 6.9 percent among rich), and level of education completed (22.5 percent with no education and 9.2 percent with post-secondary).

Overweight: Nationally, 15 percent are overweight and differs by age (24 percent among 40-49 years and 4.2 percent among 15-19 years), residence (17.9 percent in urban and 13.1 percent in rural areas), zones (21.2 percent in South East and 9.7 percent in North West), wealth (21.4 percent among rich and 8.1 percent among poor), and level of educational completed (24 percent among those with post-secondary and 10.7 percent among those with none).

Obesity: Overall, 8.1 percent are obese and differ by age categories (15.6 percent among 40-49 years and 1.6 percent among 15-19 years), residence (12.5 percent in urban and 5.2 percent in rural areas), zones (15.4 percent in South East and 3.6 percent in North West), wealth (15.9 percent among rich and 2.2 percent among poor), and level of education completed (16.3 percent among those with post-secondary and 4 percent among those with no education).

Anthropometry of children (aged 6-59 months)

A key objective of the NFCMS 2021 was to assess the prevalence, severity, and distribution of malnutrition in children (aged 6-59 months). In this context, the term malnutrition covers two broad groups of conditions. One is undernutrition, which includes stunting (low length/height-for-age), wasting (low weight-for-length/height), and underweight (low weight-for-age). The other is overweight (weight- for-length/height) and obesity (weight-for-length/height).

Stunting reflects linear growth retardation caused by long-term, insufficient nutrient intake and repeated infections. Wasting results from acute food shortage and illness, causing recent weight loss or failure to gain weight. Underweight is a composite indicator that can indicate wasting, stunting, or both. Thus, it might be challenging to interpret. However, it is still a useful anthropometric indicator to track individual-level changes in growth over time when collected sequentially, such as through a growth monitoring programme. Overweight and its severe form, obesity, are measures of overnutrition, which result from an energy imbalance between calories consumed and calories expended (de Onis & Branca, 2016, Black et al., 2013, and WHO, 2000).

Stunting was defined as height-for-age Z-score (HAZ) below −2SD (HAZ <−2SD) from the WHO Child Growth Standards median. Severe stunting was defined as HAZ <−3SD. Wasting was defined as weight-for-height Z-score (WHZ) <−2SD. Similarly, severe acute malnutrition (SAM) or severe wasting was defined as WHZ <−3SD. Underweight was defined as weight-for-age Z-score (WAZ) <−2SD, and severe underweight was defined as WAZ <−3SD. Overweight was defined as weight-for-length/height Z-score (WHZ) above 2SD (WHZ > 2SD), while obesity was defined as WHZ >3SD.

The prevalence at national level of stunting (33.8 percent), wasting (11.5 percent), underweight (25.5 percent), and being overweight (1.5 percent) in children (aged 6-59 months), is summarized in **Figure 40**. The prevalence of child stunting of 33.8 percent means that one out of every three children (aged 6- 59 months) in Nigeria was too short compared to a healthy, well-nourished child of the same age and sex. According to global benchmarks using the ‘novel approach,’ this level of stunting in children is very high (≥30 percent). The prevalence of wasting or global acute malnutrition of 11.5 percent (children were too thin for their height) is classified as high (10-<15 percent), according to global benchmarks using the ‘novel approach’. While the overweight prevalence in children of 1.5 percent is classified as very low (<2.5%) using the ‘novel approach’ (de Onis et al., 2019).

Table 191 presents the prevalence of malnutrition among children (aged 6-59 months) as determined by anthropometric indices, stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

- **Stunting:** For children (aged 6-59 months), there was a statistically significant difference in the prevalence of stunting between the age category (P < 0.001), residence (P < 0.001), zones (P< 0.001), wealth quintile (P < 0.001), and level of education completed by caregiver (P < 0.001). The prevalence of stunting was lowest in the 6-11-months-old age category (16.8 percent) and more than double at 39.8 percent in children in the 24-35-months-old age category. The prevalence was higher among children residing in rural (40.0 percent) versus those residing in urban areas (20.8 percent). The prevalence was highest in the North West zone (48.6 percent). The prevalence of stunting was lowest among children in households in the richest wealth quintile (13.2 percent) and highest in children whose caregivers had no formal education (45.6 percent).

- **Wasting**: Among children (aged 6-59 months) there was a statistically significant difference in the prevalence of wasting in between the age categories (P < 0.001), zones (P < 0.002) and wealth quintiles (P < 0.015). The prevalence of wasting was highest in the 6-11-months- old age category (25.4 percent). It was also highest in children in the North East zone (17.1 percent). It was highest among children in households in the poorest wealth quintile (14.3 percent).
- **Underweight**: In children (aged 6-59 months) there was a statistically significant difference in the prevalence of underweight in between sex (P < 0.026), residence (P < 0.001), zone (P < 0.001), wealth quintile (P < 0.001) and level of education completed by caregiver (P < 0.001). The prevalence of underweight was higher in male (27.3 percent) than in female (23.7 percent) children. It was higher in children residing in rural (29.4 percent) versus urban (17.4 percent) areas. The prevalence of underweight was highest in the North West zone (35.8 percent), in children in households in the poorest wealth quintile (36.8 percent), and in children whose caregivers had no formal educational (33.3 percent).
- **Overweight**: There was no significant variation in the prevalence of overweight in children (aged 6-59 months) across the background characteristics.

Table 192 presents the prevalence of severe malnutrition among children (aged 6-59 months) as determined by anthropometric indices, stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

- **Severe stunting**: The prevalence of severe stunting among children (aged 6-59 months) nationally was 17.1 percent. There was a statistically significant difference in the prevalence of severe stunting between the age categories (P < 0.001), residence (P < 0.001), zone (P < 0.001), wealth quintile (P < 0.001), and level of education completed by the caregiver (P < 0.001). The prevalence of severe stunting was lowest in the 6-11-months-old age category (7.0 percent). It was higher among children residing in rural (21.3 percent) versus urban (8.4 percent) areas. It was highest in children in the North West zone (28.1 percent), in children in households in the poorest wealth quintile (29.4 percent), and children whose caregivers had no formal education (25.9 percent).
- **Severe wasting**: Overall, the prevalence of severe wasting in children (aged 6-59 months) was 3.0 percent. There was a statistically significant difference in the prevalence of severe wasting between the age categories (P < 0.001) and zone (P < 0.001). The prevalence of severe wasting was highest in the 6-11-months old age category (6.5 percent). It was also highest in children in the North East zone (6.3 percent).
- **Severe underweight**: Overall, the prevalence of severe underweight in children (aged 6-59 months) was 9.3 percent. There was a statistically significant difference in the prevalence of severe underweight between the age categories (P < 0.042), residence (P < 0.001), zone (P < 0.001), wealth quintile (P < 0.001), and level of education completed by caregiver (P < 0.001). The prevalence of severe underweight was highest in the 6-11-months-old age category (11.4 percent). It was higher among children residing in rural (11.1 percent) versus urban (5.4 percent) areas. It was highest in children in the North West zone (13.7 percent), children in households in the poorest wealth quintile (15.7 percent), and children whose caregivers had no formal educational (14.8 percent).
- **Obesity**: Overall, the prevalence of obesity in children (6-59 months old) was 0.6 percent. There was a statistically significant difference in the prevalence of obesity between the zones (P < 0.023). The prevalence was highest in the South East zone (1.7 percent).

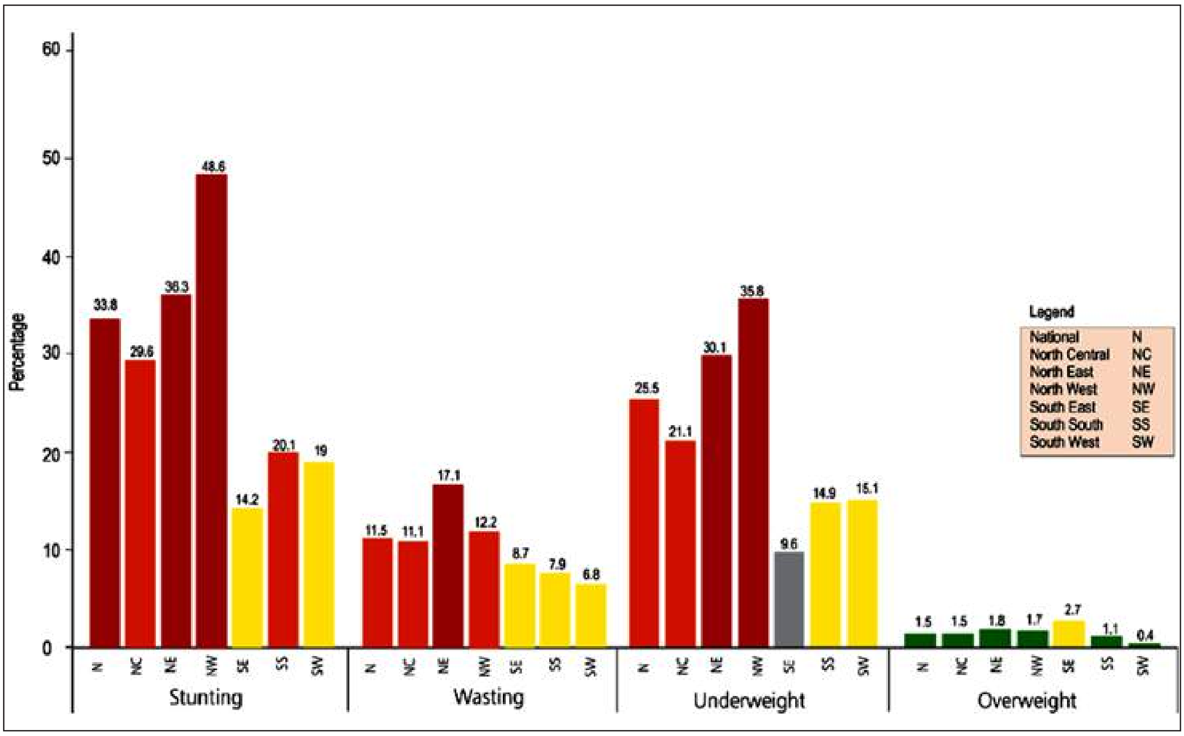


Figure 40. Anthropometric status for children (aged 6-59 months), Nigeria 2021

Using 2006 WHO Child Growth Standards:

Stunting, (low length/height-for-age), is defined as height-for-age Z-score (HAZ) <−2SD Wasting, (low weight-for length/height), is defined as weight-for-height Z-score (WHZ) <−2SD Underweight, (low weight-for-age), is defined as weight-for-age Z-score (WAZ) <−2SD

Overweight, (weight-for-length/height), is defined as weight-for-length/height Z-score (WHZ) > 2SD

Table 191. Malnutrition status of children (aged 6-59 months), Nigeria 2021

Background characteristics	Stunting		Wasting		Underweight		Overweight	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	4855	33.8 [30.9, 36.8]	4863	11.5 [10.1, 13.2]	4895	25.5 [23.4, 27.8]	4863	1.5 [1.1, 2.0]
Age category	(P < 0.001***)		(P < 0.001***)		(P = 0.292)		(P = 0.349)	
6-11 months	502	16.8 [12.5, 22.1]	503	25.4 [19.7, 32.0]	517	24.8 [19.2, 31.4]	503	1.5 [0.7, 3.2]
12-23 months	1132	32.0 [28.0, 36.4]	1139	17.8 [14.4, 21.8]	1146	27.6 [23.9, 31.7]	1139	1.7 [1.0, 2.9]
24-35 months	1214	39.8 [35.5, 44.2]	1221	10.3 [7.7, 13.5]	1221	27.6 [23.9, 31.6]	1221	1.7 [1.0, 3.0]
36-47 months	1183	36.9 [32.2, 41.8]	1180	5.1 [3.6, 7.3]	1186	23.7 [20.1, 27.8]	1180	1.6 [1.0, 2.6]
48-59 months	824	33.1 [28.4, 38.2]	820	5.5 [3.9, 7.8]	825	22.6 [18.7, 27.1]	820	0.6 [0.3, 1.4]
Sex	(P = 0.280)		(P = 0.502)		(P < 0.026*)		(P = 0.471)	
Male	2428	35.0 [31.0, 39.3]	2432	12.0 [10.4, 13.8]	2456	27.3 [24.6, 30.1]	2432	1.3 [0.9, 2.0]
Female	2427	32.5 [29.4, 35.8]	2431	11.1 [9.0, 13.5]	2439	23.7 [21.2, 26.5]	2431	1.6 [1.1, 2.4]
Residence	(P < 0.001***)		(P = 0.881)		(P < 0.001***)		(P = 0.5707)	
Urban	1990	20.8 [17.1, 25.1]	1997	11.4 [9.0, 14.3]	2005	17.4 [14.6, 20.6]	1997	1.3 [0.8, 2.2]
Rural	2865	40.0 [36.6, 43.5]	2866	11.6 [9.8, 13.7]	2890	29.4 [26.7, 32.2]	2866	1.6 [1.1, 2.3]
Zone	(P < 0.001***)		(P < 0.002**)		(P < 0.001***)		(P = 0.127)	
North Central	761	29.6 [22.9, 37.4]	765	11.1 [6.5, 18.3]	768	21.1 [14.8, 29.2]	765	1.5 [0.8, 2.7]
North East	818	36.3 [29.1, 44.3]	818	17.1 [13.9, 20.9]	829	30.1 [25.1, 35.6]	818	1.8 [1.0, 3.3]
North West	892	48.6 [43.2, 54.0]	890	12.2 [9.9, 15.1]	899	35.8 [31.8, 39.9]	890	1.7 [1.0, 3.0]
South East	705	14.2 [11.4, 17.6]	709	8.7 [6.7, 11.2]	714	9.6 [7.5, 12.4]	709	2.7 [1.3, 5.8]
South South	826	20.1 [16.2, 24.7]	827	7.9 [5.8, 10.7]	831	14.9 [12.1, 18.2]	827	1.1 [0.5, 2.3]
South West	853	19.0 [15.8, 22.8]	854	6.8 [5.0, 9.1]	854	15.1 [12.9, 17.6]	854	0.4 [0.1, 1.1]
Wealth quintile	(P < 0.001***)		(P < 0.015*)		(P < 0.001***)		(P = 0.799)	
Poorest	887	47.9 [43.2, 52.6]	878	14.3 [11.4, 17.7]	889	36.8 [31.9, 41.9]	878	1.7 [0.9, 3.2]
Second	834	46.0 [41.7, 50.4]	836	11.5 [9.1, 14.5]	842	34.6 [30.1, 39.3]	836	1.8 [1.1, 3.0]
Middle	903	33.0 [27.9, 38.5]	914	9.4 [7.0, 12.6]	919	20.1 [16.5, 24.3]	914	1.3 [0.7, 2.6]
Fourth	1128	23.1 [19.7, 26.9]	1132	8.6 [6.8, 10.8]	1139	18.4 [15.6, 21.5]	1132	1.3 [0.7, 2.3]
Richest	1083	13.2 [10.4, 16.6]	1083	13.9 [10.5, 18.1]	1086	13.9 [11.1, 17.3]	1083	1.2 [0.7, 2.2]
Level of education completed by caregiver	(P < 0.001***)		(P = 0.121)		(P < 0.001***)		(P = 0.376)	
None	1101	45.6 [41.4, 49.8]	1103	13.8 [11.4, 16.6]	1111	33.3 [29.5, 37.4]	1103	1.8 [1.2, 2.9]
Primary	765	29.4 [25.2, 33.9]	764	12.8 [9.0, 17.8]	771	22.0 [17.9, 26.7]	764	1.2 [0.6, 2.4]
Secondary	2371	29.3 [25.8, 33.1]	2379	10.4 [8.6, 12.5]	2387	22.5 [19.7, 25.5]	2379	1.1 [0.6, 1.9]
Post-secondary	426	14.6 [11.1, 19.1]	429	8.9 [5.1, 15.2]	430	13.5 [10.1, 17.8]	429	1.6 [0.7, 3.6]

Using 2006 WHO Child Growth Standards:
1Stunting, (low length/height-for-age), is defined as height-for-age Z-score (HAZ) <−2SD 2Wasting, (low weight-for-length/height), is defined as weight-for-height Z-score (WHZ) <−2SD 3Underweight, (low weight-for-age), is defined as weight-for-age Z-score (WAZ) <−2SD
4Overweight, (weight-for-length/height), is defined as weight-for-length/height Z-score (WHZ) > 2SD Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Table 192. Severe malnutrition status of children (aged 6-59 months), Nigeria 2021

Background characteristics	Severe Stunting		Severe Wasting		Severe Underweight		Obesity	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	4855	17.1 [15.1, 19.4]	4863	3.0 [2.3, 3.9]	4895	9.3 [8.1, 10.6]	4863	0.6 [0.4, 0.9]
Age category	(P < 0.001***)		(P < 0.001***)		(P < 0.042*)		(P = 0.467)	
6-11 months	502	7.0 [4.2, 11.5]	503	6.5 [3.4, 12.0]	517	11.4 [7.9, 16.1]	503	1.0 [0.4, 2.3]
12-23 months	1132	14.6 [12.0, 17.7]	1139	4.9 [3.5, 7.0]	1146	10.2 [7.7, 13.2]	1139	0.8 [0.4, 1.5]
24-35 months	1214	21.0 [17.0, 25.7]	1221	3.4 [2.2, 5.2]	1221	11.2 [8.8, 14.0]	1221	0.7 [0.2, 2.1]
36-47 months	1183	20.2 [16.8, 24.1]	1180	1.0 [0.5, 1.9]	1186	6.5 [4.8, 8.7]	1180	0.3 [0.1, 0.8]
48-59 months	824	16.6 [13.2, 20.6]	820	0.5 [0.1, 1.7]	825	8.2 [5.8, 11.3]	820	0.4 [0.1, 1.2]
Sex	0.000	(P = 0.493)	0.000	(P = 0.793)	0.000	(P = 0.917)	0.000	(P = 0.606)
Male	2428	17.7 [15.3, 20.4]	2432	3.1 [2.3, 4.2]	2456	9.4 [7.8, 11.2]	2432	0.6 [0.3, 1.2]
Female	2427	16.6 [14.0, 19.5]	2431	2.9 [2.0, 4.3]	2439	9.2 [7.6, 11.2]	2431	0.5 [0.3, 0.9]
Residence	0.000	(P < 0.001***)	0.000	(P = 0.582)	0.000	(P < 0.001***)	0.000	(P = 0.8243)
Urban	1990	8.4 [6.5, 10.9]	1997	3.3 [2.2, 5.0]	2005	5.4 [4.1, 7.2]	1997	0.6 [0.3, 1.3]
Rural	2865	21.3 [18.7, 24.2]	2866	2.9 [2.1, 3.9]	2890	11.1 [9.5, 13.0]	2866	0.6 [0.3, 1.1]
Zone	0.000	(P < 0.001***)	0.000	(P < 0.001***)	0.000	(P < 0.001***)	0.000	(P < 0.023*)
North Central	761	14.4 [9.8, 20.7]	765	4.0 [2.1, 7.3]	768	8.4 [5.4, 12.9]	765	0.3 [0.1, 0.9]
North East	818	19.0 [14.5, 24.4]	818	6.3 [4.5, 8.8]	829	12.4 [9.5, 16.1]	818	0.7 [0.3, 1.8]
North West	892	28.1 [23.8, 32.9]	890	2.1 [1.2, 3.4]	899	13.7 [11.1, 16.6]	890	0.8 [0.3, 1.9]
South East	705	5.4 [3.7, 7.7]	709	1.7 [0.9, 3.1]	714	2.4 [1.4, 4.1]	709	1.7 [0.9, 3.5]
South South	826	6.5 [4.2, 9.8]	827	1.8 [1.0, 3.2]	831	4.5 [2.8, 7.0]	827	0.1 [0.0, 0.6]
South West	853	5.3 [3.8, 7.5]	854	1.2 [0.6, 2.3]	854	2.5 [1.5, 4.1]	854	0.1 [0.0, 0.7]
Wealth quintile	0.000	(P < 0.001***)	0.000	(P = 0.365)	0.000	(P < 0.001***)	0.000	(P = 0.500)
Poorest	887	29.4 [25.1, 34.2]	878	3.7 [2.4, 5.4]	889	15.7 [12.6, 19.5]	878	0.8 [0.3, 2.4]
Second	834	24.0 [20.1, 28.3]	836	2.4 [1.3, 4.2]	842	11.3 [9.1, 14.1]	836	0.2 [0.1, 0.8]
Middle	903	15.0 [11.4, 19.4]	914	3.5 [2.0, 5.9]	919	8.7 [6.2, 12.0]	914	0.5 [0.2, 1.4]
Fourth	1128	9.7 [7.2, 12.9]	1132	2.0 [1.2, 3.5]	1139	5.2 [3.7, 7.4]	1132	0.7 [0.3, 1.5]
Richest	1083	3.7 [2.2, 6.2]	1083	3.6 [2.2, 5.7]	1086	4.0 [2.6, 6.1]	1083	0.7 [0.4, 1.5]
Level of education completed by caregiver	0.000	(P < 0.001***)	0.000	(P = 0.089)	0.000	(P < 0.001***)	0.000	(P = 0.500)
None	1101	25.9 [22.6, 29.6]	1103	4.0 [2.8, 5.7]	1111	14.8 [12.2, 17.9]	1103	0.6 [0.3, 1.4]
Primary	765	14.4 [11.4, 18.0]	764	4.0 [2.1, 7.7]	771	7.4 [5.0, 10.7]	764	0.2 [0.0, 0.8]
Secondary	2371	13.6 [11.0, 16.7]	2379	2.0 [1.3, 3.2]	2387	6.7 [5.5, 8.3]	2379	0.5 [0.2, 1.2]
Post-secondary	426	4.8 [2.4, 9.4]	429	3.9 [1.9, 7.8]	430	2.4 [1.1, 5.1]	429	0.3 [0.1, 1.4]

Using 2006 WHO Child Growth Standards:
[1]Severe stunting, (low length/height-for-age), is defined as height-for-age Z-score (HAZ) <−3SD [2]Severe wasting (low weight-for-length/height) is defined as weight-for-height Z-score (WHZ) <−3SD
[3]Severe underweight, (low weight-for-age), is defined as weight-for-age Z-score (WAZ) <−3SD [4]Obesity, (weight-for-length/height), is defined as weight-for-length/height Z-score (WHZ) > 3SD Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies $P<0.05$, ** signifies $P<0.01$, *** signifies $P<0.001$).

Anthropometry of adolescent girls (aged 10-14 years)

Adolescent growth and nutrition have been largely overlooked in national studies on food consumption and nutrition status. The National Food Consumption and Micronutrient Survey (NFCMS) 2021 is a landmark study in establishing the nutrition status of adolescent girls in Nigeria.

BMI-for-age z-scores and height-for-age z-scores were calculated using the respondents' height, weight, and age. Stunting or short stature among adolescent girls (aged 10-14 years) is defined as height-for-age Z-score (HAZ) <−2SD. Underweight/thinness among adolescent girls (aged 10-14 years) is defined as a BMI-for-age Z-scores (BAZ) <-2SD. Normal weight among adolescent girls (10-14 years) is defined as (-2SD≤BAZ≤1). Overweight among adolescent girls (10-14 years) is defined as 1SD<BAZ≤2SD. Obesity among adolescent girls is defined as BAZ>2SD.

The prevalence of thinness, normal weight, overweight, and obesity among adolescent girls (aged 10-14 years) is summarized in **Figure 41**. At the national level, the prevalence of adolescent girls with normal weight was 80.4 percent; that is, most adolescent girls in Nigeria had an expected body weight compared to a healthy adolescent girl of the same age. The prevalence of adolescent girls with thinness was 15.4 percent, overweight was 3.1 percent, and obesity was 1.1 percent.

Table 193 presents the prevalence of stunting, thinness, normal weight, overweight, and obesity among adolescent girls (aged 10-14 years) stratified by age, residence, and wealth quintile.

- **Stunting**: The prevalence of stunting among adolescent girls (aged 10-14 years) was 21.7 percent. There was a statistically significant difference in the prevalence of stunting between residence (P < 0.002), and wealth quintile (P = 0.009). The prevalence of stunting was higher among adolescent girls residing in rural (25.8 percent) versus urban areas (14.5 percent). It was highest in adolescent girls in households in the poorest wealth quintile (33.2 percent).
- **Thinness**: There was no significant variation in the prevalence of thinness in adolescent girls (aged 10-14 years old) across the background characteristics.
- **Normal weight**: There was no significant variation in the prevalence of normal weight in
- adolescent girls (aged 10-14 years old) across the background characteristics.
- **Overweight**: There was a statistically significant difference in the prevalence of overweight among adolescent girls (aged 10-14 years old) between residence (P < 0.050) and wealth quintile (P < 0.040). The prevalence of overweight was as higher among adolescent girls residing in urban (4.4 percent) versus rural areas (2.3 percent). It is highest among adolescent girls in households in the richest wealth quintile (5.6 percent).
- **Obesity**: There was no significant variation in the prevalence of obesity in adolescent girls (aged 10-14 years old) across the background characteristics.

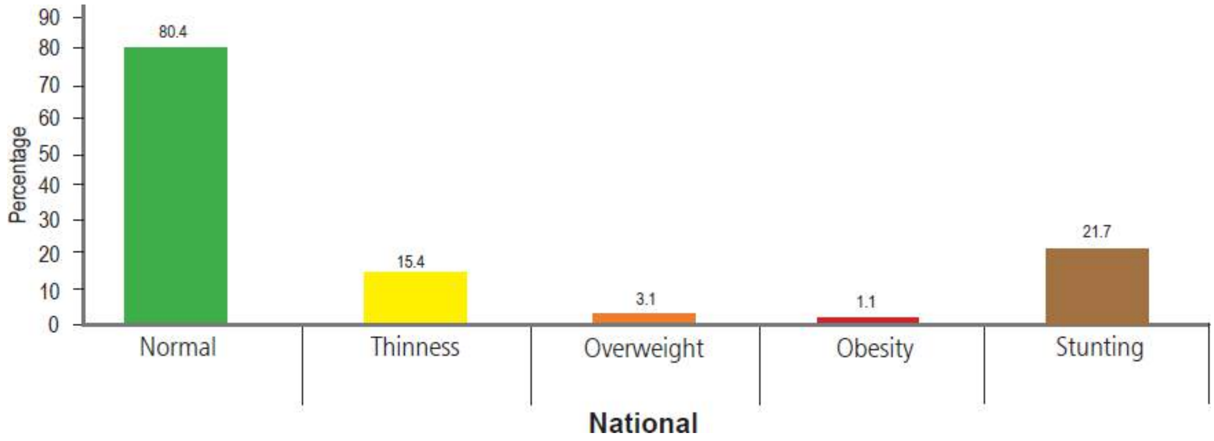


Figure 41. Prevalence of normal weight, thinness, overweight, obesity and stunting among adolescent girls (aged 10-14 years), Nigeria 2021
Data are weighted to account for survey design and non-response
Stunting or short stature among adolescent girls (10-14 years) is defined as height-for-age Z-score (HAZ) <−2SD.
Thinness among adolescent girls (10-14 years) is defined as a BMI-for-age Z-scores (BAZ) <-2SD.
Normal weight among adolescent girls is defined as (-2SD≤BAZ≤1). Overweight among adolescent girls (10-14 years) is defined as 1SD<BAZ≤2SD. Obesity among adolescent girls is defined as BAZ>2SD.
Reference: https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age

Table 193. Prevalence of stunting, thinness, normal weight, overweight, and obesity in adolescent girls (aged 10-14 years), Nigeria 2021

Background characteristics	Stunting (HAZ<-2SD)		Thinness (BAZ<-2SD)		Normal (-2SD≤BAZ≤1)		Overweight 1SD<BAZ≤2		Obesity BAZ>2SD	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	995	21.7 [18.2, 25.7]	995	15.4 [12.3, 19.2]	995	80.4 [76.5, 83.7]	995	3.1 [2.2, 4.2]	995	1.1 [0.6, 2.2]
Age category	(P = 0.438)		(P = 0.194)		(P = 0.104)		(P = 0.587)		(P = 0.088)	
10 years	262	20.2 [14.1, 28.0]	261	12.7 [7.7, 20.2]	261	82.3 [75.0, 87.8]	261	2.6 [1.2, 5.2]	261	2.5 [1.0, 5.8]
11 years	156	18.7 [11.8, 28.4]	155	13.5 [8.5, 20.9]	155	82.7 [75.2, 88.3]	155	3.6 [1.7, 7.3]	155	0.2 [0.0, 1.5]
12 years	192	28.8 [20.1, 39.3]	193	14.0 [8.7, 21.9]	193	82.8 [75.1, 88.5]	193	2.9 [1.4, 6.0]	193	0.3 [0.1, 1.3]
13 years	191	21.6 [14.3, 31.3]	192	22.9 [16.0, 31.5]	192	71.4 [62.6, 78.8]	192	4.5 [2.4, 8.5]	192	1.2 [0.3, 4.2]
14 years	194	18.7 [11.5, 29.1]	194	14.5 [8.6, 23.3]	194	82.5 [73.4, 89.0]	194	2.2 [1.1, 4.4]	194	0.8 [0.1, 5.2]
Residence	(P < 0.002**)		(P = 0.551)		(P = 0.720)		(P < 0.050*)		(P = 0.150)	
Urban	417	14.5 [10.7, 19.5]	416	14.2 [10.5, 18.8]	416	79.6 [74.5, 83.9]	416	4.4 [2.8, 6.9]	416	1.9 [0.8, 4.3]
Rural	578	25.8 [20.9, 31.4]	579	16.1 [11.8, 21.6]	579	80.8 [75.4, 85.3]	579	2.3 [1.5, 3.7]	579	0.7 [0.3, 1.9]
Wealth quintile	(P < 0.001***)		(P = 0.620)		(P = 0.663)		(P < 0.040*)		(P = 0.111)	
Poorest	176	33.2 [24.4, 43.2]	179	15.8 [10.5, 23.1]	179	81.3 [73.9, 87.0]	179	1.8 [0.7, 4.8]	179	1.0 [0.2, 4.8]
Second	163	21.8 [14.7, 31.2]	161	13.7 [8.5, 21.2]	161	84.8 [76.8, 90.3]	161	1.6 [0.5, 4.9]	161	0.0 [., .]
Middle	187	27.1 [18.8, 37.4]	187	20.2 [11.2, 33.5]	187	77.7 [65.0, 86.7]	187	1.9 [0.8, 4.5]	187	0.2 [0.0, 1.4]
Fourth	216	16.1 [10.7, 23.5]	216	13.3 [8.3, 20.5]	216	80.1 [72.7, 85.8]	216	4.5 [2.3, 8.6]	216	2.1 [0.8, 5.7]
Richest	249	9.6 [5.3, 16.6]	248	14.1 [9.2, 21.0]	248	77.9 [70.7, 83.8]	248	5.6 [3.5, 9.0]	248	2.4 [0.8, 6.6]

[1]Stunting or short stature among adolescent girls (aged 10-14 years) is defined as height-for-age Z-score (HAZ) <−2SD.
[2]Thinness among adolescent girls (aged 10-14 years) is defined as a BMI-for-age Z-scores (BAZ) <-2SD.
[3]Normal weight among adolescent girls is defined as (-2SD≤BAZ≤1).
[4]Overweight among adolescent girls (aged 10-14 years) is defined as 1SD<BAZ≤2SD.
[5]Obesity among adolescent girls is defined as BAZ>2SD.
*Reference: https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age.
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Anthropometry of Women of Reproductive Age (WRA, aged 15-49 years)

The height, weight, and body composition of women prior to conception have important implications on the subsequent health of the mother during pregnancy, delivery, and post-partum, and for the development of children both pre-and postnatal (Black 2008). Information on anthropometry of non-pregnant WRA is especially important in low and low-middle income countries (LMIC), where millions of women of childbearing age have anthropometric evidence of an adverse environment, including recent or/and long-term undernutrition (thinness) and where the rate of increase in overweight and obesity may now outpace that in more upper-middle, and high-income countries (Black et al., 2013).

The World Health Organization (WHO) defines thinness as being below the healthy weight range. Thinness in WRA affects women and increases the risk of an intergenerational cycle of malnutrition and child mortality. Thinness can be defined as a body mass index (BMI) of <18.5 kg/m^2 for WRA

≥20 years and as BMI-for-age Z-scores (BAZ) <-2SD in WRA <20 years. WHO defines overweight and obesity as abnormal or excessive fat accumulation that may impair health. Overweight and obesity can be defined as 25≤BMI<30 kg/m^2, and obesity as a BMI ≥30 kg/ m^2 for WRA ≥20 years. For WRA <20 years old, overweight is defined as 1SD<BAZ≤2, and obesity is defined as BAZ>2SD. Normal weight is defined as -2SD≤BAZ≤1 for WRA<20 years and 18.5≤BMI<25 kg/m^2 for WRA ≥20 years.

The prevalence of thinness, normal weight, overweight, and obesity among WRA (aged 15-49 years) nationally and by the zones are summarized in **Figure 42**. About 63 percent of WRA had normal weight. Overall, the prevalence of thinness, overweight, and obesity among WRA was 14.2, 15.0, and 8.1 percent, respectively.

Table 194 presents the prevalence of thinness, normal weight, overweight, and obesity among WRA (aged 15-49 years) stratified by age category, residence, zone, wealth quintile, and level of education completed.

- **Thinness**: There was a statistically significant difference in the prevalence of thinness between the age categories (P < 0.001), residence (P < 0.002), zones (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P < 0.001). The prevalence of thinness was lowest in the 15-19-year- old age category (9.9 percent). It was higher among WRA residing in rural (16.1 percent) versus urban (11.1 percent) areas. It was highest among WRA in the North West zone (21.7 percent). The prevalence of thinness was lowest in women in households in the richest wealth quintile (6.9 percent), and women who had completed post-secondary education (9.2 percent).
- **Normal weight**: There was a statistically significant difference in the prevalence of normal weight between the age categories (P < 0.001), residence (P < 0.001), zones (P < 0.033), wealth quintile (P < 0.001), and level of education completed (P < 0.001). The prevalence of normal weight was lowest in the 40-49-years-old age category (48.4 percent). It was higher among WRA residing in rural (65.6 percent) versus urban (58.5 percent) areas. It was highest among WRA in the North Central zone (66.7 percent). The prevalence of normal weight was lowest in women in households in the richest wealth quintile (55.7 percent), and women who had completed post-secondary education (50.5 percent).
- **Overweight**: There was a statistically significant difference in the prevalence of overweight between the age categories (P < 0.001), residence (P < 0.001), zones (P < 0.001), wealth quintile

(P < 0.001), and level of educational completed (P < 0.001). The prevalence of overweight was lowest in the 15-19-years-old age category (4.2 percent). It was higher among WRA residing in urban (17.9 percent) versus rural (13.1 percent) areas. It was highest among WRA in the South East zone (21.2 percent). The prevalence of overweight was highest in women in households in the richest wealth quintile (21.4 percent), and women who had completed post-secondary education (24.0 percent).

- **Obesity**: There was a statistically significant difference in the prevalence of obesity between the age categories (P < 0.001), residence (P < 0.001), zones (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P < 0.001). The prevalence of obesity was highest in the 40-49-years-old age category (15.6 percent). It was higher among WRA residing in urban (12.5 percent) versus rural (5.2 percent) areas. It was highest among WRA in the South East zone (15.4 percent). The prevalence of obesity was highest among women in the households in the richest wealth quintile (15.9 percent), and women who had completed post-secondary education (16.3 percent).

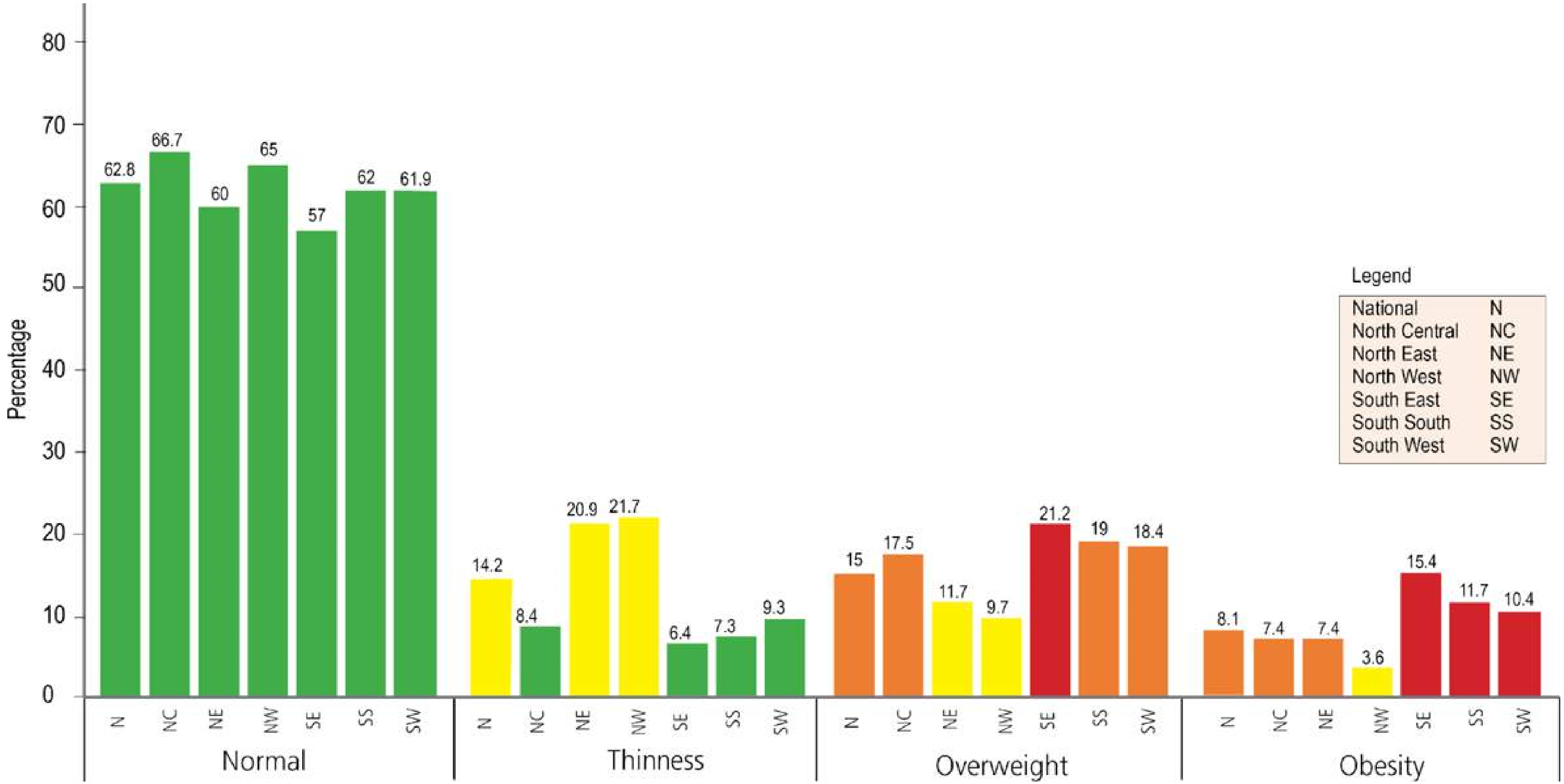


Figure 42. Prevalence of thinness, normal weight, overweight, and obesity among WRA (aged 15-49 years), Nigeria 2021
For WRA <20 years old, thinness is defined as BAZ<-2SD, normal weight is defined as -2SD≤BAZ≤1, overweight is defined as 1SD<BAZ≤2, and obesity is defined as BAZ>2SD For WRA ≥20 years, thinness is defined as BMI<18.5 kg/m², normal weight as BMI 18.5-24.9 kg/m², overweight is defined as BMI 25-29.9 kg/m², and obesity defined as ≥ 30 kg/m² Data are weighted to account for survey design and non-response

Table 194. Prevalence of thinness, normal weight, overweight, and obesity in WRA (aged 15-49 years), Nigeria 2021

Background characteristics	Thinness (19 or less: BAZ<-2SD 20 or more: BMI<18.5)		Normal (19 or less: -2SD≤BAZ≤1 20 or more: 18.5≤BMI<25)		Overweight (19 or less 1SD<BAZ≤2 20 or more: 25≤BMI<30)		Obesity (19 or less: BAZ>2SD 20 or more: BMI≥30)	
	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
National	5333	14.2 [12.8, 15.6]	5333	62.8 [61.2, 64.4]	5333	15.0 [13.7, 16.3]	5333	8.1 [7.1, 9.2]
Age category	(P < 0.001***)		(P < 0.001***)		(P < 0.001***)		(P < 0.001***)	
15-19 years	1148	9.9 [7.6, 12.7]	1148	84.3 [81.7, 86.6]	1148	4.2 [3.0, 5.9]	1148	1.6 [0.8, 3.0]
20-29 years	1652	18.4 [16.0, 21.1]	1652	63.3 [60.5, 66.1]	1652	13.2 [11.4, 15.2]	1652	5.0 [3.9, 6.5]
30-39 years	1503	14.1 [11.8, 16.8]	1503	54.0 [50.7, 57.3]	1503	19.9 [17.2, 22.7]	1503	12.0 [9.6, 14.9]
40-49 years	1030	11.9 [9.5, 14.9]	1030	48.4 [44.9, 52.0]	1030	24.0 [21.0, 27.3]	1030	15.6 [13.2, 18.4]
Residence	(P < 0.002**)		(P < 0.001***)		(P < 0.001***)		(P < 0.001***)	
Urban	2160	11.1 [9.2, 13.4]	2160	58.5 [56.2, 60.7]	2160	17.9 [15.9, 20.1]	2160	12.5 [10.7, 14.5]
Rural	3173	16.1 [14.2, 18.2]	3173	65.6 [63.4, 67.7]	3173	13.1 [11.5, 14.8]	3173	5.2 [4.3, 6.4]
Zone	(P < 0.001***)		(P < 0.033*)		(P < 0.001***)		(P < 0.001***)	
North Central	877	8.4 [5.7, 12.2]	877	66.7 [63.1, 70.0]	877	17.5 [14.8, 20.5]	877	7.4 [5.5, 10.1]
North East	863	20.9 [16.4, 26.1]	863	60.0 [56.2, 63.7]	863	11.7 [9.4, 14.5]	863	7.4 [4.9, 11.1]
North West	928	21.7 [19.1, 24.7]	928	65.0 [61.6, 68.2]	928	9.7 [7.4, 12.6]	928	3.6 [2.3, 5.5]
South East	878	6.4 [4.5, 9.0]	878	57.0 [52.4, 61.4]	878	21.2 [18.0, 24.9]	878	15.4 [12.2, 19.3]
South South	880	7.3 [5.6, 9.5]	880	62.0 [57.0, 66.8]	880	19.0 [15.4, 23.3]	880	11.7 [9.2, 14.8]
South West	907	9.3 [7.4, 11.7]	907	61.9 [57.9, 65.6]	907	18.4 [15.3, 22.0]	907	10.4 [7.9, 13.6]
Wealth quintile	(P < 0.001***)		(P < 0.001***)		(P < 0.001***)		(P < 0.001***)	
Poorest	958	27.3 [23.3, 31.8]	958	62.4 [58.2, 66.4]	958	8.1 [6.1, 10.6]	958	2.2 [1.3, 3.5]
Second	908	15.5 [12.7, 18.8]	908	69.9 [65.7, 73.9]	908	10.4 [8.3, 13.1]	908	4.1 [2.8, 5.9]
Middle	1087	14.4 [11.4, 17.9]	1087	64.9 [61.1, 68.5]	1087	15.0 [12.5, 17.9]	1087	5.8 [4.4, 7.6]
Fourth	1194	8.9 [6.9, 11.4]	1194	62.2 [59.1, 65.3]	1194	17.9 [15.3, 20.8]	1194	11.0 [9.1, 13.2]
Richest	1166	6.9 [5.1, 9.3]	1166	55.7 [52.1, 59.4]	1166	21.4 [18.6, 24.5]	1166	15.9 [13.6, 18.6]
Level of education completed	(P < 0.001***)		(P < 0.001***)		(P < 0.001***)		(P < 0.001***)	
None	1052	22.5 [19.4, 25.9]	1052	62.8 [59.5, 66.1]	1052	10.7 [8.5, 13.3]	1052	4.0 [2.8, 5.8]
Primary	864	12.3 [9.8, 15.4]	864	58.9 [54.4, 63.2]	864	18.5 [15.5, 22.0]	864	10.3 [8.0, 13.1]
Secondary	2795	12.1 [10.4, 13.9]	2795	65.3 [63.2, 67.3]	2795	14.6 [13.0, 16.3]	2795	8.1 [6.7, 9.7]
Post-secondary	448	9.2 [6.1, 13.6]	448	50.5 [44.5, 56.6]	448	24.0 [19.9, 28.7]	448	16.3 [12.5, 21.0]

For WRA <20 years old, 1thin is defined as BAZ<-2SD, 2normal weight is defined as - 2SD≤BAZ≤1, 3overweight is defined as 1SD<BAZ≤2, and 4obesity is defined as BAZ>2SD For WRA ≥20 years, 1thin is defined as BMI<18.5 kg/m2, 2normal weight as BMI 18.5-24.9 kg/m2, 3overweight is defined as BMI 25-29.9 kg/m2, and 4obesity defined as ≥ 30 kg/m2 Data are weighted to account for survey design and non-response

N, number of respondents in the sub-group (unweighted) CI, Confidence Interval

Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P<0.001)

Coverage of national interventions to improve micronutrient status [26]

This section describes the coverage of nutrition-specific interventions among children (aged 6-59 months), adolescent girls (aged 10-14 years old), women of reproductive age (aged 15-49 years old), and pregnant women (aged 15-49 years old).[27] The results presented are based on a questionnaire[28] administered to the survey respondents (caregivers in the case of children).

Nutrition-specific interventions, such as vitamin A, iron, folic acid and multivitamin supplementation, nutrition counselling, antenatal care, and delivery of therapeutic foods, are critical for addressing malnutrition in vulnerable populations (Bhutta et al., 2013). Deworming treatment is another intervention to improve nutritional status. Helminths (commonly referred to as worms) can cause diarrhoea, poor absorption of nutrients, and loss of appetite, increasing vulnerability to micronutrient deficiencies (Hall et al., 2008).

The Nigeria National Micronutrient Deficiency Control guidelines describe the interventions to address micronutrient deficiencies among children (aged 6-59 months), such as deworming, vitamin A supplementation, use of micronutrient powders for home fortification, etc. (FMOH, 2013). Some interventions, including nutrition education of caregivers, are reflected in the National Policy on Food and Nutrition, which prioritizes both the health system and food-based approaches to MNDC (MBNP, 2016).

An objective of the survey was to assess the coverage of nutrition-specific interventions of interest among the four survey target groups.

Box 12. Key Findings on Coverage of National Interventions to Improve Micronutrient Status

Intervention coverage among children aged 6-59 months.

Vitamin A Supplementation: One in four children (25 percent) received a vitamin A capsule in the last 6 months nationally, and differed by age (32.6 percent in 6-11 months and 20.1 percent in 36-47 months), residence (36.1 in urban and 19.3 percent in rural), zones (41.9 percent in North Central and 8.0 in North West), wealth (41.7 percent among rich and 12.8 percent among poor) and level of education completed by caregiver (41.7 percent with post-secondary and 18.5 percent with no education).

Nutrition Counselling: Only 15 percent of caregivers received some form of nutrition counseling nationally.

26 The premise of the NFCMS aligns with the UNICEF conceptual framework of determinants of undernutrition (2013*). Individual nutritional status measured by indicators such as those of anthropometry and micronutrient biomarkers is determined by two immediate factors - high quality diets and optimal health. Three underlying factors influence these: access to sufficient, safe, and nutritious food; adequate care practices for especially women and children; and access to health services including healthy environments, water, and sanitation. Finally, at a basic level, political, economic, and institutional determinants underpin all of these factors.
*UNICEF (United Nations Children's Fund). 2013. Improving Child Nutrition: The Achievable Imperative for Global Progress. New York: UNICEF.

27 For scope of final report for the biomarker component, see Annex 5

28 See Annex 4 for questionnaire (Q): Q1. Children (aged 6-59 months); Q2. Adolescent girls (aged 10-14 years) and Women of reproductive age (aged 15-49 years); Q3. Pregnant women (aged 15-49 years)

Coverage of nutrition counseling and specific key messages: 81 percent of caregivers reported receiving counseling on breastfeeding; 83 percent on when to start feeding foods other than breastmilk; 87 percent on giving a variety of foods; 89 percent on giving animal source foods; 85 percent on how often to feed a child; and 75 percent on not feeding sugary drinks.

Use of micronutrient powder or any sprinkles with iron: Use of iron/micronutrient powder is low (7.1 percent) nationally and differs by zone (10.4 percent in South West and 2 percent in South East.

Deworming: Deworming treatment was 27.5 percent nationally and differs by age 33 percent among 48-59 months and 16.9 percent among 6-11 months), residence (41.2 percent in urban and 20.3 percent in rural areas), zone (60.2 percent South South and 7.5 percent in North West), wealth (51.7 among rich and 13 percent among poor), and level of education completed by caregiver (46.2 percent with post-secondary and 17.9 percent with no education).

Use of ready-to-use therapeutic feeds/plumpy'nut: The use of therapeutic foods in the past 12 months is low (2.4 percent) nationally, and differs by zone (0.5 percent in South East and 5.9 percent in North East); overall, 14.1 percent reported using it the day preceding the survey and differs by zone (49.8 percent in South South and 14.1 percent in South West).

Wasted children who received ready-to-use therapeutic feeds/plumpy'nut: Nationally, only 2.8 percent received ready-to-use therapeutic foods in the past 12 months. Among those wasted children who received ready-to-use therapeutic foods in the past 12 months, 2.1 percent received it the day preceding the survey.

Intervention coverage among adolescent girls (aged 10-14 years)

Use of multivitamins in the past six months: Only 8.4 percent of adolescent girls used multivitamins and differs by residence (13 percent in urban and 6 percent in rural areas) and wealth (15.1 percent among rich and 1 percent among poor). There was no significant variation in the use of multivitamins at least once in the past seven days, among adolescent girls across the background characteristics.

Frequency of use of multivitamins and iron or iron/folic acid tablets in the past seven days: Among those who indicated using multivitamins and iron or iron/folic acid tablets, 36 percent took multivitamins and 17 percent took iron/folic acid tablets for the entire seven days.

Use of iron or iron/folic acid tablets in the past six months: Overall, use of iron/folic acid tablets was 11 percent, and differs by residence (16 percent in urban and 8 percent in rural areas) and wealth (22 percent among rich and 5.7 percent among poor). There was no significant variation in the use of iron or iron/folic acid tablets at least once in the past seven days, among adolescent girls across the background characteristics.

Deworming in the past six months: Overall, one in four (25 percent) adolescent girls used deworming treatment in the past 6 months and differs by residence (31 percent in urban and 21 percent in rural areas) and wealth quintile (41.2 percent among rich and 12.6 percent among poor).

Intervention coverage among women of reproductive aged, 15-49 years

Use of multivitamins in the past six months: Nationally, 13 percent reported using multivitamins in the past 6 months and differs by age (16.2 percent among 30-39 years and 7.4 percent among 15-19 years), residence (16.2 percent in urban and 10.3 percent in rural areas), zone (27.6 percent in South West and 2.6 percent in North West), wealth (18.3 percent among rich and 6.7 percent among poor) and level of education completed (21.6 percent among those with post-secondary and 7.2 percent among those with no education).

Frequency of use of multivitamins and iron or iron/folic acid tablets in the past seven days: Among those who indicated using multivitamins and iron or iron/folic acid tablets, 26 percent took multivitamins and 32 percent took iron/folic acid tablets for the entire seven days.

Use of iron or iron/folic acid tablets in the past six months: Overall, 14 percent of women of reproductive aged took iron or iron/folic acid tablets in the past six months and differs by age (17.9 percent among 40-49 years and 8.6 percent among 15-19 years), residence (18.1 percent in urban and 11.5 percent in rural areas), zone (31.9 percent in South West and 2.2 percent in North West), wealth (18.9 percent among rich and 7.7 percent among poor) and level of education completed (21 percent among those with post-secondary and 8 percent among those with no education).

Deworming in the past six months: Overall, 19 percent of women of reproductive aged reported using a deworming treatment in the past 6 months, months and differs by age (22.9 percent among 40-49 years and 16.4 percent among 15-19 years), residence (23.3 percent in urban and 15.9 percent in rural areas), zone (41 percent in South East and 7 percent in North West), wealth (30 percent among rich and 10.4 percent among poor) and level of education completed (28 percent among those with post-secondary and 10.2 percent among those with no education).

Intervention coverage among pregnant women (aged, 15-49 years)

Antenatal care: Nationally, 45 percent of pregnant women reported receiving at least one antenatal care visit and differs by age category (55 percent among 40-49 years and 28 percent among 15-19 years), residence (56 percent in urban and 38.9 percent in rural areas) and wealth (64 percent among rich and 30 percent among poor).

Adequacy of number of antenatal care visits by the length of pregnancy: Although first trimester visits were adequate (100 percent) as pregnancy progressed, fewer pregnant women obtained adequate antenatal visits (77 percent at the 7th month).

Consumed a tablet or syrup containing iron at least once in the past seven days: 86 percent of pregnant women reported consuming a tablet or syrup containing iron at least once in the past seven days.

Frequency of use of iron tablet or syrup in the past seven days: Overall, 52 percent of the respondents took a tablet or syrup containing iron for the entire seven days.

Consumed a tablet or syrup containing iron and/or folic acid yesterday: 70 percent of pregnant women reported taking iron/folic acid tablets the day before the interview.

Spoke with a health worker or community volunteer about what foods to eat: Overall, 34 percent of pregnant women reported speaking to a health worker or community volunteer about what foods to eat during pregnancy and differs by age (51 percent among 40-49 years and 18 percent among 15-19 years), residence (50 percent in urban and 25 percent in rural areas), wealth (56 percent among rich and 19 among poor), and level of education completed (56 percent among post-secondary and 23 percent among those with no education).

Spoke with a health worker or community volunteer about breastfeeding: Nationally, 31 percent of pregnant women reported talking to a health worker or community volunteer about breastfeeding their newborn and differs by age (41 percent for 40-49 years and 11 percent for 15-19 years), residence (45 percent in urban and 23 percent in rural areas), wealth (52 percent among rich and 14 percent among poor), and level of education completed (51 percent among post-secondary and 24 among those with no education).

Intervention coverage among children (aged 6-59 months)

Figure 43 presents the percentage of children (aged 6-59 months) who received deworming drugs, vitamin A supplementation, micronutrient powder or any sprinkle with iron, therapeutic foods, and whose caregivers received any nutrition counselling. Overall, the use of iron/micronutrient powder (7.1 percent) and therapeutic foods (2.4 percent) was low. The percentage of children (aged 6-59 months) receiving a vitamin A capsule in the previous six months was 25 percent nationally, while the percentage of those receiving deworming treatment in the past six months was 28 percent nationally. The percentage of children aged 6-59 months whose caregivers received some form of nutrition counselling in the previous six months was 15 percent nationally.

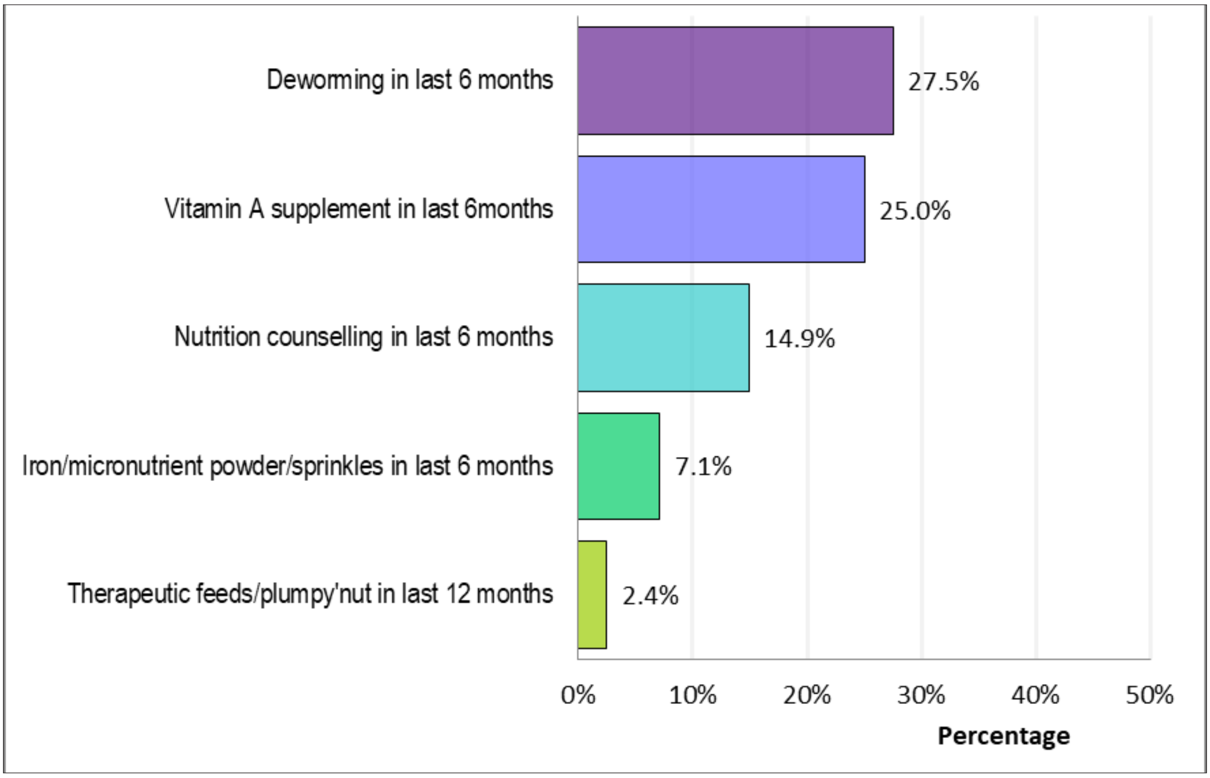


Figure 43. Coverage of nutrition-specific interventions among children (aged 6-59 months), Nigeria 2021
Data are weighted to account for survey design and non-response

Coverage of vitamin A supplementation among children aged 6-59 months

In countries where vitamin A deficiency (VAD) is a public health problem, the World Health Organization (WHO) recommends giving children (aged 6-59 months) two consecutive high- dose supplements of vitamin A per year (Dalmiya and Palmer, 2007). In Nigeria, vitamin A is delivered routinely to children (aged 6-59 months) as stipulated in the Integrated Management of Childhood

Illness (IMCI) strategy at frontline health facilities during bi-annual Maternal Neonatal and Child Health Weeks (MNCHW) and National Immunization Plus Days by trained healthcare workers (Aghaji et al, 2019).

Table 195 presents the percentage of children (aged 6-59 months) who received a vitamin A capsule in the last six months, stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

There was a statistically significant difference in the percentage of children (aged 6-59 months) who received a vitamin A capsule in the last six months between the age category (P = 0.001), residences (P < 0.001), zones (P <0.001), wealth quintiles (P < 0.001) and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) who received a vitamin A capsule in the last six months was highest among children in the 6-11- months age category (33 percent). It was higher in children residing in urban areas (36.1 percent) versus rural areas (19 percent). It was lowest in the North West zone (8 percent) and among children in the lowest wealth quintile (13 percent). It was highest among children whose caregivers had post-secondary education (42 percent).

Table 195. Vitamin A supplementation among children aged 6-59 months, Nigeria 2021

Characteristics	Received a vitamin A dose in the last 6 months		
	N	%	[95/% CI]
National	4,679	25.0	[21.6, 28.9]
Age category	(P = 0.001) **		
6-11 months	514	32.6	[25.1, 41.1]
12-23 months	1,083	29.5	[25.3, 34.1]
24-35 months	1,202	22.8	[19.0, 27.0]
36-47 months	1,117	20.1	[15.4, 25.8]
48-59 months	763	24.3	[19.4, 29.8]
Sex	(P = 0.269)		
Male	2,352	24.2	[20.5, 28.3]
Female	2,327	25.9	[22.1, 30.2]
Residence	(P < 0.001) ***		
Urban	1,879	36.1	[29.6, 43.2]
Rural	2,800	19.3	[15.7, 23.4]
Zone	(P < 0.001) ***		
North Central	721	41.9	[33.5, 50.8]
North East	785	29.9	[19.5, 42.9]
North West	901	8.0	[4.8, 13.0]
South East	697	39.5	[34.4, 44.9]
South South	786	26.5	[21.2, 32.4]
South West	789	36.4	[32.0, 41.0]
Wealth quintile	(P < 0.001) ***		
Lowest	853	12.8	[9.4, 17.1]
Second	811	15.5	[11.9, 20.0]
Middle	882	26.9	[21.5, 33.2]
Fourth	1,076	33.8	[28.3, 39.7]
Highest	1,037	41.7	[33.8, 50.0]
Level of education completed by caregiver	(P < 0.001)***		
None	1,062	18.5	[14.1, 23.9]
Primary	741	23.4	[19.2, 28.2]
Secondary	2,294	28.6	[24.9, 32.7]
Post-secondary	415	41.7	[31.9, 52.1]
Missing/don't know	8	4.7	[0.6, 30.1]

Data are based on question chs6 of the biomarker questionnaire
chs6. Within the last six months, was (name of child) given a vitamin A dose like this (caregiver shown locally sourced Vitamin A capsule)? [1]All children are eligible for Vitamin A supplementation
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Figure 44 presents the source of verification for caregivers' statements on vitamin A supplementation in the last six months in children (aged 6-59 months). Most of the data collected (87 percent) were verified through mothers' recall.

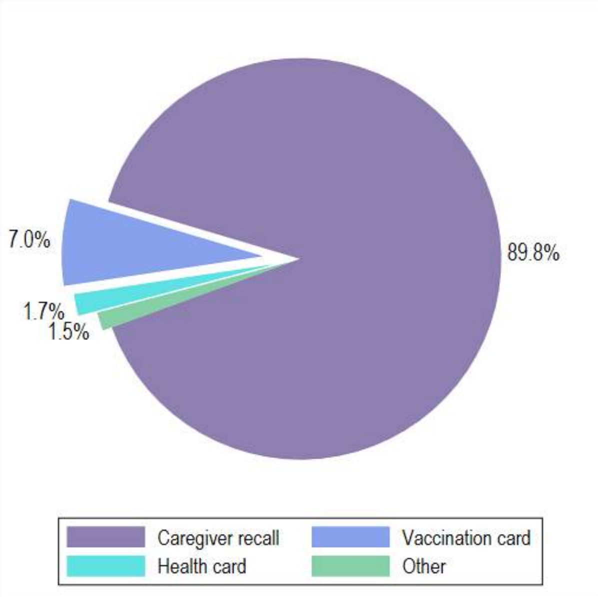


Figure 44. Source of verification among children (6-59 months) who received a Vitamin A dose in the past six months, Nigeria 2021
Question chs7 is linked to question chs6.
chs6. Within the last six months, was (name of child) given a vitamin A dose like this (caregiver shown locally sourced Vitamin A capsule)?
chs7. Source of verification
Data are weighted to account for survey design and non-response

Coverage of nutrition counselling and specific key messages

Table 196 presents the percentage of children (aged 6-59 months) whose caregivers received nutrition counselling from a health worker or community volunteer on specific topics. The data are stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

1. **Breastfeeding**: Nationally, among caregivers of children (aged 6-59 months) who reported receiving some type of nutrition counselling from a health worker or community volunteer, 81 percent received nutrition counselling on breastfeeding. There was a statistically significant difference in the percentage of children whose caregivers received information on breastfeeding between the age category ($P < 0.001$) and the zones ($P = 0.003$). The prevalence was highest among children in the 12-23-months age category (93 percent) and lowest in the North Central zone (64 percent).

2. **When to start feeding foods other than breastmilk (e.g., after six months)**: Nationally, the prevalence of nutrition counselling from a health worker or community volunteer on when to start feeding foods other than breastmilk among caregivers of children (aged 6-59 months) who reported receiving some form of nutrition counselling was 83 percent. There was a statistically significant difference in the percentage of children whose caregivers received this information between the age category ($P = 0.019$). The prevalence was lowest in the 48-59- months age category (70 percent).

3. **Giving a variety of types of foods**: Nationally, the prevalence of nutrition counselling from a health worker or community volunteer on providing a variety of types of foods among caregivers of children aged 6-59 months who reported receiving some form of nutrition counselling was 87 percent. There was no significant variation across the background characteristics.

4. **Giving animal source foods specifically, eggs, milk, meats, or fish**: Nationally, the prevalence of nutrition counselling from a health worker or community volunteer on giving animal source foods, specifically eggs, milk, meats, or fish, among caregivers of children (aged 6-59 months) who reported receiving some form of nutrition counselling was 89 percent. There was a statistically significant difference in the percentage of children whose caregivers received this information between the sex of the child (P = 0.003) and zones (P = 0.026). The percentage of children whose caregivers received this information was higher among female (93 percent) as compared to male (84 percent) children. The percentage of children whose caregivers received this information was lowest in the North West zone (79 percent).
5. **How often to feed the child:** Nationally, the prevalence of nutrition counselling from a health worker or community volunteer on how often to feed the child among caregivers of children (aged 6-59 months) who reported receiving some form of nutrition counselling was 85 percent. There was a statistically significant difference in the percentage of children whose caregivers received this information between the sex of the child (P = 0.007) and residence (P=0.004). The percentage was higher among female (90 percent) as compared to male (80 percent) children and higher among children residing in urban (91 percent) versus rural areas (80 percent).
6. **Not feeding sugary drinks (e.g., fizzy drinks)**: Nationally, the prevalence of nutrition counselling from a health worker or community volunteer on not feeding sugary drinks (e.g. fizzy drinks) among caregivers of children (aged 6-59 months) who reported receiving some form of nutrition counselling was 75 percent. The percentage of children whose caregivers received this information was lowest in the North Central zone (58 percent), and highest among children in households in the lowest wealth quintile (84 percent).

Table 196. Coverage of nutrition counselling on specific key messages in the past six months among children (aged 6-59 months) whose caregivers1 reported receiving some form of nutrition counselling, Nigeria 2021

Characteristics	Breastfeeding			When to start other food			Giving a variety of food			Giving animal source food			Frequency of feeding			Avoiding sugary drinks		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	731	81.1	[74.4, 86.5]	730	82.6	[75.3, 88.1]	732	87.3	[82.9, 90.7]	724	88.8	[84.4, 92.1]	736	85.1	[80.3, 88.9]	724	74.8	[68.5, 80.2]
Age category	(P < 0.001)***			(P = 0.019)*			(P = 0.469)			(P = 0.727)			(P = 0.862)			(P = 0.430)		
6-11 months	137	90.6	[77.1, 96.5]	137	85.7	[71.7, 93.4]	135	86.0	[74.0, 92.9]	134	88.5	[75.4, 95.1]	137	82.5	[70.6, 90.3]	134	80.3	[69.1, 88.2]
12-23 months	213	93.2	[87.3, 96.5]	213	87.2	[77.5, 93.1]	213	84.1	[75.8, 89.9]	210	91.2	[85.3, 94.9]	214	85.0	[77.0, 90.5]	208	74.0	[64.1, 82.0]
24-35 months	172	81.4	[73.1, 87.7]	172	89.6	[82.1, 94.2]	173	90.5	[83.8, 94.6]	170	85.7	[75.2, 92.2]	174	86.4	[75.8, 92.8]	172	71.7	[58.8, 81.8]
36-47 months	143	61.9	[48.4, 73.8]	142	71.4	[55.2, 83.5]	144	85.9	[76.0, 92.1]	143	87.5	[78.4, 93.1]	144	88.1	[79.1, 93.5]	143	70.5	[59.3, 79.6]
48-59 months	66	68.4	[47.5, 83.8]	66	69.9	[48.5, 85.2]	67	93.8	[77.2, 98.5]	67	92.5	[76.0, 97.9]	67	81.4	[60.6, 92.6]	67	82.7	[68.6, 91.3]
Sex	(P = 0.941)			(P = 0.424)			(P = 0.179)			(P = 0.003)**			(P = 0.007)**			(P = 0.254)		
Male	356	81.3	[74.7, 86.5]	354	84.5	[77.7, 89.4]	357	85.0	[78.2, 89.9]	353	84.1	[77.3, 89.1]	358	80.0	[72.4, 85.9]	356	72.2	[64.8, 78.5]
Female	375	81.0	[70.7, 88.3]	376	80.9	[70.1, 88.5]	375	89.3	[84.3, 92.9]	371	93.0	[88.3, 95.9]	378	89.5	[84.7, 93.0]	368	77.1	[68.9, 83.6]
Residence	(P = 0.703)			(P = 0.933)			(P = 0.203)			(P = 0.375)			(P = 0.004)**			(P = 0.015)*		
Urban	334	82.6	[67.6, 91.6]	335	82.9	[67.8, 91.8]	334	90.2	[83.1, 94.5]	332	90.9	[82.9, 95.3]	335	91.4	[86.0, 94.9]	332	82.9	[73.9, 89.2]
Rural	397	80.0	[73.6, 85.1]	395	82.3	[74.8, 87.9]	398	85.1	[79.3, 89.4]	392	87.2	[81.4, 91.3]	401	80.2	[73.5, 85.5]	392	68.4	[60.0, 75.8]
Zone	(P = 0.003)**			(P = 0.226)			(P = 0.519)			(P = 0.026)*			(P = 0.059)			(P = 0.005)**		
North Central	104	64.3	[54.1, 73.4]	103	82.4	[64.2, 92.4]	104	88.3	[77.5, 94.3]	100	88.2	[80.6, 93.1]	106	82.6	[72.8, 89.4]	101	57.8	[43.1, 71.1]
North East	234	75.6	[59.3, 86.8]	233	79.3	[61.4, 90.2]	234	83.9	[73.9, 90.5]	234	95.2	[89.1, 98.0]	234	91.6	[85.6, 95.2]	233	86.3	[77.6, 92.0]
North West	68	84.1	[68.6, 92.8]	68	77.0	[62.5, 87.0]	68	85.9	[70.3, 94.0]	67	79.2	[63.0, 89.5]	68	75.6	[58.1, 87.4]	68	79.2	[60.6, 90.4]
South East	49	82.5	[69.0, 90.9]	49	89.6	[74.9, 96.2]	49	98.5	[90.1, 99.8]	48	94.0	[77.9, 98.6]	49	91.2	[78.5, 96.7]	48	58.9	[41.7, 74.2]
South South	137	89.9	[81.8, 94.6]	137	81.3	[66.3, 90.6]	138	91.6	[82.0, 96.3]	138	88.6	[80.2, 93.7]	139	80.2	[66.7, 89.1]	137	66.2	[52.0, 78.0]
South West	139	95.5	[90.0, 98.0]	140	95.6	[90.0, 98.1]	139	89.5	[78.8, 95.1]	137	84.8	[71.0, 92.7]	140	86.8	[75.9, 93.2]	137	68.9	[56.4, 79.2]
Wealth quintile	(P = 0.410)			(P = 0.176)			(P = 0.190)			(P = 0.599)			(P = 0.253)			(P = 0.025)*		
Lowest	112	79.7	[65.6, 88.9]	112	87.6	[73.0, 94.9]	112	84.1	[70.3, 92.2]	112	89.8	[77.6, 95.7]	112	80.9	[66.7, 90.0]	111	84.3	[73.1, 91.4]
Second	142	77.6	[68.3, 84.8]	142	76.7	[66.1, 84.8]	143	81.0	[70.5, 88.5]	139	84.9	[74.5, 91.5]	145	80.7	[71.1, 87.7]	140	61.6	[50.7, 71.5]
Middle	129	90.5	[81.9, 95.2]	128	92.5	[84.4, 96.5]	129	87.1	[77.6, 93.0]	128	85.7	[70.9, 93.7]	129	83.5	[68.9, 92.0]	125	72.8	[59.3, 83.2]
Fourth	186	83.3	[67.8, 92.2]	186	83.2	[66.8, 92.4]	187	91.7	[84.8, 95.7]	183	89.8	[80.6, 94.9]	188	86.8	[78.8, 92.0]	186	76.4	[66.4, 84.1]

Table 196. Coverage of nutrition counselling on specific key messages in the past six months among children (aged 6-59 months) whose caregivers1 reported receiving some form of nutrition counselling, Nigeria 2021 (continued).

Characteristics	Breastfeeding			When to start other food			Giving a variety of food			Giving animal source food			Frequency of feeding			Avoiding sugary drinks		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
Highest	160	77.6	[60.7, 88.5]	160	76.5	[59.1, 88.0]	159	91.6	[82.7, 96.1]	160	92.9	[84.4, 96.9]	160	92.4	[85.1, 96.3]	160	79.2	[66.0, 88.2]
Level of education completed by caregiver	(P = 0.426)			(P = 0.636)			(P = 0.652)			(P = 0.744)			(P = 0.255)			(P = 0.633)		
None	150	77.6	[63.1, 87.5]	149	80.1	[64.5, 90.0]	149	87.4	[78.3, 93.0]	149	87.7	[77.2, 93.8]	151	81.4	[69.9, 89.2]	148	74.5	[62.4, 83.7]
Primary	115	87.3	[75.8, 93.8]	114	89.4	[78.1, 95.2]	115	83.6	[72.3, 90.9]	113	87.1	[75.6, 93.7]	115	91.2	[82.0, 95.9]	113	73.1	[63.9, 80.7]
Secondary	360	84.9	[78.1, 89.9]	361	83.3	[76.2, 88.6]	361	87.1	[81.3, 91.3]	355	91.4	[86.8, 94.4]	362	86.0	[79.2, 90.9]	356	76.5	[69.9, 82.1]
Post-secondary	73	77.1	[44.1, 93.5]	73	77.6	[44.1, 93.8]	74	92.1	[82.6, 96.6]	74	90.3	[73.9, 96.8]	75	92.0	[83.1, 96.4]	74	83.5	[66.4, 92.9]
Missing/don't know	1	0.0		1	100.0		1	100.0		1	100.0		1	100.0		1	100.0	

The data presented in this table are based on question chs5 of the biomarker questionnaire
The data were collected from respondents who answered yes to question chs4 of the biomarker questionnaire
chs4. In the last six months, has a health worker or community volunteer spoken with you about how to feed [name of child]? chs5. If yes [to chs4], did the health worker or community volunteer speak with you about any of these topics?
[1]This data refers to the primary caregiver of the sampled child, regardless of whether it was the child's mother. Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Use of micronutrient powder or any sprinkles with iron

Table 197 presents the use of micronutrient powder or any sprinkles with iron in the past six months among children (aged 6-59) months stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver. There was a statistically significant difference in the percentage of children aged 6-59 months who received sprinkles with iron or some form of micronutrient powder in the past six months between the zones (P = 0.035). The use of micronutrient powder or any sprinkles with iron in the past six months was lowest in the South East zone (2 percent). Results are based on respondents that received a supply of sprinkles with iron or any micronutrient powder in the past six months.

Table 197. Use of micronutrient powder or any sprinkles with iron in the past six months among children (aged 6-59 months), Nigeria 2021

Characteristics	Received Iron/micronutrient powder/sprinkles in last 6 months[1]		
	N	%	[95/% CI]
National	4,830	7.1	[5.7, 8.8]
Age category	(P = 0.617)		
6-11 months	523	5.7	[3.8, 8.5]
12-23 months	1,122	7.6	[5.4, 10.7]
24-35 months	1,229	7.6	[5.6, 10.2]
36-47 months	1,158	6.2	[4.6, 8.4]
48-59 months	798	7.9	[5.1, 12.0]
Sex	(P = 0.455)		
Male	2,419	7.4	[5.9, 9.4]
Female	2,411	6.8	[5.1, 8.8]
Residence	(P = 0.118)		
Urban	1,961	8.8	[6.3, 12.1]
Rural	2,869	6.2	[4.7, 8.2]
Zone	(P = 0.035)*		
North Central	756	7.8	[5.0, 12.1]
North East	790	9.1	[5.8, 14.0]
North West	906	4.7	[2.8, 7.8]
South East	716	2.0	[0.8, 4.6]
South South	809	8.6	[4.6, 15.4]
South West	853	10.4	[6.8, 15.7]
Wealth quintile	(P = 0.553)		
Lowest	869	6.2	[4.0, 9.3]
Second	836	5.8	[3.8, 8.6]
Middle	915	7.7	[5.4, 11.0]
Fourth	1,121	8.1	[5.7, 11.3]
Highest	1,069	8.2	[5.1, 12.8]
Level of education completed by caregiver	(P = 0.343)		
None	1,088	6.2	[4.4, 8.7]
Primary	761	7.8	[5.6, 10.9]
Secondary	2,376	7.2	[5.5, 9.5]
Post-secondary	433	9.9	[6.1, 15.6]
Missing/don't know	8	2.9	[0.3, 20.5]

The data are based on question chs8 of the biomarker questionnaire
chs8. In the last six months, did you receive a supply of sprinkles with iron or any micronutrient powder like this (show sprinkles) to give to [name of child]? 1Applies to all children. In populations where anaemia is a public health problem, point-of-use fortification of complementary foods with iron-containing micronutrient powders in infants and young children aged 6–59 months is recommended by the WHO to improve iron status and reduce anaemia (WHO, 2016) Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Deworming

The Nigeria MNDC guidelines (FMOH, 2013) recommend that deworming be done as per the WHO guidelines.

The WHO recommends deworming for all children (12-23 months) and preschool children (1 to 4 years old) to reduce the worm burden of soil-transmitted helminth infection. Where the baseline prevalence for soil-transmitted helminth is more than 50 percent, the WHO recommends bi- annual deworming. Where the prevalence is lower, the recommendation is for annual deworming. The guidelines recommend single dose albendazole (400 mg) or mebendazole (500 mg). For bi- annual deworming, a half-dose of albendazole (i.e., 200 mg) is recommended for children younger than 24 months (WHO, 2017).

Table 198 presents the percentage of children (aged 6-59 months) who received deworming treatment in the last six months (including and excluding children 6-11 months old), stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver. Although the question was asked across all age categories, only children (12-59 months old) are eligible for deworming. Nationally, the coverage of deworming among children (aged 6-59 months) was 28 percent. Excluding children ineligible for deworming, the national coverage was 29 percent.

Reviewing the data for children aged 6-59 months, there was a statistically significant difference in the percentage of children who received deworming drugs between the age category ($P < 0.001$), residence ($P < 0.001$), zone ($P < 0.001$), wealth quintile ($P < 0.001$), and level of education completed by caregiver ($P < 0.001$). The percentage of children who received the deworming drug was highest among children in the 48- 59-months age category (33 percent). It was higher in children residing in urban (41 percent) versus rural (20 percent) areas. It was lowest among children in the North West zone (8 percent). The percentage of children (aged 6-59 months) who received the deworming drug was highest among children in the highest wealth quintile (52 percent) and children whose caregivers had completed post-secondary education (46 percent).

Reviewing the data for children aged 12-59 months, there was a statistically significant difference in the percentage of children aged 12-59 months who received deworming drugs between the age category ($P = 0.024$), residence ($P < 0.001$), zone ($P < 0.001$), wealth quintile ($P < 0.001$), and level of education completed by caregiver ($P < 0.001$). The percentage of children who received the deworming drug was highest among children in the 48-59-months age category (33 percent). It was higher in children residing in urban (44 percent) compared to rural (21 percent) areas. It was lowest among children in the North West zone (8 percent). The percentage of children aged 12-59 months who received the deworming drug was highest among children in the highest wealth quintile (57 percent) and children whose caregivers had completed post-secondary education (50 percent).

The information on the children (aged 6 to 11 months) who received (but should not have received) deworming medication is detailed in **Table 199**. The percentage of children who received the deworming drug was higher among children residing in urban (25 percent) compared to rural (12 percent) areas. It was lowest among children in the North West zone (0.9 percent) and in households in the poorest wealth quintile (7 percent).

Table 198. Deworming in the past six months among children (6-59 months), Nigeria 2021

Characteristics	Child (6-59 months) given drug for intestinal worms in last 6 months			Child (12-59 months) given drug for intestinal worms in last 6 months		
	N	%	[95/% CI]	N	%	[95/% CI]
National	4,867	27.5	[25.1, 30.2]	4,339	28.9	[26.3, 31.6]
Age category	(P < 0.001)***			(P = 0.024)*		
6-11 months	528	16.9	[12.9, 22.0]	0		
12-23 months	1,135	25.5	[22.3, 28.9]	1,135	25.5	[22.3, 28.9]
24-35 months	1,243	29.2	[25.6, 33.0]	1,243	29.2	[25.6, 33.0]
36-47 months	1,158	29.2	[25.7, 33.0]	1,158	29.2	[25.7, 33.0]
48-59 months	803	33.0	[28.3, 38.0]	803	33.0	[28.3, 38.0]
Sex	(P = 0.923)			(P = 0.663)		
Male	2,440	27.5	[24.4, 30.8]	2,194	28.5	[25.2, 32.0]
Female	2,427	27.6	[24.8, 30.6]	2,145	29.3	[26.3, 32.5]
Residence	(P < 0.001)***			(P < 0.001)***		
Urban	1,974	41.2	[36.7, 45.9]	1,740	43.5	[38.8, 48.3]
Rural	2,893	20.3	[17.3, 23.6]	2,599	21.3	[18.2, 24.7]
Zone	(P < 0.001)***			(P < 0.001)***		
North Central	760	24.8	[19.0, 31.8]	678	26.0	[19.8, 33.5]
North East	812	23.2	[18.3, 28.9]	721	23.7	[18.4, 30.0]
North West	908	7.5	[4.8, 11.5]	806	8.3	[5.3, 12.8]
South East	712	59.7	[53.4, 65.7]	648	61.4	[54.8, 67.6]
South South	826	60.2	[52.7, 67.3]	737	60.2	[52.2, 67.6]
South West	849	43.1	[38.3, 48.0]	749	47.0	[41.7, 52.4]
Wealth quintile	(P < 0.001)***			(P < 0.001)***		
Lowest	879	13.0	[9.9, 17.0]	785	13.8	[10.4, 18.1]
Second	849	16.7	[13.1, 21.1]	765	17.4	[13.7, 21.9]
Middle	913	23.0	[19.2, 27.3]	827	23.2	[19.4, 27.5]
Fourth	1,128	39.8	[35.3, 44.3]	993	41.2	[36.7, 45.9]
Highest	1,078	51.7	[46.3, 57.1]	953	56.6	[51.8, 61.2]
Level of education completed by caregiver	(P < 0.001)***			(P < 0.001)***		
None	1,105	17.9	[14.3, 22.2]	989	18.7	[14.9, 23.3]
Primary	768	22.5	[18.9, 26.6]	687	23.7	[19.9, 27.9]
Secondary	2,384	33.5	[30.3, 36.8]	2,127	35.0	[31.6, 38.5]
Post-secondary	435	46.2	[40.6, 52.0]	383	49.5	[43.0, 56.1]
Missing/don't know	8	38.8	[11.3, 75.9]	8	38.8	[11.3, 75.9]

The data are based on question chs9 of the biomarker questionnaire chs9. Was [name of child] given any drug for intestinal worms in the last six months? The question was asked across all age categories
[1]Only children 12-59 months are eligible for deworming; the data are analyzed for children 6-59 months and children 12-59 months
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Table 199. Background characteristics of children (aged 6 to 11 months) who received some form of drug for intestinal worms in the last six months

Characteristics	Child (6-11 months) given drug for intestinal worms in last 6 months		
	N	%	[95/% CI]
National	528	16.9	[12.9, 22.0]
Sex	(P = 0.287)		
Male	246	18.8	[13.1, 26.2]
Female	282	15.3	[11.1, 20.6]
Residence	(P = 0.015)*		
Urban	234	24.7	[15.9, 36.3]
Rural	294	12.3	[8.7, 17.1]
Zone	(P < 0.001)***		
North Central	82	13.6	[7.0, 24.8]
North East	91	19.7	[8.8, 38.4]
North West	102	0.9	[0.2, 4.2]
South East	64	42.4	[29.4, 56.7]
South South	89	60.1	[46.9, 71.9]
South West	100	11.4	[6.3, 19.9]
Wealth quintile	(P = 0.002)**		
Lowest	94	7.1	[3.6, 13.4]
Second	84	11.1	[5.9, 19.8]
Middle	86	21.5	[12.5, 34.3]
Fourth	135	27.7	[19.1, 38.3]
Highest	125	20.7	[12.3, 32.7]
Level of education completed by caregiver	(P = 0.168)		
None	116	11.6	[5.4, 23.1]
Primary	81	14.0	[7.8, 24.0]
Secondary	257	20.8	[15.7, 26.9]
Post-secondary	52	24.1	[11.9, 42.9]
Missing/don't know	0		

[1]Only children 12-59 months are eligible for deworming
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval

Use of therapeutic feeds: Use of ready-to-use therapeutic feeds/plumpy'nut

Table 200 presents the percentage of children aged 6-59 months who received some form of therapeutic feeds in the past 12 months, and those who received some form of therapeutic feeds the day before the interview, stratified by age, sex, residence, zone, wealth quintile, and level of education completed by the caregiver.

Received any ready-to-use therapeutic feeds/plumpy'nut in the past 12 months: There was a statistically significant difference in the percentage of children 6-59 months who received any ready-to-use therapeutic feeds/plumpy'nut in the past 12 months between the zones (P = 0.005). The prevalence was highest among children in the North East zone (6 percent).

Received any ready-to-use therapeutic feeds/plumpy'nut yesterday: There was a statistically significant difference in the percentage of children aged 6-59 months who received any ready-to-use therapeutic feeds/plumpy'nut a day before the interview between the zones (P = 0.042) and wealth quintile (P = 0.036). The prevalence was highest among children in the South South zone (50 percent) and in households in the second wealth quintile (39.4 percent).

Table 200. Use of therapeutic feeds in the past 12 months and the day before the interviews among children aged 6-59 months, Nigeria 2021

Characteristics	Therapeutic feeds/plumpy'nut in last 12 months			Therapeutic feeds/plumpy'nut yesterday		
	N	%	[95/% CI]	N	%	[95/% CI]
National	4,884	2.4	[1.6, 3.8]	85	14.1	[8.0, 23.8]
Age category	(P = 0.575)			(P = 0.050)		
6-11 months	527	1.1	[0.4, 3.1]	6	59.8	[29.4, 84.2]
12-23 months	1,135	2.4	[1.4, 4.1]	21	21.0	[8.5, 43.2]
24-35 months	1,250	2.5	[1.5, 4.4]	25	10.4	[4.3, 22.8]
36-47 months	1,164	2.6	[1.5, 4.5]	21	6.9	[1.1, 32.4]
48-59 months	808	2.9	[1.1, 7.2]	12	8.6	[1.2, 41.7]
Sex	(P = 0.327)			(P = 0.711)		
Male	2,449	2.1	[1.3, 3.4]	42	12.7	[5.7, 26.2]
Female	2,435	2.8	[1.6, 4.7]	43	15.2	[7.4, 28.7]
Residence	(P = 0.095)			(P = 0.410)		
Urban	1,982	3.7	[1.9, 7.0]	48	17.8	[11.2, 27.2]
Rural	2,902	1.8	[1.0, 3.1]	37	10.1	[2.5, 32.9]
Zone	(P = 0.005)**			(P = 0.042)*		
North Central	770	1.5	[0.5, 4.3]	6	18.6	[2.6, 66.0]
North East	807	5.9	[2.8, 12.0]	42	10.5	[5.7, 18.7]
North West	910	2.3	[1.1, 4.7]	20	9.7	[2.8, 28.7]
South East	716	0.5	[0.1, 2.4]	5	14.1	[1.5, 63.4]
South South	822	1.7	[0.5, 5.5]	7	49.8	[22.7, 77.0]
South West	859	0.6	[0.2, 1.5]	5	7.5	[0.8, 44.4]
Wealth quintile	(P = 0.369)			(P = 0.036)*		
Lowest	879	3.1	[1.7, 5.5]	20	0.0	
Second	849	1.5	[0.8, 2.7]	13	39.4	[14.8, 70.7]
Middle	918	2.9	[1.3, 6.3]	17	9.7	[1.3, 45.7]
Fourth	1,137	2.8	[1.6, 4.9]	20	24.7	[10.6, 47.8]
Highest	1,081	2.1	[1.0, 4.2]	15	7.1	[1.8, 23.4]
Level of education completed by caregiver	(P = 0.400)			(P = 0.176)		
None	1,106	3.2	[1.8, 5.5]	27	4.9	[0.9, 22.7]
Primary	769	1.8	[0.8, 3.9]	11	0.0	
Secondary	2,394	2.0	[1.2, 3.5]	34	22.0	[10.5, 40.5]
Post-secondary	439	3.4	[1.6, 7.3]	10	24.5	[6.3, 61.0]
Missing/don't know	8	0.0		0		

The data are based on questions chs20 and chs21 of the biomarker questionnaire
chs20. In the last 12 months, was [name of child] given any ready to use therapeutic feeds/plumpy'nut like (show locally sourced product) because the child was malnourished?
chs21. Did [name of child] consume it yesterday?
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001)

Table 201 presents the percentage of children (aged 6-59 months) who were identified as having wasting, who received any therapeutic feeds in the past 12 months, and those who received some form of therapeutic feeds the day before the interview stratified by age, sex, residence, zone, wealth quintile, and level of education completed by the caregiver.

Received any ready-to-use therapeutic feeds/plumpy'nut in the past 12 months: Nationally, 2.8 percent of children with wasting reported receiving therapeutic feeds/plumpy'nut in the past 12 months. There was no significant variation across the background characteristics.

Received any ready-to-use therapeutic feeds/plumpy'nut yesterday: Among those wasted children who received ready-to-use therapeutic foods in the past 12 months, nationally, 2.1 percent of children with wasting reported receiving therapeutic feeds/plumpy'nut a day before the interview. There was no significant variation across the background characteristics.

Table 201. Use of therapeutic feeds in the past 12 months and the day before the interviews among children with wasting (aged 6-59 months), Nigeria 2021

Characteristics	Therapeutic feeds/plumpy'nut in last 12 months			Therapeutic feeds/plumpy'nut yesterday		
	N	%	[95/% CI]	N	%	[95/% CI]
National	485	2.8	[1.3, 6.2]	9	2.1	[6.2, 52.8]
Age category	(P = 0.496)					
6-11 months	116	0.8	[0.1, 5.9]	1	100.0	
12-23 months	174	4.3	[1.7, 10.6]	5	26.2	[3.6, 77.3]
24-35 months	89	3.4	[0.7, 14.6]	2	0.0	
36-47 months	57	0.0		0	0.0	
48-59 months	49	5.2	[0.7, 28.9]	1	0.0	
Sex	(P = 0.840)			(P = 0.554)		
Male	252	3.0	[1.2, 7.4]	5	13.7	[1.6, 60.3]
Female	233	2.6	[0.9, 7.3]	4	31.0	[4.1, 82.5]
Residence	(P = 0.593)			(P = 0.402)		
Urban	188	3.7	[1.0, 12.3]	4	31.8	[11.0, 63.7]
Rural	297	2.4	[0.8, 6.6]	5	13.4	[1.5, 60.8]
Zone	(P = 0.471)			(P = 0.737)		
North Central	59	3.5	[0.4, 23.3]	1	0.0	
North East	110	5.8	[1.9, 16.0]	6	24.9	[6.5, 61.2]
North West	113	2.0	[0.4, 8.8]	2	27.4	[2.2, 86.3]
South East	63	0.0		0		
South South	70	0.0		0		
South West	70	0.0		0		
Wealth quintile	(P = 0.081)					
Lowest	118	7.1	[2.8, 16.8]	6	0.0	
Second	86	3.6	[1.1, 10.9]	3	73.2	[18.8, 97.0]
Middle	78	0.0		0	0.0	[., .]
Fourth	90	0.0		0	0.0	[., .]
Highest	112	0.0		0	0.0	[., .]
Level of education completed by caregiver						
None	128	5.9	[2.4, 13.6]	6	19.4	[2.5, 69.3]
Primary	78	1.5	[0.2, 10.3]	1	0.0	
Secondary	225	1.5	[0.4, 6.0]	2	36.0	[3.3, 90.2]
Post-secondary	35	0.0		0	0.0	[., .]
Missing/don't know	0	0.0		0		

The data are based on questions chs20 and chs21 of the biomarker questionnaire
chs20. In the last 12 months, was [name of child] given any ready to use therapeutic feeds/plumpy'nut like (show locally sourced product) because the child was malnourished?
chs21. Did [name of child] consume it yesterday?
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001)

Intervention coverage among adolescent girls (aged 10-14 years)

The Nigeria National Micronutrient Deficiency Control guidelines (FMOH, 2013) describe the following interventions to address micronutrient deficiencies among adolescent girls – deworming, iron, and folate supplementation. Some of these interventions are reflected in the National Policy on Food and Nutrition (FMOH, 2013), which prioritizes both the health system and food-based approaches to MNDC (MBNP, 2016). An objective of the survey was to assess the coverage of these interventions among adolescent girls in Nigeria.

Figure 45 presents the coverage of nutrition-related interventions (multivitamin, iron or iron/folic acid tablets, deworming) and their use in the last six months among adolescent girls nationally. It was reported that 25 percent of adolescent girls used deworming treatment. The use of iron/folic acid tablets was reported among 11 percent of adolescent girls, while the use of multivitamins was reported among 8 percent of adolescent girls.

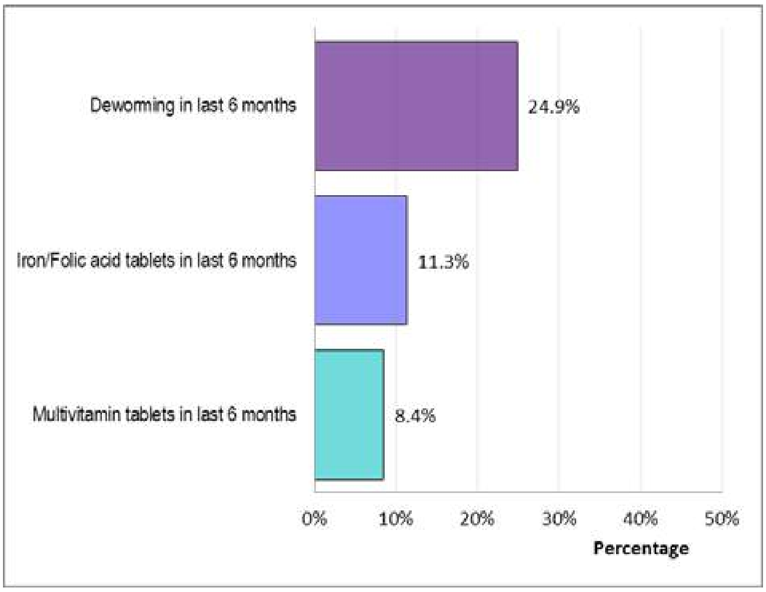


Figure 45. Coverage of nutrition-specific interventions among adolescent girls, Nigeria 2021
Data are weighted to account for survey design and non-response Number of adolescent girls responding nationally: (n=1002)

Table 202 presents the use of multivitamins, iron or iron/folic acid tablets, and deworming treatment among adolescent girls (aged 10-14 years), stratified by age, residence, and wealth quintile.

a. **Use of multivitamins in the past six months:** There was a statistically significant difference in the percentage of adolescent girls who reported use of multivitamins between residence (P = 0.006) and wealth quintile ($P < 0.001$). The use of multivitamins was higher among adolescent girls residing in urban (13 percent) versus rural areas (6 percent). The prevalence was lowest in respondents in households in the lowest wealth quintile (1.0 percent).

b. **Use of multivitamins in the past seven days**: There was no significant variation in the use of multivitamins, at least once in the past seven days, among adolescent girls across the background characteristics. **Figure 44** presents the frequency of use of multivitamins in the past seven days among adolescent girls who reported use of multivitamins in the past six months.

c. **Use of iron or iron/folic acid tablets in the past six months**: There was a statistically significant difference in the percentage of adolescent girls who reported use of iron or iron/folic acid tablets in the past six months between residence (P = 0.007) and wealth quintile (P < 0.001). The use of iron or iron/folic acid tablets in the past six months was lower among adolescent girls residing in the rural (8 percent) versus urban (16 percent) areas. Their use was lowest among respondents in households in the lowest wealth quintile (6 percent).

d. **Use of iron or iron/folic acid tablets at least once in the past seven days**: There was no significant variation in the use of iron or iron/folic acid tablets, at least once in the past seven days, among adolescent girls across the background characteristics. **Figure 45** presents the frequency of use of iron or iron/folic acid tablets in the past seven days among adolescent girls who reported use of iron or iron/folic acid tablets in the past six months.

e. **Deworming in the past six months**: There was a statistically significant difference in the prevalence of deworming between residence (P = 0.012) and wealth quintile (P < 0.001). Deworming was higher among adolescent girls residing in urban (31 percent) versus rural areas (21 percent). Deworming was highest among adolescent girls in households in the richest wealth quintile (41 percent).

Table 202. Use of multivitamin, iron or iron/folic acid tablets, and deworming treatment among adolescent girls (aged 10-14 years), Nigeria 2021

Characteristics	Took multivitamin tablets in the past six months			Took multivitamin in past 7 days			Took iron tablets or iron/folic acid in the past six			Took iron tablets or iron/folic acid in last 7 days			Took deworming drug in past six months		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	977	8.4	[6.2, 11.2]	89	55.9	[39.9, 70.7]	979	11.3	[9.1, 14.0]	126	61.1	[49.1, 72.0]	974	24.9	[21.4, 28.7]
Age category	(P = 0.118)			(P = 0.814)			(P = 0.273)			(P = 0.988)			(P = 0.649)		
10 years	260	8.5	[5.2, 13.7]	25	64.5	[39.4, 83.6]	263	11.2	[7.5, 16.4]	30	65.3	[43.6, 82.1]	263	25.0	[19.1, 32.1]
11 years	156	12.3	[6.1, 23.2]	13	48.3	[17.4, 80.5]	157	11.1	[7.0, 17.1]	22	61.0	[36.7, 80.8]	153	30.0	[22.0, 39.4]
12 years	193	6.7	[3.7, 11.8]	19	48.1	[22.6, 74.6]	194	8.5	[5.2, 13.4]	26	59.5	[36.6, 78.9]	193	20.8	[15.1, 28.0]
13 years	193	11.4	[6.7, 18.8]	23	61.2	[33.8, 83.0]	189	16.3	[10.7, 24.1]	32	58.6	[36.9, 77.3]	192	24.8	[17.5, 34.0]
14 years	175	3.6	[1.7, 7.5]	9	44.3	[15.2, 77.9]	176	9.8	[5.2, 17.5]	16	60.5	[28.3, 85.6]	173	25.3	[17.5, 35.2]
Residence	(P = 0.006)**			(P = 0.712)			(P = 0.007)**			(P = 0.683)			(P = 0.012)*		
Urban	402	12.5	[8.4, 18.2]	49	58.2	[37.3, 76.6]	402	15.7	[11.6, 20.9]	72	59.0	[42.5, 73.6]	401	30.9	[25.2, 37.1]
Rural	575	5.5	[3.5, 8.5]	40	52.2	[29.2, 74.3]	577	8.4	[6.0, 11.6]	54	63.9	[45.4, 79.1]	573	20.7	[16.3, 26.0]
Wealth quintile	(P < 0.001)***			(P = 0.581)			(P < 0.001)***			(P = 0.904)			(P < 0.001)***		
Lowest	174	1.0	[0.2, 4.8]	2	20.5	[1.6, 80.7]	175	5.7	[2.9, 11.0]	12	48.3	[18.9, 79.0]	175	15.7	[10.1, 23.4]
Second	159	5.7	[3.0, 10.4]	13	68.8	[37.6, 89.0]	160	9.0	[4.9, 16.2]	15	59.2	[26.6, 85.3]	159	12.6	[7.0, 21.7]
Middle	183	8.2	[4.3, 15.0]	16	61.1	[30.8, 84.7]	184	9.1	[5.5, 14.8]	26	60.0	[34.3, 81.1]	185	17.6	[11.8, 25.6]
Fourth	214	15.1	[9.3, 23.5]	30	45.9	[23.3, 70.4]	214	22.0	[15.5, 30.2]	42	67.1	[47.5, 82.1]	213	37.9	[29.5, 47.1]
Highest	243	12.3	[7.7, 19.1]	28	61.1	[35.7, 81.6]	242	11.6	[7.6, 17.3]	31	59.2	[36.5, 78.6]	238	41.2	[33.0, 49.8]

The data are based on questions wtt2, wtt3, wtt4, wtt5, and wrf2 of the biomarker questionnaire wtt2. During the last six months, did you take any multivitamin tablets?
wtt3. How many days did you take any of these products in the last seven days? See Figure 44 for more details. wtt4. During the last six months, did you take any iron/folic acid tablets? wtt5. How many days did you take any iron/folic acid tablets in last seven days? See Figure 45 for more details. wrf2. Did you take any drugs for intestinal worms in the past six months? Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Figure 46 presents the frequency of use of multivitamins in the past seven days among adolescent girls who reported taking a multivitamin product in the seven days leading to the survey. 36 percent took multivitamins for the entire seven days.

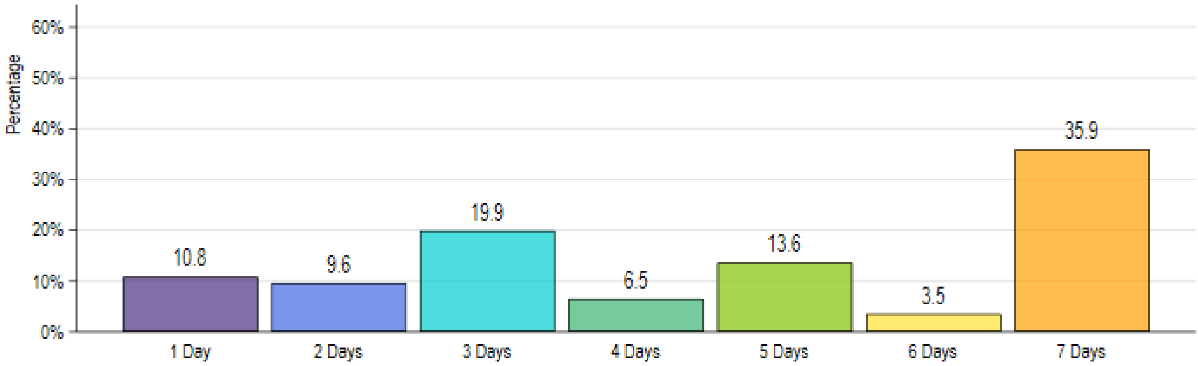


Figure 46. Frequency of use of multivitamins in the past seven days among adolescent girls (aged 10-14 years) who reported taking any multivitamin product seven days prior to the survey, Nigeria 2021
Based on question wtt3. How many days did you take any of these products [any multivitamin tablets] in the last seven days? Data are weighted to account for survey design and non-response

Figure 47 presents the frequency of use of some form of iron or iron/folic acid tablets in the past seven days among adolescent girls who reported taking any iron or iron/folic acid tablets in the seven days leading to the survey. 17 percent took iron/folic acid tablets for the entire seven days.

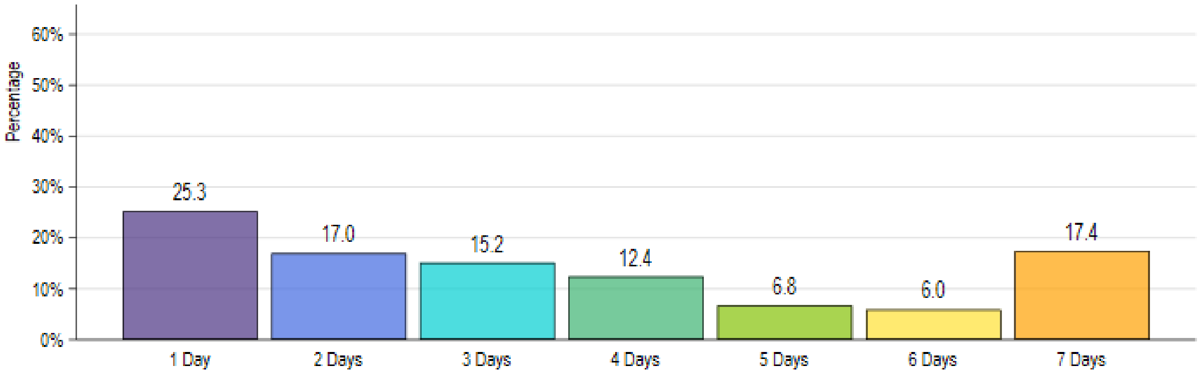


Figure 47. Frequency of use of any iron or iron/folic acid tablets in the past seven days among adolescent girls (aged 10-14 years) who reported taking any iron or iron/folic acid tablet seven days prior to the survey, Nigeria 2021
Based on question wtt5. How many days did you take any iron/folic acid tablets in last seven days? Data are weighted to account for survey design and non-response

Intervention coverage among women of reproductive age (aged, 15-49 years)

The Nigeria National Micronutrient Deficiency Control Guidelines (FMOH, 2013) describe deworming, iron supplementation, and folate supplementation as interventions to address micronutrient deficiencies among Women of Reproductive Age (WRA). Some of these interventions are reflected in the National Policy on Food and Nutrition (MBNP, 2016), which prioritizes both the health system and food-based approaches to micronutrient deficiency control. An objective of the survey was to assess the coverage of these interventions among WRA in Nigeria.

Figure 48 presents the overall prevalence of nutrition-related interventions (use of multivitamin, iron or iron/folic acid tablets, and deworming) in the last six months among WRA (aged 15- 49 years) nationally. The use of deworming treatment in the past six months was reported in 19 percent of WRA. Nationally, 13 percent of WRA took a multivitamin in the past six months. The use of iron/folic acid among WRA was 14 percent in the past six months.

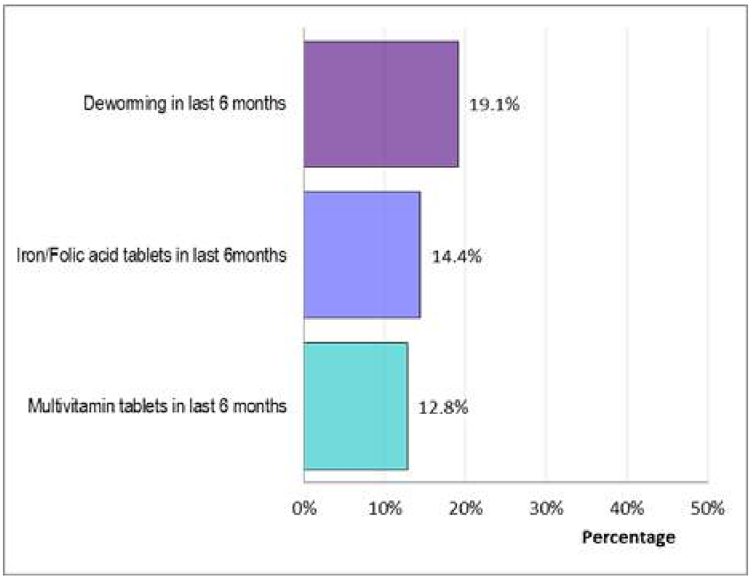


Figure 48. Coverage of nutrition-specific interventions among women of reproductive age (aged 15-49 years), Nigeria 2021
Data are weighted to account for survey design and non-response Number of WRA who responded nationally: (n= 5238)

Table 203 presents the use of multivitamin, iron or iron/folic acid tablets, and deworming treatment among women of reproductive age (WRA, aged 15-49 years) stratified by age, residence, zone, wealth quintile, and educational attainment.

- **Use of multivitamin tablets in the past six months**: There was a statistically significant difference in the percentage of WRA reporting use of multivitamins in the past six months between age category (P < 0.001), residence (P = 0.002), zone (P < 0.001), wealth quintile (P
- < 0.001) and level of education completed (P < 0.001). The use of multivitamin tablets in the past six months was lowest in the 15-to-19-years age category (7 percent). It was lower in WRA residing in rural (10 percent) versus urban areas (16 percent). It was lowest among respondents in the North West zone (3 percent), among those in households in the poorest wealth quintile (7 percent) and among respondents with no formal educational (7 percent).
- **Use of multivitamin tablets at least once in the past seven days**: Among those who reported use of a multivitamin in the past six months, 65 percent reported use of multivitamins at least once in the past seven days prior to the survey. There was a statistically significant difference in the percentage of WRA, who reported use of a multivitamin in the past six months, reporting

the use of multivitamins at least once in the past seven days between with the zones (P = 0.001). The use of multivitamin tablets was lowest among respondents in the North West zone (44 percent). **Figure 49** presents the frequency of use of multivitamin tablets in the past seven days among respondents those who reported use of a multivitamin in the past six months.

- **Use of iron or iron/folic acid tablets in the past six months**: There was a statistically significant difference in the percentage of WRA reporting use of iron or iron/folic acid tablets in the past six months among the age category (P < 0.001), residence (P = 0.001), zone (P < 0.001), wealth quintile (P < 0.001), and educational attainment (P < 0.001). Use of iron or iron/folic acid tablets in the past six months in WRA was lowest in the 15 to 19-year age category (9 percent). It was lower in WRA residing in rural (12 percent) than in the urban (18 percent) areas. It was lowest among respondents in the North West zone (2 percent), among WRA in the lowest wealth quintile (8 percent), and among respondents with no educational attainment (8 percent).
- **Use of iron or iron/folic acid tablets at least once in the past seven days**: **Figure 50** presents the frequency of use of any iron/folic acid in the past seven days among women of reproductive age nationally. About 10 percent of WRA took iron/folic acid tablets at least once in the past seven days before the interview.
- **Deworming**: There was a statistically significant difference in the percentage of WRA reporting deworming in the past six months among the age category (P < 0.001), residence (P < 0.001), zone (P < 0.001), wealth quintile (P < 0.001), and educational attainment (P < 0.001). Deworming in the past six months among WRA was highest in the 40 to 49 year age category (23 percent). It was higher among WRA residing in urban (23 percent) than in the rural (16 percent) areas. It was lowest among respondents in the North West zone (7 percent), in the lowest wealth quintile (10 percent), and respondents with no educational attainment (10 percent).

Table 203. Use of multivitamin, iron or iron/folic acid tablets, and deworming treatment among women of reproductive age (aged 15-49 years), Nigeria 2021

Characteristics	Took multivitamin tablet in the past six months			Took multivitamin tablet in past seven days			Took iron or iron/folic acid tablets in the past six months			Took iron or iron/folic acid tablets in the past seven days			Took deworming drug in past six months		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	5,280	12.8	[11.3, 14.5]	716	65.3	[59.6, 70.6]	5,268	14.4	[13.0, 16.0]	872	59.9	[54.4, 65.3]	5,305	19.1	[17.2, 21.0]
Age category	(P < 0.001)***			(P = 0.096)			(P < 0.001)***			(P = 0.635)			(P = 0.001)**		
15-19 years	1,137	7.4	[5.7, 9.6]	89	51.8	[37.8, 65.5]	1,135	8.6	[6.7, 11.0]	127	56.4	[45.4, 66.8]	1,148	16.4	[13.6, 19.7]
20-29 years	1,625	12.8	[10.9, 15.0]	218	63.7	[53.3, 73.0]	1,625	13.9	[11.9, 16.2]	257	61.5	[52.0, 70.2]	1,635	16.7	[14.2, 19.5]
30-39 years	1,507	16.2	[13.7, 19.0]	249	67.8	[60.1, 74.6]	1,503	17.4	[14.9, 20.2]	290	57.3	[48.1, 66.0]	1,504	21.5	[18.9, 24.3]
40-49 years	1,011	14.6	[11.4, 18.4]	160	71.7	[61.8, 79.9]	1,005	17.9	[15.0, 21.1]	198	63.7	[55.1, 71.5]	1,018	22.9	[19.4, 26.8]
Residence	(P = 0.002)**			(P = 0.100)			(P = 0.001)**			(P = 0.053)			(P = 0.001)**		
Urban	2,080	16.2	[13.7, 18.9]	343	61.0	[52.7, 68.6]	2,079	18.1	[15.4, 21.1]	428	55.1	[47.2, 62.8]	2,078	23.3	[19.7, 27.2]
Rural	3,200	10.3	[8.2, 12.8]	373	70.1	[62.4, 76.8]	3,189	11.5	[9.6, 13.7]	444	65.8	[58.3, 72.6]	3,227	15.9	[13.7, 18.3]
Zone	(P < 0.001)***			(P = 0.001)**			(P < 0.001)***			(P = 0.123)			(P < 0.001)***		
North Central	864	11.2	[8.0, 15.5]	115	50.6	[38.5, 62.8]	869	16.4	[12.7, 21.0]	165	54.6	[44.8, 64.1]	862	12.4	[10.0, 15.3]
North East	847	8.6	[5.7, 13.0]	49	80.7	[52.9, 93.9]	837	9.6	[7.4, 12.4]	75	66.1	[37.0, 86.6]	850	12.5	[9.8, 15.9]
North West	928	2.6	[1.5, 4.3]	18	44.0	[18.2, 73.5]	927	2.2	[1.1, 4.0]	15	51.6	[19.6, 82.3]	938	7.0	[4.8, 10.2]
South East	876	13.1	[10.3, 16.4]	116	54.0	[40.7, 66.8]	878	20.4	[15.3, 26.8]	182	58.1	[46.0, 69.3]	881	41.0	[35.0, 47.4]
South South	862	22.3	[18.3, 26.8]	183	83.9	[73.9, 90.5]	853	17.7	[14.1, 21.9]	144	81.6	[60.0, 92.9]	874	33.7	[27.2, 40.9]
South West	903	27.6	[22.7, 33.1]	235	61.0	[51.1, 70.1]	904	31.9	[27.6, 36.5]	291	52.7	[45.4, 59.9]	900	30.0	[26.2, 34.0]
Wealth quintile	(P < 0.001)***			(P = 0.356)			(P < 0.001)***			(P = 0.530)			(P < 0.001)***		
Lowest	942	6.7	[4.7, 9.4]	72	67.6	[54.2, 78.6]	935	7.7	[5.6, 10.4]	92	68.5	[55.5, 79.1]	947	10.4	[7.9, 13.6]
Second	891	8.9	[6.8, 11.7]	88	72.3	[59.6, 82.2]	895	11.2	[9.0, 14.0]	115	60.9	[48.1, 72.3]	904	13.4	[10.6, 16.8]
Middle	1,083	12.4	[9.3, 16.2]	140	64.3	[49.3, 76.9]	1,077	14.9	[12.0, 18.4]	186	61.7	[52.4, 70.2]	1,090	15.6	[12.9, 18.6]
Fourth	1,188	16.5	[13.6, 19.8]	192	57.9	[48.0, 67.2]	1,185	18.9	[15.9, 22.4]	238	55.2	[46.3, 63.8]	1,189	24.2	[21.0, 27.6]
Highest	1,156	18.3	[15.2, 21.8]	222	68.6	[59.9, 76.1]	1,156	17.7	[14.7, 21.2]	239	59.4	[49.7, 68.4]	1,155	30.0	[24.9, 35.6]
Level of education completed	(P < 0.001)***			(P = 0.291)			(P < 0.001)***			(P = 0.580)			(P < 0.001)***		
None	1,044	7.2	[5.4, 9.6]	72	76.4	[62.1, 86.5]	1,038	8.0	[6.1, 10.5]	93	66.0	[52.8, 77.1]	1,054	10.2	[8.0, 12.8]
Primary	852	15.6	[11.5, 20.9]	114	69.3	[53.9, 81.3]	850	20.2	[16.4, 24.5]	172	62.1	[52.8, 70.6]	858	18.0	[14.7, 21.8]
Secondary	2,804	13.4	[11.8, 15.2]	415	64.1	[57.1, 70.5]	2,797	14.9	[13.2, 16.7]	492	59.3	[52.1, 66.0]	2,809	22.1	[19.6, 24.8]
Post secondary	441	21.6	[17.4, 26.6]	105	57.6	[45.3, 69.1]	444	21.0	[16.5, 26.4]	104	53.4	[40.2, 66.2]	444	28.1	[22.7, 34.3]
Missing/don't know	10	16.9	[3.5, 53.2]	2	35.8	[3.3, 90.0]	10	16.9	[3.5, 53.2]	2	35.8	[3.3, 90.0]	10	10.9	[1.4, 51.3]

The data are based on questions wtt2, wtt3, wtt4, wtt5, and wrf2 of the biomarker questionnaire wtt2. During the last six months, did you take any multivitamin tablets?
wtt3. How many days did you take any of these products in the last week (seven days)? See Figure 49 for more details. wtt4. During the last six months, did you take any iron/folic acid tablets?
wtt5. How many days did you take any iron/folic acid tablets in the last seven days? See Figure 50 for more details. wrf2. Did you take any drugs for intestinal worms in the past six months?
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies $P < 0.05$, ** signifies $P < 0.01$, *** signifies $P < 0.001$).

Figure 49 presents the frequency of use of multivitamins in the past seven days among WRA who reported use of a multivitamin in the past six months. 26 percent took multivitamins for the entire seven days.

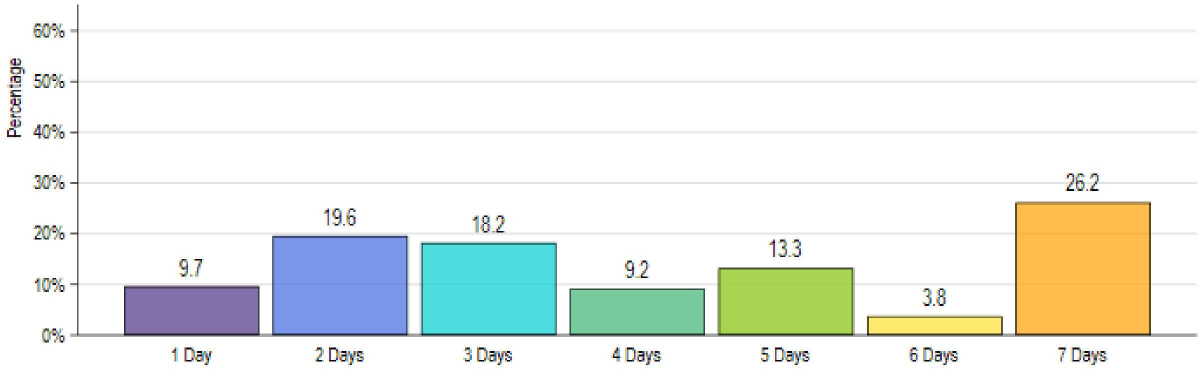


Figure 49. Frequency of use of multivitamins in the past seven days among WRA who reported use of a multivitamin in the past six months, Nigeria 2021
Based on question wtt3. How many days did you take any of these products [any multivitamin tablets] in the last seven days? Data are weighted to account for survey design and non-response

Figure 50 presents the frequency of use of any iron or iron/folic acid tablets in the past seven days among WRA who reported use of any iron or iron/folic acid tablets in the past six months. 32 percent took iron/folic acid tablets for the entire seven days.

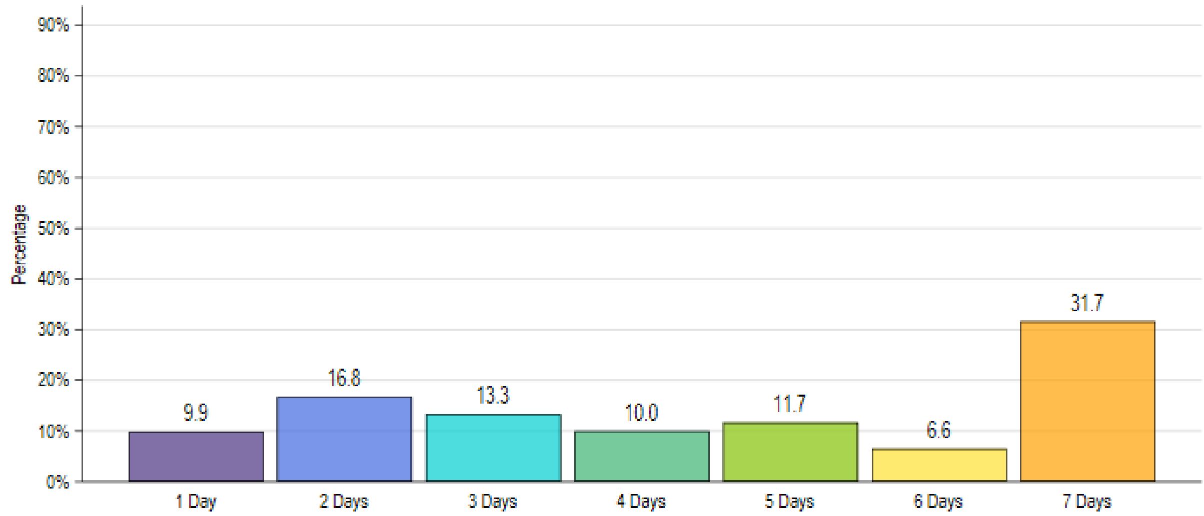


Figure 50. Frequency of use of any iron/folic acid tablets in the past seven days among WRA, Nigeria 2021
Based on question wtt5. How many days did you take any iron/folic acid tablets in the last seven days? Data are weighted to account for survey design and non-response

Intervention coverage among pregnant women (aged, 15-49 years)

The Nigeria National Micronutrient Deficiency Control Guidelines (FMOH, 2013) describe the following interventions to address micronutrient deficiencies among pregnant women – deworming, antenatal care, and iron/folate supplementation. Some of these interventions, including nutrition education, are also reflected in the National Policy on Food and Nutrition, which prioritizes both the health system and food-based approaches to MNDC (MBNP, 2016). An objective of the survey was to assess the coverage of these interventions among pregnant women in Nigeria.

Figure 51 presents the overall prevalence of antenatal care, iron/folic acid use, and nutrition counselling among pregnant women (aged 15-49 years). Nationally, 45 percent of pregnant women reported receiving at least one antenatal care visit. While 86 percent of pregnant women reported taking iron/folic acid tablets at least once in the past seven days, 70 percent of pregnant women reported taking iron/folic acid tablets the day before the interview. Thirty-four (34) percent of pregnant women reported speaking to a health worker or community volunteer about what foods to eat during pregnancy, while 31 percent of pregnant women reported talking to a health worker or community volunteer about breastfeeding their newborn.

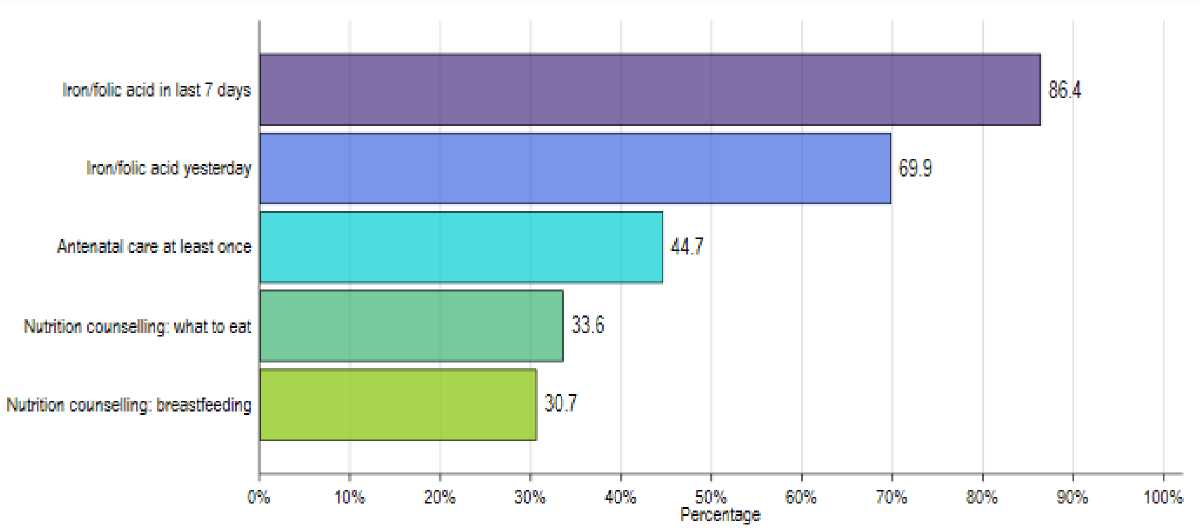


Figure 51. Overall prevalence of any nutrition-related interventions – antenatal care, supplementation, and nutrition counselling - among pregnant women (aged 15-49 years), Nigeria 2021
Data are weighted to account for survey design and non-response

Antenatal care

Antenatal care (ANC) entails periodic visits by pregnant women to designated health centers staffed and equipped for maternity services. The World Health Organization (WHO, 2018) recommends a minimum of eight ANC contacts: five contacts in the third trimester, one contact in the first trimester, and two contacts in the second trimester (**Table 204**).

Table 204. WHO recommendations on antenatal care for a positive pregnancy experience

WHO ANC recommends a minimum of eight contacts: five contacts in the third trimester, one contact in the first trimester, and two contacts in the second trimester, as detailed below
First trimester
Contact 1: up to 12 weeks
Second trimester
Contact 2: 20 weeks Contact 3: 26 weeks
Third trimester
Contact 4: 30 weeks Contact 5: 34 weeks Contact 6: 36 weeks Contact 7: 38 weeks Contact 8: 40 weeks
Return for delivery at 41 weeks if has not given birth. *Note:* Intermittent preventive treatment of malaria in pregnancy should be started at ≥ 13 weeks.

These give pregnant women the opportunity for appropriate counselling, micronutrient supplementation (folic acid and iron), medical screening, vaccination, and preventive treatment for malaria, all aimed at ensuring safe pregnancy outcomes. Conditions such as hepatitis (A, B, and C), HIV pregnancy-induced hypertension, and gestational diabetes are usually screened for during ANC visits. In addition, ANC visits can result in the early detection of high-risk pregnancies as women with risk factors suggestive of possible obstetric complication(s) are identified through careful review of their medical history and appropriate medical screening. ANC visits allow pregnant women to receive specialized and individualized pregnancy management plan(s) as needed.

Table 205 presents the percentage of pregnant women receiving antenatal care stratified by age, residence, wealth quintile, and level of education completed. There was a statistically significant difference in the prevalence of antenatal care among pregnant women between the age category (P = 0.047), residence (P = 0.001) and wealth quintile (P < 0.001). The percentage of pregnant women seeking antenatal care was lowest among pregnant women in the 15-19-years age category. It was higher among pregnant women residing in urban (56 percent) versus rural areas (39 percent). It was highest among pregnant women in households in the highest wealth quintile (64 percent).

Table 205. Prevalence of at least one antenatal care visit among pregnant women, Nigeria 2021

Characteristics	Antenatal care at least once		
	N	%	[95/% CI]
National	774	44.7	[39.4, 50.0]
Age category	(P = 0.047)*		
15-19 years	66	28.3	[16.9, 43.5]
20-29 years	418	43.0	[36.7, 49.5]
30-39 years	254	50.7	[43.1, 58.1]
40-49 years	36	55.2	[32.0, 76.4]
Residence	(P = 0.001)**		
Urban	312	56.3	[49.3, 63.0]
Rural	462	38.9	[32.3, 45.9]
Wealth quintile	(P < 0.001)***		
Lowest	156	37.0	[28.4, 46.5]
Second	131	29.5	[20.6, 40.2]
Middle	140	48.2	[36.0, 60.6]
Fourth	174	54.0	[45.6, 62.3]
Highest	171	63.9	[54.7, 72.2]
Level of education completed	(P = 0.106)		
None	161	38.5	[28.9, 49.2]
Primary	114	48.5	[35.9, 61.4]
Secondary	406	45.7	[38.8, 52.7]
Post-secondary	70	59.9	[47.8, 70.8]
Missing/don't know	2	100.0	

The data are based on question wpw1 of the biomarker questionnaire
wpw1. Have you seen any health worker for antenatal care during this pregnancy? Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

The WHO recommends the first antenatal care (ANC) contact within three months (12 weeks) of conception. **Figure 52** presents the reported timing of the first antenatal care visit by month of pregnancy among pregnant women nationally. Relatively fewer respondents met this recommendation, with some pregnant women receiving their first ANC contact in their third trimester.

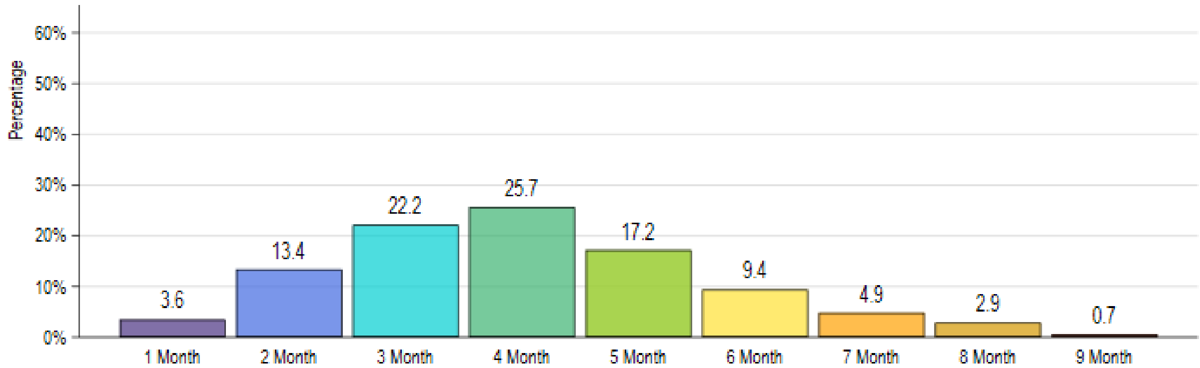


Figure 52. Timing of the first antenatal care visit by month of pregnancy among pregnant women, Nigeria 2021
Based on question wpw2. How many months pregnant were you when first received antenatal care? Data are weighted to account for survey design and non-response

The WHO advises at least one ANC contact during the first trimester, two contacts during the second trimester, and five contacts during the third trimester. **Figure 53** presents the adequacy of the number of antenatal care visits among pregnant women by the length of pregnancy nationally. Although first trimester visits were adequate, as pregnancy progressed, fewer pregnant women obtained adequate ANC visits.

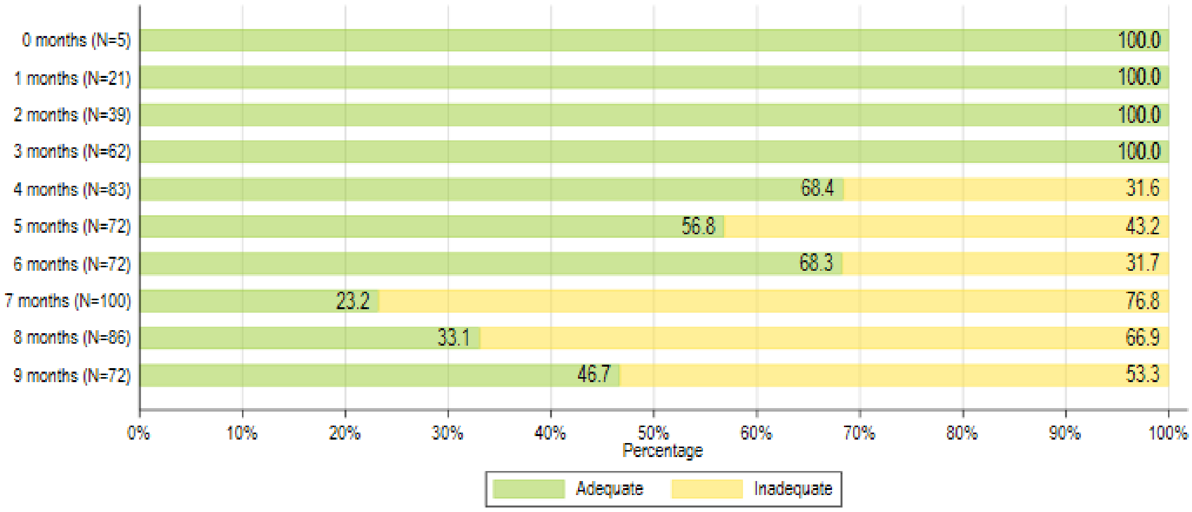


Figure 53. Adequacy of number of antenatal care visits by the length of pregnancy among pregnant women, Nigeria 2021
Based on question wpw3. How many times have you received antenatal care so far? Data are weighted to account for survey design and non-response.

Use of iron and/or folic acid tablets

Table 206 presents the percentage of pregnant women (aged 15- 49 years) who consumed a tablet or syrup containing iron in the past seven days and those who consumed a tablet or syrup containing iron and/or folic acid the day before the interview. The data are stratified by age, residence, wealth quintile, and educational attainment.

Consumed a tablet or syrup containing iron at least once in the past seven days: There was a statistically significant difference in the percentage of pregnant women who took a tablet or syrup containing iron at least once in past seven days before the interview between level of education completed (P = 0.046). The prevalence was highest among pregnant women with post-secondary education (100 percent).

Consumed a tablet or syrup containing iron and/or folic acid yesterday: There was a statistically significant difference in the use of tablet/syrup containing iron and/or folic acid among pregnant women the day before the interview between level of education completed (P = 0.001). The prevalence was highest among pregnant women with post-secondary education (100 percent).

Table 206. Percentage of pregnant women (aged 15 to 49 years) who consumed a tablet or syrup containing iron at least once in the last seven days and those who consumed a tablet or syrup containing iron and/or folic acid the day before the interview, Nigeria 2021

Characteristics	Took tablet or syrup containing iron at least once in past seven days			Took tablet of syrup containing iron or iron/folic acid yesterday		
	N	%	[95/% CI]	N	%	[95/% CI]
National	112	86.4	[78.2, 91.9]	112	69.9	[58.7, 79.1]
Age category	(P = 0.834)			(P = 0.694)		
15-19 years	8	82.9	[36.5, 97.6]	8	71.1	[31.6, 92.9]
20-29 years	58	84.7	[71.2, 92.5]	58	74.0	[58.5, 85.2]
30-39 years	42	87.6	[73.5, 94.7]	42	62.9	[44.0, 78.5]
40-49 years	4	100.0		4	81.0	[27.6, 98.0]
Residence	(P = 0.569)			(P = 0.114)		
Urban	55	88.7	[75.2, 95.3]	55	78.8	[64.7, 88.3]
Rural	57	84.7	[72.5, 92.0]	57	62.8	[45.8, 77.1]
Wealth quintile	(P = 0.966)			(P = 0.798)		
Lowest	18	86.2	[67.0, 95.0]	18	65.9	[34.8, 87.5]
Second	17	84.4	[58.8, 95.3]	17	75.6	[52.0, 89.8]
Middle	17	92.6	[61.8, 99.0]	17	78.7	[53.4, 92.3]
Fourth	28	84.6	[60.4, 95.2]	28	73.3	[50.7, 88.0]
Highest	32	86.1	[67.0, 95.0]	32	62.4	[43.4, 78.1]
Level of education completed by caregiver	(P = 0.046)*			(P = 0.001)**		
None	20	97.4	[83.5, 99.6]	20	92.2	[76.7, 97.7]
Primary	15	71.9	[40.5, 90.6]	15	49.4	[23.9, 75.1]
Secondary	66	78.6	[64.7, 88.0]	66	57.3	[44.1, 69.5]
Post-secondary	8	100.0		8	100.0	

The data are based on question wpw7 of the biomarker questionnaire
wpw7. How many days in the last seven days (one week) did you consume a tablet or syrup containing iron? wpw8. Did you consume a tablet or syrup containing iron and/or folic acid yesterday?
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001). Number of pregnant women who responded nationally: (n= 124)
[1]Less than (n = 124) due to relatively fewer respondents for the household and dietary intake questionnaires
[2]Less than (n = 124) due to the response “Don’t Know”

Figure 54 presents the frequency of use of a tablet or syrup containing iron among pregnant women who reported taking a tablet or syrup containing iron at least once in the past seven days prior to the survey. Fifty-two (52) percent of the respondents took a tablet or syrup containing iron for the entire seven days.

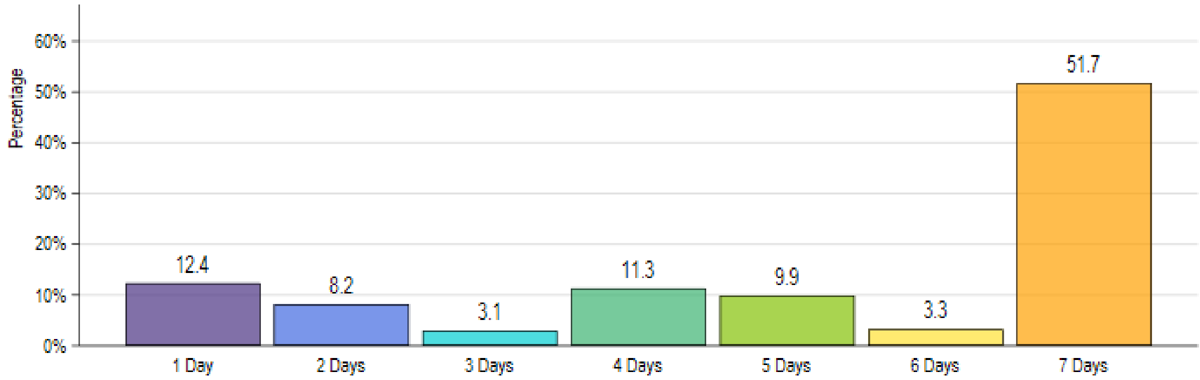


Figure 54. Frequency of use of iron tablet or syrup in the past seven days among pregnant women, Nigeria 2021
Based on question wpw7. How many days in the last seven days (one week) did you consume a tablet or syrup containing iron? Data are weighted to account for survey design and non-response.

Nutrition counselling

Table 207 presents the percentage of pregnant women (aged 15-49 years) who had spoken to a health worker or community volunteer about what foods to eat during pregnancy and breastfeeding their newborn. The data are stratified by age, residence, wealth quintile, and level of education completed.

Spoke with a health worker or community volunteer about what foods to eat during pregnancy: There was a statistically significant difference in the prevalence of pregnant women who had spoken to a health worker or community volunteer about what foods to eat during pregnancy between the age category (P = 0.012), residence (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P = 0.003). The prevalence was highest in the 40-49- years age category (51 percent). It was higher among pregnant women residing in the urban (50 percent) versus rural areas (25 percent). It was highest among pregnant women in the highest wealth quintile (56 percent) and lowest among pregnant women with no formal education (23 percent).

Spoke with a health worker or community volunteer about breastfeeding your newborn: There was a statistically significant difference in the prevalence of pregnant women who had spoken to a health worker or community volunteer about breastfeeding their newborn between the age category (P = 0.023), residence (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P = 0.009). The prevalence was highest in the 40-49-years age category (41 percent). It was lower among pregnant women residing in rural (24 percent) versus to urban areas (45 percent). It was highest among pregnant women in households in the highest wealth quintile (52 percent) and lowest among pregnant women with no formal education (24 percent).

Table 207. Percentage of pregnant women (aged 15-49 years) who had spoken to a health worker or community volunteer about what foods to eat during pregnancy and about breastfeeding their newborn

Characteristics	Nutrition counselling: what to eat			Nutrition counselling: breastfeeding		
	N	%	[95/% CI]	N	%	[95/% CI]
National	774	33.6	[29.0, 38.6]	774	30.7	[26.4, 35.2]
Age category	(P = 0.012)*			(P = 0.023)*		
15-19 years	66	18.2	[9.6, 31.7]	66	11.0	[5.5, 20.7]
20-29 years	418	30.7	[25.0, 37.1]	418	29.6	[23.4, 36.8]
30-39 years	254	40.5	[33.2, 48.3]	254	36.6	[29.7, 44.1]
40-49 years	36	51.0	[28.0, 73.6]	36	41.1	[19.1, 67.2]
Residence	(P < 0.001)***			(P < 0.001)***		
Urban	312	50.4	[43.6, 57.3]	312	45.0	[37.6, 52.7]
Rural	462	25.2	[20.2, 31.1]	462	23.5	[19.0, 28.6]
Wealth quintile	(P < 0.001)***			(P < 0.001)***		
Lowest	156	26.1	[19.3, 34.3]	156	28.2	[21.4, 36.1]
Second	131	18.9	[11.8, 28.9]	131	13.6	[8.3, 21.4]
Middle	140	36.1	[25.2, 48.7]	140	30.2	[19.8, 43.0]
Fourth	174	41.9	[31.9, 52.6]	174	39.4	[29.7, 49.9]
Highest	171	56.1	[47.1, 64.7]	171	51.5	[43.1, 59.8]
Level of education completed by caregiver	(P = 0.003)**			(P = 0.009)**		
None	161	23.4	[16.4, 32.3]	161	23.5	[16.8, 31.9]
Primary	114	35.2	[25.9, 45.8]	114	27.3	[19.4, 36.9]
Secondary	406	37.1	[31.0, 43.5]	406	34.0	[28.5, 40.0]
Post-secondary	70	55.8	[44.3, 66.6]	70	51.1	[39.7, 62.4]

The data are based on questions wpw9 and wpw10 of the biomarker questionnaire
wpw9. So far, during this pregnancy, has a health worker or community volunteer spoken with you about what foods to eat during pregnancy? wpw10. So far, during this pregnancy, has a health worker or community volunteer spoken with you about breastfeeding your newborn?
Data are weighted to account for survey design and non-response. N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Self-reported morbidity[26]

This section describes the self-reported morbidity among children (aged 6-59 months), adolescent girls (aged 10-14 years old), women of reproductive age (aged 15-49 years old), and pregnant women (aged 15-49 years old).[27] The results presented are based on a questionnaire[28] which was administered to the survey respondents (caregivers in the case of children) and focused on the prevalence of self-reported fever, cough, and diarrhoea in all four target groups, in addition to self-reported difficulty breathing and blood in stool in children and self-reported malaria and hospitalization in adolescent girls, women of reproductive age and pregnant women. These results contribute to one of the survey's main goals, which was to analyze morbidity as a critical factor related with anaemia.

Box 13. Key Findings on Self-reported morbidity

Self-reported morbidity among children (aged 6-59 months)

Diarrhoea in the past two weeks: *Overall,* 36 percent reported having diarrhoea in the past two weeks and differs by age (46.7 percent among 6-11 months and 23.3 percent among 48-59 months), residence (39 percent in rural and 30 in urban areas), zones (45 percent in North East and 25 percent in South West), wealth (42 percent among poor and 30 percent among rich), and level of education completed by caregiver (41 percent among those with none and 25 percent among those with post-secondary).

Diarrhoea yesterday: those who reported having diarrhoea a day before the interview were 14 percent, nationally and differs by age (23.8 percent among 6-11 months and 5.8 percent among 48-59 months), sex (15.6 percent among males and 12 percent among females), zone (20 percent in North East and 6 percent in South West), wealth (19 percent among poor and 9 percent among rich), and level of education completed by caregiver (19 percent among those with no education and 9.6 percent among those with post-secondary).

Blood in stool in the past two weeks: 8 percent of children reported having blood in stool and this differs by zones (10 percent in North East and 4 percent in South West) and wealth (11 percent among poor and 2.4 percent among rich).

Treatments for diarrhoea in children*: Nationally, 38 percent used* Oral Rehydration Salt (ORS), 28 percent used antibiotic pill/syrup, 13 percent used antimotility, and 11 percent used zinc and differing by residence (51 percent in urban and 33 percent in rural areas) and wealth (56 percent among rich and 31 percent among poor) for ORS; zones (36 percent in North West and 9 percent in South South) and level of education completed by caregiver (40 percent among those with no education and 23 percent among those with post-secondary) for antibiotic pill/syrup; and residence (27 percent in urban and 8 in rural areas) and zones (34 percent in North East and 1 percent in North West) for antimotility.

26 The premise of the NFCMS aligns with the UNICEF conceptual framework of determinants of undernutrition (2013*). Individual nutritional status measured by indicators such as those of anthropometry and micronutrient biomarkers is determined by two immediate factors - high quality diets and optimal health. Three underlying factors influence these: access to sufficient, safe, and nutritious food; adequate care practices for especially women and children; and access to health services including healthy environments, water, and sanitation. Finally, at a basic level, political, economic, and institutional determinants underpin all of these factors.
* UNICEF (United Nations Children's Fund). 2013. Improving Child Nutrition: The Achievable Imperative for Global Progress. New York: UNICEF.
27 For scope of final report for the biomarker component, see Annex 5
28 See Annex 4 for questionnaire (Q): Q1. Children (aged 6-59 months); Q2. Adolescent girls (aged 10-14 years) and Women of reproductive age (aged 15-49 years); Q3. Pregnant women (aged 15-49 years)

Fever: Overall, 46 percent were reported to have had a fever in the past two weeks, and differs by age (50 percent among 12-13 months and 37 percent among 48-59 months) and zone (53 percent in North East, South East and 39 percent in South West).

Cough: Nationally, 37 percent of children had a cough in the last two weeks, and differs by age (40 percent among 12-23 months and 32 percent among 48-59 months), zone (51 percent in South East and 23 percent in North West), wealth (45 percent among rich and 33 percent among poor), and level of education completed by caregiver (45 percent among those with post-secondary and 32 percent among those with none).

Difficulty breathing: The prevalence of fast, short, rapid breaths or difficulty breathing was 13 percent and differs by zones (22 percent in North East and 8 percent in South West), wealth (10 percent among the rich and 21 percent among the poor), and level of education completed by caregiver (17 percent among those with no education and 13 percent among those with post-secondary).

Self-reported morbidity among adolescent girls (aged 10-14 years).

Cough in the past two weeks: Overall, 32 percent reported having a cough, and no significant variation in the prevalence of cough in the past two weeks among adolescent girls across the background characteristics.

Fever in the past two weeks: Nationally, 29 percent reported having a fever, and no significant variation in the prevalence of fever in the past two weeks among adolescent girls across the background characteristics.

Malaria in the past two weeks: One in five (20 percent) adolescent girls 10-14 years reported having malaria and no significant variation in the prevalence of malaria in the past two weeks among adolescent girls across the background characteristics.

Diarrhoea in the past two weeks: Only 16 percent reported having diarrhoea and no significant variation in the prevalence of diarrhoea in the past two weeks among adolescent girls across the background characteristics.

Difficulty breathing in the past two weeks: Overall, 32 percent reported having difficulty in breathing differing by wealth (59 among poor and 19 among rich).

Hospitalization/clinic in the past two weeks: The prevalence of hospitalization was low (6 percent) nationally and no significant variation in hospitalization/clinic in the past two weeks among adolescent girls across the background characteristics.

Self-reported morbidity among women of reproductive age (aged 15- 49 years)

Cough in the past two weeks: Overall, 23 percent reported having a cough, and differ by zones (31 percent in North East and 18 percent in South West)

Fever in the past two weeks: Nationally, 37 percent reported having a fever, and different by age (41 percent among 40-49 years), residence (42 percent in rural and 30 percent in urban areas), zone (49 percent in South South and 27 percent in North West), wealth (42 percent among poor and 29 percent among rich), and level of education completed (42 percent among those who completed primary education and 28 percent among those with post-secondary).

Malaria in the past two weeks: (27 percent) of women of reproductive age reported having malaria and differs by age (33 percent among 40-49 years and 20 percent among 15-19 years), residence (30 percent in rural and 23 percent in urban), zones (51 percent in South South and 14 percent in North West), and level of education completed (34 percent among those who completed primary education and 28 percent among those with post-secondary).

Diarrhoea in the past two weeks: Only 17 percent reported having diarrhoea and differing by zones (24 percent in North East and 14 percent in South West)

Hospitalization/clinic in the past two weeks: The prevalence of hospitalization was low (8 percent) nationally and differs by age (11 percent among 40-49 years and 6 percent among 15-19 years) and zones (20 percent in North East and 4 percent in North West).

Self-reported morbidity among pregnant women (aged 15-49 years)

Cough in the past two weeks: Overall, 20 percent reported having a cough. There was no significant variation in the prevalence of cough in the past two weeks among pregnant women across the background characteristics.

Fever in the past two weeks: Nationally, 40 percent of pregnant women reported having a fever, and differs by residence (43 percent in rural and 33 percent in urban areas), and wealth (58 percent among those in the middle quintile and 25 percent among rich).

Malaria in the past two weeks: Overall, 31 percent of pregnant women reported having malaria. There was no significant variation in the prevalence of malaria in the past two weeks among pregnant women across the background characteristics.

Diarrhoea in the past two weeks: Only 20 percent reported having diarrhoea. There was no significant variation in the prevalence of diarrhoea in the past two weeks among pregnant women across the background characteristics.

Hospitalization/clinic in the past two weeks: The prevalence of hospitalization was 19 percent nationally and there was no significant variation in the prevalence of hospitalization in the past two weeks among pregnant women across the background characteristics.

Self-reported morbidity among children (aged 6-59 months)

Figure 55 presents the prevalence of self-reported morbidity (reported by caregivers) among children (aged 6-59 months). The prevalence of diarrhoea in the past two weeks among children (6-59 months) was 36 percent. The presence of blood in stool in the past two weeks was reported among 8 percent of children, and those who reported having diarrhoea a day before the interview were 14 percent, nationally. Fever in the past two weeks was reported in 46 percent of children, 37 percent of children (aged 6-59 months) had cough in the past two weeks, while the prevalence of fast, short, rapid breaths or difficulty breathing at any time in the past two weeks was 13 percent.

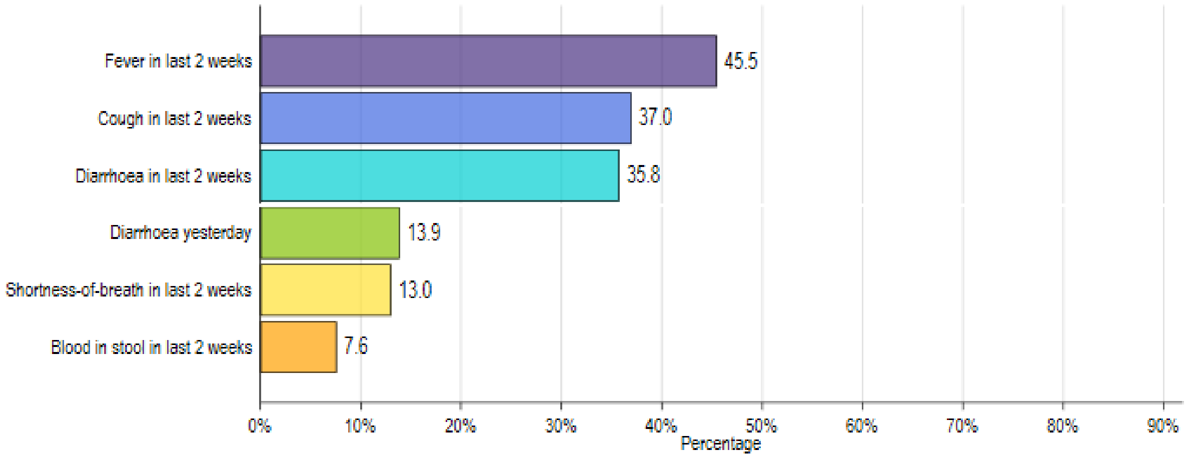


Figure 55. Prevalence of self-reported morbidity (reported by caregiver), and anaemia risk among children (aged 6-59 months), Nigeria 2021
Data are weighted to account for survey design and non-response

Diarrhoea and Blood in stool

Diarrhoea is defined as having three or more loose or watery stools in past 24 hours.

Table 208 presents the prevalence of diarrhoea in the past two weeks, blood in stool in the past two weeks and diarrhoea yesterday among children (aged 6-59 months) stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

- **Had diarrhoea in the past two weeks**: There was a statistically significant difference in the percentage of children who were ill with diarrhoea in the past two weeks before the interview between the age category (P < 0.001), residence (P = 0.001), zones (P < 0.001), wealth quintile (P = 0.001), and level of education completed by caregiver (P < 0.001). The prevalence of diarrhoea in the past two weeks among children was lowest in the 48-59-months age category (23 percent). It was higher among children residing in rural (39 percent) versus urban areas (30 percent). It was highest among children in the North East zone (45 percent). The prevalence of diarrhoea in the past two weeks among children was lowest among children in households in the highest wealth quintile (30 percent). It was highest among children whose caregivers had no formal education (41 percent).

- **Had blood in stool in the past two weeks**: There was a statistically significant difference in the percentage of children (aged 6-59 months) who had experienced blood in stool in the past two weeks before the interview between the zones (P = 0.015) and wealth quintile (P = 0.001). The prevalence of blood in stool in the past two weeks was highest among children in the North East zone (10 percent), in children in households in the poorest wealth quintile (11.2 percent).

- **Had diarrhoea yesterday**: There was a statistically significant difference in the percentage of children (aged 6-59 months) who were ill with diarrhoea yesterday (a day before the interview) between age category (P < 0.001), sex (P = 0.007), zone (P < 0.001), wealth quintile (P = 0.001), and level of education completed by caregiver (P < 0.001). The prevalence of diarrhoea a day before the interview among children was highest in the 6-11-months age category (24 percent). It was higher in the male (16 percent) versus female children (12 percent). It was highest in the North East zone (20 percent). The prevalence was highest among children in households in the second wealth quintile (19 percent), and among children whose caregivers had completed no formal education (19 percent).

Table 208. Prevalence of diarrhoea[1] and blood in stool among children (aged 6-59 months), Nigeria 2021

Characteristics	Had diarrhoea in past two weeks			Had blood in stool in past two weeks			Had diarrhoea yesterday		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	4,900	35.8	[33.1, 38.5]	4,836	7.6	[6.1, 9.4]	4,882	13.9	[11.8, 16.2]
Age category	(P < 0.001)***			(P = 0.442)			(P < 0.001)***		
6-11 months	530	46.7	[40.6, 53.0]	522	7.8	[5.0, 12.1]	528	23.8	[19.3, 29.0]
12-23 months	1,140	44.5	[40.1, 49.1]	1,130	8.1	[5.9, 10.8]	1,138	19.2	[15.4, 23.7]
24-35 months	1,254	37.9	[33.3, 42.7]	1,240	8.5	[6.2, 11.6]	1,247	11.6	[9.0, 14.8]
36-47 months	1,166	28.2	[24.7, 31.9]	1,149	7.4	[5.4, 10.2]	1,163	11.7	[9.1, 14.9]
48-59 months	810	23.3	[19.4, 27.6]	795	5.5	[3.7, 8.2]	806	5.8	[3.7, 9.1]
Sex	(P = 0.273)			(P = 0.528)			(P = 0.007)**		
Male	2,452	36.7	[33.6, 39.9]	2,414	7.9	[6.3, 9.8]	2,441	15.6	[12.9, 18.6]
Female	2,448	34.8	[31.6, 38.1]	2,422	7.3	[5.5, 9.6]	2,441	12.1	[10.2, 14.5]
Residence	(P = 0.001)**			(P = 0.256)			(P = 0.014)*		
Urban	1,984	30.0	[26.4, 33.8]	1,955	6.3	[4.3, 9.3]	1,977	10.1	[7.3, 13.8]
Rural	2,916	38.8	[35.3, 42.4]	2,881	8.3	[6.4, 10.6]	2,905	15.9	[13.2, 18.9]
Zone	(P < 0.001)***			(P = 0.015)*			(P < 0.001)***		
North Central	768	37.5	[31.7, 43.7]	764	9.1	[6.4, 12.8]	767	12.4	[9.1, 16.7]
North East	821	45.2	[39.2, 51.3]	807	10.0	[7.3, 13.5]	818	20.0	[15.3, 25.7]
North West	909	36.5	[30.7, 42.8]	907	8.9	[5.6, 13.9]	908	18.2	[13.9, 23.5]
South East	715	31.2	[26.7, 36.0]	714	4.1	[2.5, 6.6]	714	6.1	[4.4, 8.5]
South South	829	31.1	[26.7, 35.8]	788	4.9	[3.1, 7.6]	817	6.6	[4.8, 9.0]
South West	858	25.1	[21.8, 28.9]	856	3.5	[2.6, 4.6]	858	5.9	[4.4, 7.8]
Wealth quintile	(P = 0.001)**			(P = 0.001)**			(P = 0.001)**		
Lowest	889	38.3	[33.4, 43.4]	876	11.2	[7.9, 15.7]	888	17.6	[14.4, 21.4]
Second	852	41.6	[35.4, 48.0]	841	8.3	[5.3, 12.7]	852	18.6	[14.7, 23.3]
Middle	919	37.4	[33.3, 41.7]	912	8.3	[6.2, 10.9]	915	12.3	[8.5, 17.6]
Fourth	1,136	30.1	[26.3, 34.2]	1,127	6.5	[4.4, 9.6]	1,128	9.3	[7.4, 11.7]
Highest	1,084	29.5	[25.4, 34.0]	1,060	2.4	[1.5, 3.8]	1,079	9.4	[5.9, 14.8]
Level of education completed by caregiver	(P < 0.001)***			(P = 0.203)			(P < 0.001)***		
None	1,113	40.5	[36.2, 45.0]	1,098	8.4	[6.2, 11.2]	1,112	18.5	[15.4, 22.2]
Primary	773	38.4	[32.8, 44.3]	765	9.3	[5.9, 14.3]	769	14.2	[10.5, 18.9]
Secondary	2,399	34.6	[31.6, 37.7]	2,365	7.7	[6.0, 9.9]	2,386	11.1	[8.6, 14.2]
Post-secondary	439	24.9	[19.9, 30.8]	432	3.3	[1.4, 7.7]	439	9.6	[6.4, 14.1]
Missing/don't know	8	16.6	[2.8, 57.9]	8	16.2	[2.1, 63.2]	8	2.9	[0.3, 20.5]

The data are based on questions chs11, chs12, and chs13 of the biomarker questionnaire chs11. Has [name of child] had diarrhoea in the last two weeks?
chs12. Was there any blood in the stools?
chs13. Did [name of child] have diarrhoea yesterday?
1Diarrhoea is defined as three or more loose or watery stools in a 24-hour period Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Figure 56 presents all reported diarrhoea treatments for children (aged 6-59 months) pooled at the national level. The most widely used treatment was Oral Rehydration Salt (ORS). **Table 207** examines top four diarrhoea treatments used that are not homemade – ORS (38 percent), antibiotic pill/syrup (28 percent), antimotility (13 percent) and zinc (11 percent). The data are stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

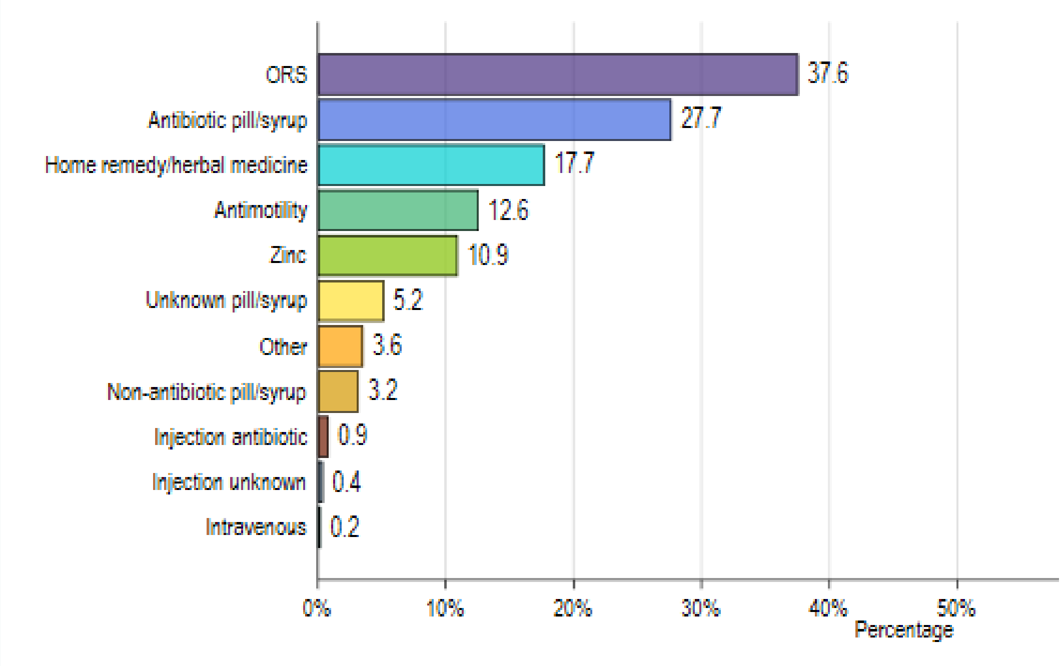


Figure 56. Reported treatments for diarrhoea in children (aged 6-59 months), Nigeria 2021
The data are based on questions chs14 and chs15 of the biomarker questionnaire
chs14. Was [name of child] given any of the following to drink at any time since he/she started having diarrhoea: A fluid made from a special packet called (local name for ORS packet)? A pre-packaged ORS liquid? (Show locally sourced ORS packet)
ORS – Oral Rehydration Salt
chs15. What (else) was given to treat diarrhoea? Data are weighted to account for survey design and non-response Number of children (aged 6-59 months) who responded nationally: (n= 4916)

- **ORS (Oral Rehydration Salt):** About 38 percent of children (aged 6-59 months) received ORS treatment for diarrhoea. There was a statistically significant difference in the percentage of children with diarrhoea who received ORS treatment between residence (P = 0.004) and wealth quintile (P = 0.005). The percentage of children who received ORS treatment for diarrhoea was higher among children residing in urban (51 percent) versus rural areas (33 percent). It was highest among children in households in the richest wealth quintile (56 percent).
- **Pill/Syrup antibiotic:** About 28 percent of children (aged 6-59 months) received antibiotic pill or syrup treatment for diarrhoea. There was a statistically significant difference in the percentage of children with diarrhoea who received antibiotic pill/syrup between the zones (P
- = 0.023) and level of education completed by caregiver (P < 0.001). The use of antibiotic pill/ syrup among children with diarrhoea was lowest in the South South zone (9 percent) and highest among children whose caregivers had no formal educational (40 percent).
- **Antimotility:** About 13 percent of children (aged 6-59 months) received antimotility treatment for diarrhoea. There was a statistically significant difference in the percentage of children with diarrhoea who received antimotility drugs between residence (P = 0.001) and the zones (P < 0.001). The use of pill/syrup antibiotics among children with diarrhoea was among children residing in urban (27 percent) versus rural areas (8 percent). It was highest in the North East zone (34 percent).

Table 209. Most common[1] diarrhoea treatment among children (aged 6-59 months), Nigeria 2021

Characteristics	ORS			Antibiotic pill/syrup			Antimotility			Zinc		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	526	37.6	[30.9, 44.7]	526	27.7	[22.3, 33.8]	526	12.6	[7.9, 19.5]	526	10.9	[6.7, 17.4]
Age category	(P = 0.198)			(P = 0.658)			(P = 0.840)			(P = 0.154)		
6-11 months	105	29.0	[19.8, 40.3]	105	22.2	[13.3, 34.6]	105	12.1	[5.5, 24.6]	105	4.4	[1.8, 10.5]
12-23 months	171	46.0	[33.0, 59.7]	171	28.5	[20.0, 38.8]	171	13.1	[7.9, 21.0]	171	14.0	[7.3, 24.9]
24-35 months	116	30.2	[19.4, 43.7]	116	26.5	[17.1, 38.7]	116	10.0	[5.1, 18.8]	116	12.7	[6.2, 24.2]
36-47 months	97	37.6	[25.0, 52.1]	97	28.8	[18.8, 41.3]	97	13.4	[6.5, 25.5]	97	12.1	[5.9, 23.3]
48-59 months	37	44.1	[26.6, 63.2]	37	39.6	[18.3, 65.6]	37	16.9	[4.5, 46.7]	37	6.0	[1.7, 19.4]
Sex	(P = 0.198)			(P = 0.225)			(P = 0.079)			(P = 0.434)		
Male	286	34.9	[26.6, 44.2]	286	24.9	[18.9, 32.0]	286	14.9	[8.7, 24.2]	286	9.9	[5.7, 16.8]
Female	240	41.0	[34.2, 48.2]	240	31.3	[23.0, 41.0]	240	9.6	[5.8, 15.6]	240	12.2	[7.0, 20.6]
Residence	(P = 0.004)**			(P = 0.848)			(P = 0.001)**			(P = 0.691)		
Urban	159	51.2	[42.4, 59.9]	159	26.7	[17.1, 39.2]	159	27.4	[14.8, 45.2]	159	9.5	[4.7, 18.3]
Rural	367	33.0	[25.3, 41.7]	367	28.0	[21.8, 35.2]	367	7.6	[4.5, 12.5]	367	11.4	[6.3, 19.9]
Zone	(P = 0.148)			(P = 0.023)*			(P < 0.001)***			(P = 0.809)		
North Central	85	31.9	[18.6, 48.9]	85	21.3	[13.2, 32.6]	85	11.5	[4.7, 25.6]	85	13.8	[5.6, 29.9]
North East	153	48.2	[40.4, 56.1]	153	22.5	[13.7, 34.7]	153	33.7	[21.3, 48.7]	153	13.4	[7.6, 22.4]
North West	136	33.2	[21.9, 46.8]	136	35.9	[26.2, 46.8]	136	0.6	[0.1, 4.3]	136	8.7	[2.6, 25.1]
South East	48	22.9	[11.8, 39.8]	48	14.8	[7.1, 28.4]	48	18.3	[9.9, 31.4]	48	10.2	[3.8, 24.5]
South South	52	31.1	[16.2, 51.5]	52	8.8	[3.3, 21.5]	52	11.8	[5.1, 25.0]	52	8.0	[2.6, 22.3]
South West	52	44.7	[29.2, 61.4]	52	27.5	[15.3, 44.2]	52	3.1	[0.4, 18.5]	52	13.3	[4.2, 34.6]
Wealth quintile	(P = 0.005)**			(P = 0.424)			(P = 0.097)			(P = 0.308)		
Lowest	123	34.4	[24.9, 45.4]	123	25.1	[15.2, 38.4]	123	7.1	[2.9, 16.4]	123	10.0	[5.4, 17.7]
Second	133	31.5	[22.6, 42.1]	133	34.0	[25.4, 43.9]	133	10.0	[5.1, 18.7]	133	9.1	[2.7, 26.7]
Middle	94	30.7	[19.6, 44.6]	94	26.5	[17.4, 38.1]	94	11.4	[5.4, 22.7]	94	7.1	[3.2, 15.2]
Fourth	102	51.1	[38.8, 63.3]	102	24.6	[16.6, 34.8]	102	16.8	[9.3, 28.4]	102	20.8	[11.8, 34.0]
Highest	71	56.3	[45.8, 66.3]	71	21.9	[12.3, 36.0]	71	28.9	[9.5, 61.2]	71	13.2	[5.6, 28.0]
Level of education completed by caregiver	(P = 0.190)			(P < 0.001)***			(P = 0.566)			(P = 0.402)		
None	162	36.9	[28.4, 46.4]	162	39.7	[30.0, 50.2]	162	10.5	[6.1, 17.6]	162	7.9	[4.1, 14.8]
Primary	89	24.4	[13.5, 40.1]	89	19.5	[11.3, 31.6]	89	11.1	[3.5, 30.5]	89	15.9	[7.4, 30.8]
Secondary	221	42.8	[31.6, 54.8]	221	18.8	[13.1, 26.4]	221	16.2	[9.0, 27.4]	221	13.7	[6.5, 26.7]
Post-secondary	31	49.4	[26.7, 72.4]	31	23.5	[10.8, 43.7]	31	21.0	[5.4, 55.5]	31	13.7	[5.2, 31.4]
Missing/don't know	1	0.0		1	0.0		1	0.0		1	0.0	

The data are based on questions chs14 and chs15 of the biomarker questionnaire
chs14. Was [name of child] given any of the following to drink at any time since he/she started having diarrhoea: A fluid made from a special packet called (local name for ORS packet)? A pre-packaged ORS liquid? (Show locally sourced ORS packet)
chs15. What (else) was given to treat diarrhoea? See Figure 42 linked to chs15
1Most common treatments are the top four (not homemade) as reported by caregivers, pooled at the national level. Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P<0.001)

Fever, Cough and Difficulty breathing

Table 210 presents the prevalence of fever and cough among children (aged 6-59 months), stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

- **Fever**: There was a statistically significant difference in the prevalence of fever in the past two weeks among children (aged 6-59 months) between age category (P = 0.002) and zone (P = 004). The percentage of children (aged 6-58 months) ill with fever in the past two weeks was lowest among children in the 48-59-months age category (37 percent) and those in the North West (40 percent) and South West (40 percent) zones.
- **Cough**: There was a statistically significant difference in the prevalence of cough in the past two weeks among children (aged 6-59 months) between age category (P = 0.023), zone (P
- < 0.001), wealth quintile (P = 0.002), and level of education completed by caregiver (P = 0.010). The percentage of children who were ill with cough in the past two weeks was highest in the 12-23-months age category (40 percent). It was lowest among children in the North West zone (23 percent). It was highest among children in households in the highest wealth quintile (45 percent). It was lowest among children whose caregivers had no formal education (32 percent).
- **Fast, short, rapid breaths or difficulty breathing**: There was a statistically significant difference in the prevalence of fast, short, rapid breaths or difficulty breathing in the past two weeks among children (aged 6-59 months) between the zones (P < 0.001), wealth quintile (P < 0.001), and level of education completed by caregiver (P = 0.005). The percentage of children who were ill with fast, short, rapid breaths or difficulty breathing in the past two weeks was highest in children in the North East zone (22 percent). It was highest among children in households in the lowest wealth quintile (21 percent). It was highest among children whose caregivers had no formal educational (17 percent).

Table 210. Prevalence of fever, cough, and difficulty breathing among children (aged 6-59 months), Nigeria 2021

Characteristics	Child ill with a fever at any time in the past two weeks			Child had a cough in the past two weeks			Child had fast, short, rapid breaths or difficulty breathing at any time in the past two weeks		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	4,886	45.5	[42.4, 48.5]	4,900	37.0	[34.4, 39.6]	4,839	13.0	[11.5, 14.7]
Age category	(P = 0.002)**			(P = 0.023)*			(P = 0.590)		
6-11 months	526	46.3	[38.8, 53.9]	530	39.1	[32.9, 45.7]	520	12.5	[9.0, 17.0]
12-23 months	1,137	50.4	[46.6, 54.1]	1,143	39.9	[35.5, 44.4]	1,129	13.3	[10.7, 16.5]
24-35 months	1,251	45.7	[41.9, 49.5]	1,251	38.4	[35.0, 41.9]	1,236	14.7	[12.0, 17.8]
36-47 months	1,164	45.6	[40.6, 50.6]	1,165	35.1	[31.7, 38.6]	1,151	11.8	[9.4, 14.8]
48-59 months	808	37.2	[32.5, 42.1]	811	31.7	[27.8, 35.9]	803	12.2	[9.4, 15.6]
Sex	(P = 0.384)			(P = 0.348)			(P = 0.538)		
Male	2,446	46.4	[42.6, 50.3]	2,456	36.1	[33.1, 39.1]	2,421	13.4	[11.6, 15.5]
Female	2,440	44.5	[40.9, 48.1]	2,444	37.9	[34.5, 41.4]	2,418	12.6	[10.6, 14.9]
Residence	(P = 0.156)			(P = 0.097)			(P = 0.217)		
Urban	1,982	42.3	[36.8, 47.9]	1,983	40.2	[35.6, 45.0]	1,955	11.6	[9.2, 14.5]
Rural	2,904	47.2	[43.5, 50.9]	2,917	35.2	[32.0, 38.6]	2,884	13.8	[11.9, 15.9]
Zone	(P = 0.004)**			(P < 0.001)***			(P < 0.001)***		
North Central	763	47.7	[43.4, 52.0]	769	45.1	[38.5, 51.9]	756	12.2	[9.3, 15.8]
North East	820	52.6	[45.4, 59.6]	818	44.7	[37.6, 52.0]	814	22.1	[17.3, 27.8]
North West	909	39.6	[32.5, 47.1]	910	22.9	[18.1, 28.4]	910	11.0	[8.5, 14.0]
South East	716	52.8	[46.7, 58.7]	716	50.6	[45.3, 55.8]	715	8.7	[6.4, 11.6]
South South	819	51.4	[45.4, 57.4]	827	44.9	[40.5, 49.5]	784	13.0	[10.0, 16.7]
South West	859	39.5	[35.9, 43.3]	860	39.4	[35.4, 43.5]	860	8.3	[6.0, 11.5]
Wealth quintile	(P = 0.862)			(P = 0.002)**			(P < 0.001)***		
Lowest	886	46.3	[40.7, 51.9]	888	34.9	[29.9, 40.3]	881	20.9	[16.7, 25.9]
Second	848	46.3	[39.3, 53.4]	852	32.8	[27.9, 38.0]	840	11.8	[8.7, 15.8]
Middle	915	45.4	[40.5, 50.4]	917	32.8	[27.9, 38.1]	909	9.7	[7.4, 12.5]
Fourth	1,133	46.3	[42.4, 50.2]	1,139	41.3	[37.1, 45.5]	1,119	11.5	[9.0, 14.7]
Highest	1,084	42.6	[35.3, 50.2]	1,084	44.8	[39.2, 50.6]	1,071	9.8	[7.5, 12.8]
Level of education completed by caregiver	(P = 0.642)			(P = 0.010)*			(P = 0.005)**		
None	1,111	45.0	[40.6, 49.5]	1,115	32.4	[27.8, 37.3]	1,105	17.2	[13.3, 21.9]
Primary	766	48.3	[42.6, 53.9]	772	38.0	[33.4, 42.8]	763	9.6	[7.1, 12.8]
Secondary	2,394	45.8	[42.4, 49.3]	2,398	38.5	[35.0, 42.2]	2,366	11.6	[9.9, 13.4]
Post-secondary	440	44.5	[36.0, 53.4]	440	44.5	[38.7, 50.4]	431	12.9	[9.5, 17.2]
Missing/don't know	8	70.5	[31.2, 92.6]	8	66.9	[27.5, 91.5]	8	21.0	[3.9, 63.3]

The data are based on questions chs16, chs17, and chs18 of the biomarker questionnaire chs 16. Has [name of child] been ill with a fever at any time in the last two weeks?
chs 17. Has [name of child] had an illness with a cough at any time in the last two weeks?
chs 18. Has [name of child] had fast, short, rapid breaths or difficulty breathing at any time in the last two weeks?
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Self-reported morbidity among adolescent girls (aged 10-14 years)

Figure 57 shows the overall prevalence of self-reported illness (cough, fever, malaria, and diarrhoea) and hospitalization/clinic visits in the last two weeks among adolescent girls (aged 10-14 years). The prevalence of hospitalization was low (6 percent), while that of cough, fever, malaria, and diarrhoea were 32 percent, 29 percent, 20 percent, and 16 percent, respectively.

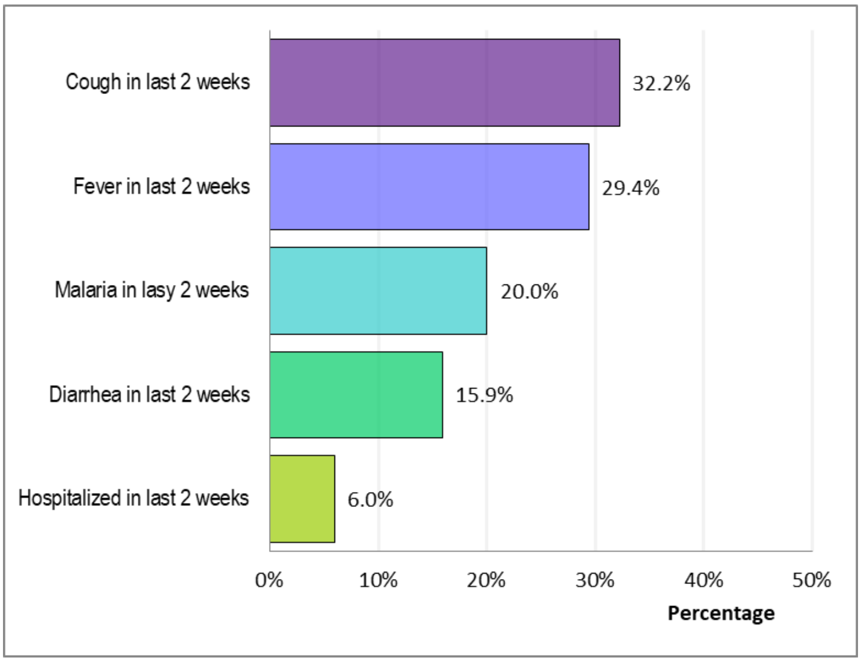


Figure 57. Overall prevalence of self-reported illness and hospitalization/clinic visits in the last two weeks among adolescent girls (aged 10-14 years), Nigeria 2021
Data are weighted to account for survey design and non-response
The number of adolescent girls who responded nationally: (n= 1003)

Table 211 presents the prevalence of self-reported illness (diarrhoea, cough, fever, and malaria) and hospitalization/clinic visits among adolescent girls in the last two weeks stratified by age, residence, and wealth quintile.

a. **Diarrhoea in the past two weeks**: There was no significant variation in the prevalence of diarrhoea in the past two weeks among adolescent girls across the background characteristics.

b. **Cough in the past two weeks**: There was no significant variation in the prevalence of cough in the past two weeks among adolescent girls across the background characteristics.

c. **Difficulty breathing in the past two weeks**: There was a statistically significant difference in the prevalence of difficulty breathing in the past two weeks between the wealth quintile (P = 0.007). The prevalence was lowest among adolescent girls in households in the highest wealth quintile (19 percent).

d. **Fever in the past two weeks**: There was no significant variation in the prevalence of fever in the past two weeks among adolescent girls across the background characteristics

e. **Malaria in the past two weeks**: There was no significant variation in the prevalence of malaria in the past two weeks among adolescent girls across the background characteristics.

f. **Hospitalization in the past two weeks**: There was no significant variation in the prevalence of hospitalization in the past two weeks among adolescent girls across the background characteristics.

Table 211. Prevalence of self-reported illness and hospitalization/clinic visits in the past two weeks among adolescent girls (aged 10-14 years), Nigeria 2021

Characteristics	Had diarrhea[1] in the past two weeks			Had cough in the past two weeks			Had difficulty breathing in the past two weeks			Had fever in the past two weeks			Had malaria in The past 2 weeks			Had hospitalized/clinic visit due to illness in past 2 weeks		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	982	15.9	[13.1, 19.2]	982	32.2	[28.3, 36.4]	323	33.2	[26.7, 40.3]	982	29.4	[25.7, 33.3]	960	20.0	[16.9, 23.5]	984	6.0	[4.3, 8.4]
Age category	(P = 0.194)			(P = 0.574)			(P = 0.894)			(P = 0.172)			(P = 0.228)			(P = 0.115)		
10 years	263	19.8	[14.3, 26.8]	263	34.5	[26.3, 43.7]	85	36.3	[24.4, 50.1]	263	36.3	[28.6, 44.8]	257	24.8	[19.1, 31.5]	264	5.8	[3.2, 10.2]
11 years	157	12.5	[7.5, 20.2]	157	31.8	[23.6, 41.2]	56	28.8	[17.1, 44.2]	157	31.9	[22.3, 43.4]	154	21.1	[14.1, 30.3]	157	10.1	[4.3, 21.9]
12 years	194	11.2	[7.1, 17.2]	194	27.0	[19.3, 36.4]	60	31.9	[18.8, 48.6]	194	25.4	[18.5, 33.6]	190	20.8	[14.7, 28.6]	194	8.6	[4.3, 16.4]
13 years	192	18.7	[12.2, 27.5]	192	30.6	[22.4, 40.2]	54	29.2	[16.3, 46.7]	193	27.4	[19.8, 36.5]	189	15.6	[10.2, 22.9]	193	2.3	[1.1, 4.7]
14 years	176	15.3	[10.3, 22.1]	176	36.9	[28.4, 46.3]	68	36.5	[23.7, 51.6]	175	23.6	[16.8, 32.2]	170	15.8	[10.1, 23.9]	176	4.2	[1.9, 9.1]
Residence	(P = 0.118)			(P = 0.408)			(P = 0.155)			(P = 0.111)			(P = 0.893)			(P = 0.793)		
Urban	404	13.0	[9.2, 17.9]	403	30.1	[24.5, 36.4]	117	26.8	[17.8, 38.3]	404	25.6	[20.6, 31.4]	397	19.7	[15.2, 25.2]	404	6.3	[3.7, 10.7]
Rural	578	18.0	[14.1, 22.6]	579	33.6	[28.3, 39.4]	206	36.9	[28.6, 46.1]	578	31.9	[26.9, 37.4]	563	20.2	[16.1, 25.0]	580	5.8	[3.7, 8.9]
Wealth quintile	(P = 0.294)			(P = 0.051)			(P = 0.007)**			(P = 0.300)			(P = 0.810)			(P = 0.652)		
Lowest	175	13.8	[9.1, 20.4]	176	28.9	[21.0, 38.4]	56	28.3	[16.4, 44.3]	175	32.3	[23.4, 42.7]	169	19.6	[12.9, 28.6]	176	8.0	[3.8, 16.0]
Second	159	11.2	[6.8, 17.7]	160	28.1	[20.3, 37.5]	52	59.1	[41.8, 74.5]	160	23.1	[16.7, 31.0]	155	18.5	[12.3, 26.9]	160	4.3	[1.8, 9.8]
Middle	185	19.7	[12.9, 28.9]	184	38.0	[28.4, 48.5]	72	32.3	[19.1, 49.1]	184	31.9	[23.4, 41.8]	180	17.9	[12.3, 25.4]	185	7.6	[3.6, 15.3]
Fourth	215	19.5	[13.0, 28.3]	214	41.3	[32.8, 50.4]	75	28.1	[17.2, 42.3]	215	33.6	[25.6, 42.5]	211	23.3	[17.3, 30.6]	215	5.9	[2.7, 12.3]
Highest	244	15.0	[10.0, 22.1]	244	25.4	[19.0, 33.0]	66	19.2	[11.3, 30.9]	244	25.1	[18.7, 32.7]	241	21.2	[15.7, 28.1]	244	4.2	[2.1, 8.4]

The data are based on questions wah1, wah2, wah3, wah5, wah6, and wah7 of the biomarker questionnaire wah1. Have you been ill with diarrhoea in the past two weeks?
wah2. Have you been ill with a cough or breathing problems in the past two weeks? wah3. When you had an illness with a cough, did you breathe faster than usual? wah5. Have you been ill with a fever in the past two weeks?
wah6. Have you been ill with malaria in the past two weeks? wah7. Have you had any hospitalization in the last two weeks?
1Diarrhoea is defined as three or more loose or watery stools in 24 hours.
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval

Self-reported morbidity among women of reproductive age (aged 15- 49 years)

Figure 58 presents the overall prevalence of self-reported illness (cough, fever, malaria, and diarrhoea) and hospitalization/clinic visits in the last two weeks among women of reproductive age (aged 15-49 years). The prevalence of hospitalization/clinic visits was low (8 percent), while that of fever, malaria, cough, and diarrhoea were 37 percent, 27 percent, 23 percent, and 17 percent, respectively.

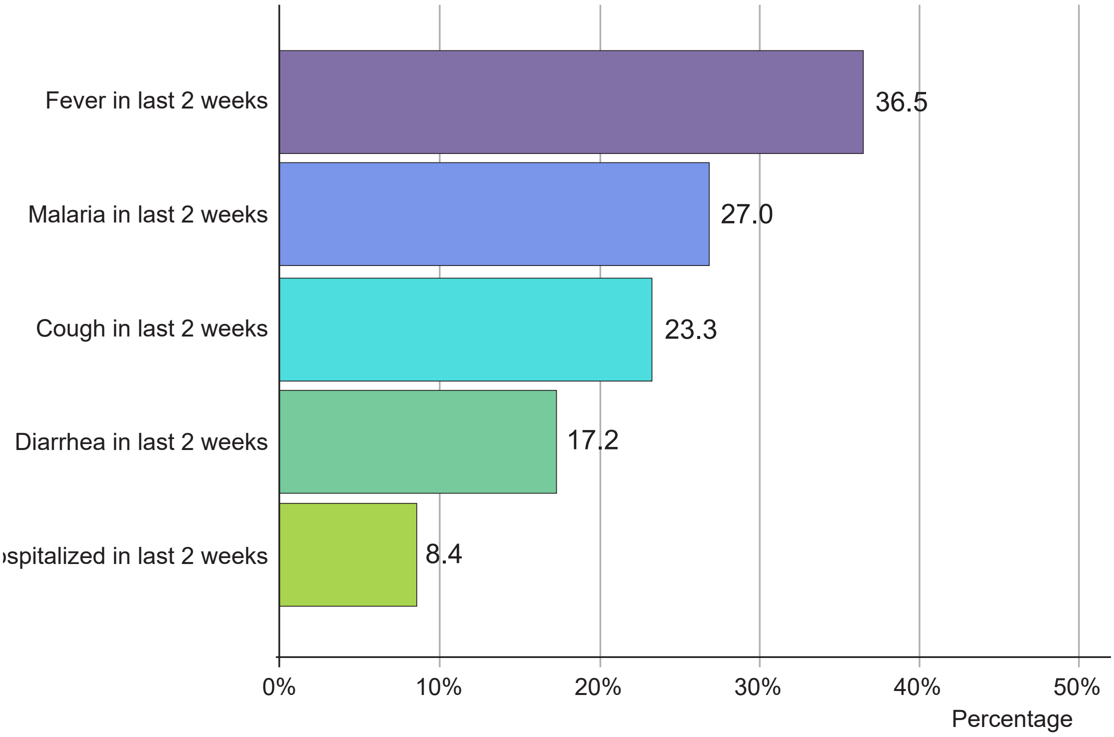


Figure 58. Overall prevalence of self-reported illness and hospitalization/clinic visits in the past two weeks among WRA (aged 15-49 years), Nigeria 2021
Data are weighted to account for survey design and non-response

Table 212 presents the prevalence of self-reported illness (fever, malaria, cough, and diarrhoea) and hospitalization/clinic visits in the past two weeks among women of reproductive age (WRA, aged 15-49 years) stratified by age, residence, zone, wealth quintile, and level of education completed.

- Diarrhoea in the past two weeks: There was a statistically significant difference in the prevalence of diarrhoea in the past two weeks among WRA between zones (P < 0.001). The prevalence of diarrhoea was highest among WRA in the North East zone (24 percent).
- Cough in the past two weeks: There was a statistically significant difference in the prevalence of cough in the past two weeks among WRA between zones (P < 0.001). The prevalence of cough was highest among WRA in the North East zone (31 percent).
- Fever in the past two weeks: There was a statistically significant difference in the prevalence of fever in the past two weeks among WRA between the age category (P < 0.001), residence (P < 0.001), zone (P < 0.001), wealth quintile (P = 0.005), and level of education completed (P
- = 0.003). The prevalence of fever was highest in the 40-49-years age category (41 percent). It was higher among WRA residing in rural (42 percent) versus urban areas (30 percent). It was highest among WRA in the South South zone (49 percent), WRA in households in the lowest wealth quintile (42 percent), and lowest among WRA who had completed post- secondary education (28 percent).

- Malaria in the past two weeks: There was a statistically significant difference in the prevalence of malaria in the past two weeks among WRA between the age category (P< 0.001), residence (P = 0.003), zones (P < 0.001), and level of education completed (P = 0.004). The prevalence of malaria was highest among WRA in the 40-49-years age category (33 percent). It was higher among WRA residing in rural (30 percent) versus urban areas (23 percent). It was highest among WRA in the South South zone (51 percent) and lowest among WRA who had no formal education (24 percent).
- Hospitalization in the past two weeks: There was a statistically significant difference in the prevalence of hospitalization in the past two weeks among WRA between age category (P = 0.030) and zones (P < 0.001). The prevalence of hospitalization was highest among WRA in the 40-49-years age category (11 percent) and WRA in the North East zone (20 percent).

Table 212. Prevalence of self-reported illness and hospitalization/clinic visits in the last two weeks among WRA (aged 15-49 years), Nigeria 2021

Characteristics	Had diarrhea[1] in the past two weeks			Had cough in past two weeks			Had fever in past two weeks			Had malaria in past two weeks			Had any hospitalized/clinic visits due to illness in past 2 weeks		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	5,417	17.2	[15.7, 18.8]	5,417	23.3	[21.5, 25.1]	5,402	36.5	[33.6, 39.4]	5,290	27.0	[25.0, 29.0]	5,428	8.4	[7.2, 9.8]
Age category	(P = 0.481)			(P = 0.222)			(P < 0.001)***			(P < 0.001)***			(P = 0.030)*		
15-19 years	1,162	16.0	[13.4, 19.0]	1,162	25.2	[21.8, 29.0]	1,155	30.0	[25.9, 34.4]	1,139	20.2	[16.8, 24.1]	1,162	5.7	[3.8, 8.6]
20-29 years	1,677	18.5	[16.3, 21.0]	1,680	23.3	[20.9, 25.9]	1,677	36.7	[32.9, 40.6]	1,640	26.5	[23.9, 29.3]	1,684	8.7	[7.0, 10.6]
30-39 years	1,546	17.2	[14.8, 20.0]	1,546	21.1	[18.7, 23.7]	1,540	38.4	[34.7, 42.1]	1,503	28.9	[26.0, 32.0]	1,550	8.8	[7.0, 11.0]
40-49 years	1,032	16.3	[13.4, 19.8]	1,029	24.1	[20.5, 28.1]	1,030	41.2	[37.1, 45.3]	1,008	33.1	[29.2, 37.2]	1,032	10.8	[8.3, 14.0]
Residence	(P = 0.468)			(P = 0.302)			(P < 0.001)***			(P = 0.003)**			(P = 0.873)		
Urban	2,132	16.5	[14.1, 19.2]	2,127	22.1	[19.2, 25.3]	2,127	29.7	[26.2, 33.5]	2,094	22.9	[19.8, 26.4]	2,134	8.6	[6.3, 11.5]
Rural	3,285	17.7	[15.8, 19.8]	3,290	24.2	[21.9, 26.5]	3,275	41.6	[37.6, 45.8]	3,196	30.1	[27.4, 32.9]	3,294	8.3	[7.0, 9.9]
Zone	(P < 0.001)***			(P < 0.001)***			(P < 0.001)***			(P < 0.001)***			(P < 0.001)***		
North Central	891	17.7	[14.9, 21.0]	891	25.5	[21.8, 29.6]	885	43.7	[37.3, 50.3]	847	27.9	[23.3, 33.0]	890	9.2	[6.9, 12.1]
North East	865	24.2	[20.1, 28.7]	867	30.9	[26.3, 35.8]	864	39.9	[34.9, 45.1]	832	24.1	[19.5, 29.4]	868	20.3	[15.9, 25.6]
North West	939	13.0	[10.2, 16.4]	940	17.7	[14.0, 22.0]	938	26.7	[19.8, 34.9]	924	13.9	[10.6, 18.0]	940	4.1	[2.6, 6.4]
South East	893	20.8	[17.3, 24.8]	894	28.7	[25.4, 32.3]	894	42.9	[37.4, 48.5]	891	43.1	[38.6, 47.7]	894	7.2	[5.3, 9.7]
South South	902	18.1	[14.3, 22.6]	898	26.3	[21.3, 31.9]	893	48.9	[42.9, 55.0]	886	50.6	[46.0, 55.3]	907	4.8	[3.2, 7.0]
South West	927	14.4	[11.2, 18.4]	927	18.2	[15.4, 21.3]	928	29.8	[26.0, 33.9]	910	23.9	[20.4, 27.9]	929	6.5	[4.7, 9.0]
Wealth quintile	(P = 0.324)			(P = 0.370)			(P = 0.005)**			(P = 0.210)			(P = 0.152)		
Lowest	962	18.5	[15.0, 22.6]	965	26.1	[22.9, 29.5]	962	41.6	[35.3, 48.1]	936	24.4	[20.7, 28.5]	968	9.3	[7.2, 12.0]
Second	918	15.8	[13.1, 18.9]	920	22.8	[19.2, 26.9]	917	40.8	[35.2, 46.7]	881	29.3	[25.1, 33.8]	919	10.1	[7.4, 13.5]
Middle	1,118	18.3	[15.1, 22.1]	1,118	23.6	[20.3, 27.3]	1,110	35.8	[31.2, 40.7]	1,098	26.7	[22.7, 31.0]	1,120	5.9	[4.2, 8.2]
Fourth	1,220	18.5	[15.6, 21.8]	1,219	22.9	[19.8, 26.3]	1,216	36.0	[31.5, 40.8]	1,196	29.7	[25.6, 34.3]	1,221	8.7	[6.4, 11.8]
Highest	1,179	14.9	[12.2, 18.0]	1,175	21.2	[18.0, 24.8]	1,177	29.2	[25.3, 33.5]	1,159	24.6	[20.8, 28.9]	1,180	8.6	[6.5, 11.2]
Highest schooling completed	(P = 0.406)			(P = 0.221)			(P = 0.003)**			(P = 0.004)**			(P = 0.301)		
None	1,076	18.7	[15.7, 22.2]	1,079	23.3	[20.1, 26.8]	1,073	39.7	[34.9, 44.8]	1,039	24.4	[20.9, 28.2]	1,080	9.0	[6.7, 12.0]
Primary	882	16.4	[13.4, 19.9]	880	22.8	[19.0, 27.0]	875	42.4	[38.1, 46.8]	862	34.3	[29.8, 39.0]	883	8.1	[6.1, 10.5]
Secondary	2,861	16.4	[14.4, 18.6]	2,865	24.3	[22.0, 26.9]	2,857	34.6	[31.5, 37.8]	2,804	26.3	[23.8, 28.9]	2,867	7.9	[6.3, 9.8]
Post-secondary	457	18.7	[14.7, 23.4]	452	17.9	[13.6, 23.2]	456	28.2	[22.7, 34.5]	445	27.6	[22.7, 33.1]	457	11.9	[8.4, 16.7]
Missing/don't know	10	0.0		10	15.0	[3.6, 45.1]	10	39.7	[12.3, 75.5]	10	0.0		10	0.0	

The data are based on questions wah1, wah2, wah3, wah5, wah6, and wah7 of the biomarker questionnaire wah1. Have you been ill with diarrhoea in the past two weeks?
wah2. Have you been ill with a cough or breathing problems in the past two weeks? wah3. When you had an illness with a cough, did you breathe faster than usual? wah5. Have you been ill with a fever in the past two weeks?
wah6. Have you been ill with malaria in the past two weeks? wah7. Have you had any hospitalization in the last two weeks?
1Diarrhoea is defined as three or more loose or watery stools in 24 hours.
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Self-reported morbidity among pregnant women (aged 15-49 years)

Figure 59 presents the overall prevalence of self-reported illness (fever, malaria, diarrhoea, and cough) and hospitalization/clinic visits in the past two weeks among pregnant women (aged 15-49 years). Nationally, the prevalence of fever, malaria, cough and diarrhoea in the past two weeks among pregnant women was 40, 31, 20, and 20 percent, respectively. The prevalence of hospitalization in the past two weeks among pregnant women was 19 percent.

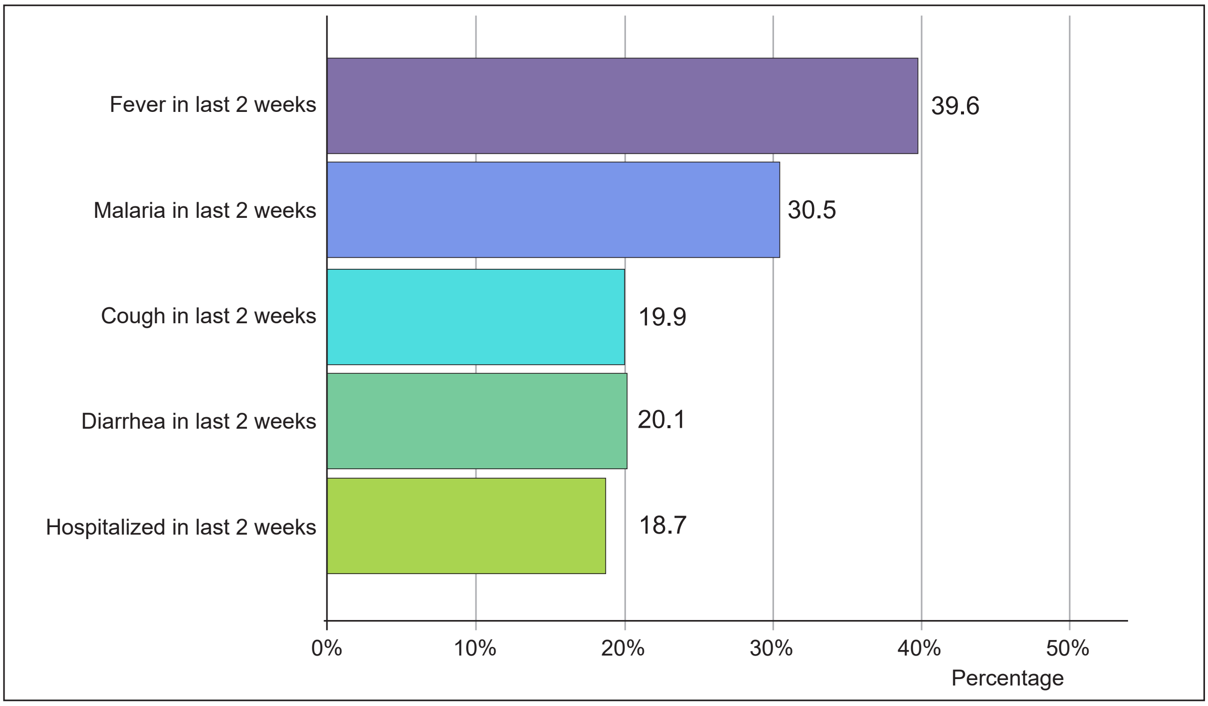


Figure 59. Overall prevalence of self-reported illness (fever, malaria, diarrhoea, and cough) and hospitalization/clinic visits in the last two weeks among pregnant women, Nigeria 2021
Data are weighted to account for survey design and non-response

Table 213 presents the prevalence of self-reported illness (fever, malaria, diarrhoea, and cough) and hospitalization/clinic visits in the past two weeks among pregnant women (aged 15-49 years) stratified by age, residence, wealth quintile, and level of education completed.

a. **Diarrhoea in the past two weeks**: There was no significant variation in the prevalence of diarrhoea in the past two weeks among pregnant women across the background characteristics.

b. **Cough in the past two weeks**: There was no significant variation in the prevalence of cough in the past two weeks among pregnant women across the background characteristics.

c. **Fever in the past two weeks**: There was a statistically significant difference in the prevalence of fever in the past two weeks among pregnant women between residence ($P = 0.027$) and wealth quintile ($P < 0.001$). The prevalence of fever was higher among pregnant women residing in rural (43 percent) versus urban areas (33 percent). It was highest among pregnant women in households in the middle wealth quintile (58 percent).

d. **Malaria in the past two weeks**: There was no significant variation in the prevalence of malaria in the past two weeks among pregnant women across the background characteristics.

e. **Hospitalization in the past two weeks**: There was no significant variation in the prevalence of hospitalization in the past two weeks among pregnant women across the background characteristics.

Table 213. Prevalence of self-reported illness and hospitalization/clinic visits in the last two weeks among pregnant women (aged 15-49 years), Nigeria 2021

Characteristics	Had diarrhea[1] in the past two weeks			Had cough in the past two weeks			**Had fever in** the past two weeks			Had malaria in the past two weeks			Had any hospitalization/clinic visit due to illness in the past two weeks		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	802	20.1	[16.9, 23.7]	802	19.9	[16.5, 23.8]	799	39.6	[34.6, 44.8]	779	30.5	[25.9, 35.6]	803	18.7	[15.5, 22.3]
Age category	(P = 0.859)			(P = 0.588)			(P = 0.551)			(P = 0.395)			(P = 0.598)		
15-19 years	71	23.3	[12.5, 39.4]	71	18.2	[9.8, 31.4]	71	29.0	[16.5, 45.7]	70	21.4	[11.0, 37.5]	71	15.2	[7.3, 29.0]
20-29 years	431	19.0	[14.4, 24.6]	430	22.1	[17.5, 27.6]	429	39.6	[32.6, 46.9]	417	29.9	[23.7, 36.9]	431	20.6	[16.3, 25.6]
30-39 years	261	20.0	[14.6, 26.7]	262	17.0	[12.0, 23.6]	260	42.1	[34.1, 50.5]	256	35.2	[27.4, 43.9]	262	17.7	[12.8, 23.9]
40-49 years	39	26.2	[8.0, 59.3]	39	17.5	[6.7, 38.3]	39	44.6	[22.3, 69.3]	36	24.4	[9.3, 50.5]	39	11.3	[2.9, 34.8]
Residence	(P = 0.134)			(P = 0.994)			(P = 0.027)*			(P = 0.309)			(P = 0.395)		
Urban	325	16.7	[12.6, 21.9]	324	19.9	[14.8, 26.1]	323	32.9	[27.6, 38.6]	314	27.4	[21.4, 34.2]	325	20.8	[15.3, 27.5]
Rural	477	21.8	[17.6, 26.6]	478	19.9	[15.5, 25.1]	476	43.0	[36.1, 50.2]	465	32.2	[26.0, 38.9]	478	17.6	[13.8, 22.1]
Wealth quintile	(P = 0.541)			(P = 0.360)			(P < 0.001)***			(P = 0.103)			(P = 0.067)		
Lowest	159	21.7	[13.7, 32.5]	160	18.4	[11.6, 27.9]	159	43.2	[33.9, 53.1]	157	38.8	[28.3, 50.4]	160	20.3	[14.2, 28.2]
Second	139	23.2	[16.1, 32.4]	139	18.3	[12.1, 26.6]	139	31.4	[21.3, 43.5]	136	24.9	[16.5, 35.8]	139	10.0	[5.8, 16.7]
Middle	147	21.9	[13.3, 33.9]	146	25.9	[17.8, 36.0]	145	58.2	[45.7, 69.8]	142	36.4	[25.8, 48.6]	147	19.1	[12.3, 28.4]
Fourth	179	17.7	[11.7, 25.9]	179	22.5	[14.9, 32.4]	178	37.2	[29.7, 45.5]	169	24.3	[16.8, 33.8]	179	22.7	[15.2, 32.4]
Highest	176	13.4	[9.0, 19.5]	176	14.1	[9.1, 21.3]	176	24.9	[18.4, 32.7]	173	26.2	[19.4, 34.4]	176	24.4	[16.7, 34.2]
Level of education completed by caregiver	(P = 0.054)			(P = 0.374)			(P = 0.400)			(P = 0.981)			(P = 0.287)		
None	165	25.5	[18.8, 33.6]	166	22.2	[14.7, 32.0]	165	40.9	[30.8, 51.9]	161	31.3	[22.7, 41.3]	166	23.8	[16.8, 32.5]
Primary	123	27.4	[19.5, 37.0]	122	27.4	[19.6, 36.8]	122	36.9	[27.5, 47.3]	117	28.9	[21.0, 38.4]	123	15.1	[8.8, 24.5]
Secondary	420	16.6	[12.5, 21.7]	420	18.6	[14.4, 23.7]	419	42.9	[36.0, 50.1]	410	31.6	[24.9, 39.1]	420	16.7	[12.4, 22.0]
Post-secondary	70	10.7	[4.8, 22.2]	70	13.3	[6.4, 25.5]	69	23.6	[13.5, 38.0]	67	31.1	[21.0, 43.3]	70	24.0	[15.3, 35.7]
Missing/don't know	2	0.0		2	0.0		2	42.2	[4.3, 92.2]	2	42.2	[4.3, 92.2]	2	0.0	

The data are based on questions wah1, wah2, wah5, wah6, and wah7 of the biomarker questionnaire wah1. Have you been ill with diarrhoea in the past two weeks?
wah2. Have you been ill with a cough or breathing problems in the past two weeks? wah5. Have you been ill with a fever in the past two weeks?
wah6. Have you been ill with malaria in the past two weeks? wah7. Have you had any hospitalization in the last two weeks?
1Diarrhoea is defined as three or more loose or watery stools in a 24-hour period Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Self-reported anaemia risk factors [26]

Self-reported anaemia risk factors in children (aged 6-59 months), adolescent girls (aged 10-14 years old), women of reproductive age (aged 15-49 years old), and pregnant women (aged 15-49 years old) are discussed in this chapter. [27] The survey results presented are based on the biomarker questionnaire[28] which was administered to the survey respondents (caregivers in the case of children) and focused on the prevalence of pica in children, adolescent girls, and Women of Reproductive Age (WRA); smoking in adolescent girls, WRA, and pregnant women; and past anaemia diagnoses in adolescent girls and WRA as anaemia risk factors.

Pica is the compulsive consumption of non-nutritive substances, like clay, dirt, or chalk. It is often associated with iron deficiency anaemia, possibly as a result of the body's attempt to compensate for the lack of essential nutrients. Particularly vulnerable are pregnant women, children, and adolescents, who have higher nutritional demands.

Smoking is well known to be harmful to health in many ways, including through its contribution to anaemia. It can cause a decrease in appetite, leading to poor nutrition, and it may also interfere with the absorption of nutrients. Furthermore, smoking increases levels of carbon monoxide in the blood, which reduces the blood's oxygen-carrying capacity, mimicking the effects of anaemia.

A previous diagnosis of anaemia might indicate ongoing health issues or lifestyle factors that could contribute to recurrent anaemia. For instance, chronic diseases, genetic conditions like sickle cell anaemia, malnutrition, or menstrual or pregnancy-related blood loss could all lead to repeated bouts of anaemia.

Box 14. Key Findings on Self-reported Anaemia Risk Factors

Self-reported anaemia risk factors in children (aged 6-59 months), adolescent girls (aged 10-14 years old), women of reproductive age (aged 15-49 years old).

Pica, children aged 6-59 months: Overall, taking pica was reported among 20 percent of the children 6-59 months seven days prior to the survey and differs by age ($P < 0.001$) and zones ($P = 0.006$).

Pica, smoking, and previous diagnosis of anaemia in adolescent girls 10-14 years: *Nationally,* 8 percent of adolescent girls (aged 10-14 years) reported taking pica seven days prior to the survey, the prevalence of self-reported smoking is only 0.3 percent, and 4 percent reported diagnosed with anaemia in the past six months. There was no significant variation in the prevalence of pica, smoking, and anaeama among adolescent girls across the background characteristics.

Pica, smoking, and previous diagnosis of anaemia in women of reproductive age: *Nationally,* 5 percent of women of reproductive age reported taking pica seven days prior to the survey, the prevalence of self-reported smoking is only 0.5 percent, and 6 percent reported diagnosed with anaemia in the past six months. There was significant variation in the prevalence of pica by zones (14 percent in South East and 1.3 percent in South West), smoking by residence (0.9 percent rural and 0.1 percent in urban areas), and anaemia by zones (8 percent in South South and 4 percent in South West).

26 The premise of the NFCMS aligns with the UNICEF conceptual framework of determinants of undernutrition (2013*). Individual nutritional status measured by indicators such as those of anthropometry and micronutrient biomarkers is determined by two immediate factors - high quality diets and optimal health. Three underlying factors influence these: access to sufficient, safe, and nutritious food; adequate care practices for especially women and children; and access to health services including healthy environments, water, and sanitation. Finally, at a basic level, political, economic, and institutional determinants underpin all of these factors.

* UNICEF (United Nations Children's Fund). 2013. Improving Child Nutrition: The Achievable Imperative for Global Progress. New York: UNICEF.

For scope of final report for the biomarker component, see Annex 5

See Annex 4 for questionnaire (Q): Q1. Children (aged 6-59 months); Q2. Adolescent girls (aged 10-14 years) and Women of reproductive age (aged 15-49 years); Q3. Pregnant women (aged 15-49 years)

Anaemia risk factors among children (aged 6-59 months)

Table 214 presents the prevalence of pica in the past seven days among children (aged 6-59 months) stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver. There was a statistically significant difference in the prevalence of pica in the past seven days among children (aged 6-59 months) between the age category (P < 0.001) and zones (P = 0.006). The percentage of children (aged 6-59 months) with pica was highest among the 6-11-months age category (38 percent). It was lowest among children in the North West zone (14 percent).

Table 214. Prevalence of pica among children (aged 6-59 months), Nigeria 2021

Characteristics	Pica in last 7 days		
	N	%	[95/% CI]
National	4,764	20.1	[17.8, 22.6]
Age category	(P < 0.001)***		
6-11 months	525	37.7	[31.2, 44.6]
12-23 months	1,106	29.7	[25.8, 33.9]
24-35 months	1,215	19.0	[14.8, 24.1]
36-47 months	1,129	10.9	[8.8, 13.3]
48-59 months	789	9.2	[6.9, 12.1]
Sex	(P = 0.907)		
Male	2,387	20.2	[17.4, 23.3]
Female	2,377	20.0	[17.5, 22.8]
Residence	(P = 0.382)		
Urban	1,940	18.6	[15.2, 22.7]
Rural	2,824	20.9	[17.9, 24.2]
Zone	(P = 0.006)**		
North Central	733	23.8	[17.7, 31.2]
North East	790	22.2	[17.0, 28.6]
North West	903	14.1	[10.0, 19.4]
South East	695	31.6	[26.2, 37.5]
South South	792	24.9	[16.8, 35.3]
South West	851	19.4	[15.5, 24.0]
Wealth quintile	(P = 0.803)		
Lowest	869	19.6	[15.8, 24.0]
Second	831	21.3	[16.3, 27.2]
Middle	890	19.2	[15.7, 23.2]
Fourth	1,098	21.5	[18.1, 25.2]
Highest	1,060	18.4	[13.7, 24.2]
Level of education completed by caregiver	(P = 0.842)		
None	1,085	19.9	[16.1, 24.2]
Primary	762	22.3	[17.0, 28.7]
Secondary	2,320	20.3	[17.4, 23.5]
Post-secondary	427	18.1	[13.6, 23.7]
Missing/don't know	8	23.9	[5.2, 64.3]

The data are based on question chs10 of the biomarker questionnaire
chs10. In the last seven days, has [name of child] eaten earth, clay, mud, or soil from any source (e.g., walls of mud houses, the yard, purchased at market)?
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001)

Anaemia risk factors among adolescent girls (aged 10-14 years)

Figure 60 presents the overall prevalence of anaemia risk factors - pica, smoking, and previous diagnosis of anaemia by a healthcare provider - among adolescent girls. Nationally, the prevalence of self-reported smoking among adolescent girls was low (0.3 percent). The prevalence of pica in the past seven days and anaemia diagnosis in the past six months among adolescent girls were 8 percent and 4 percent, respectively.

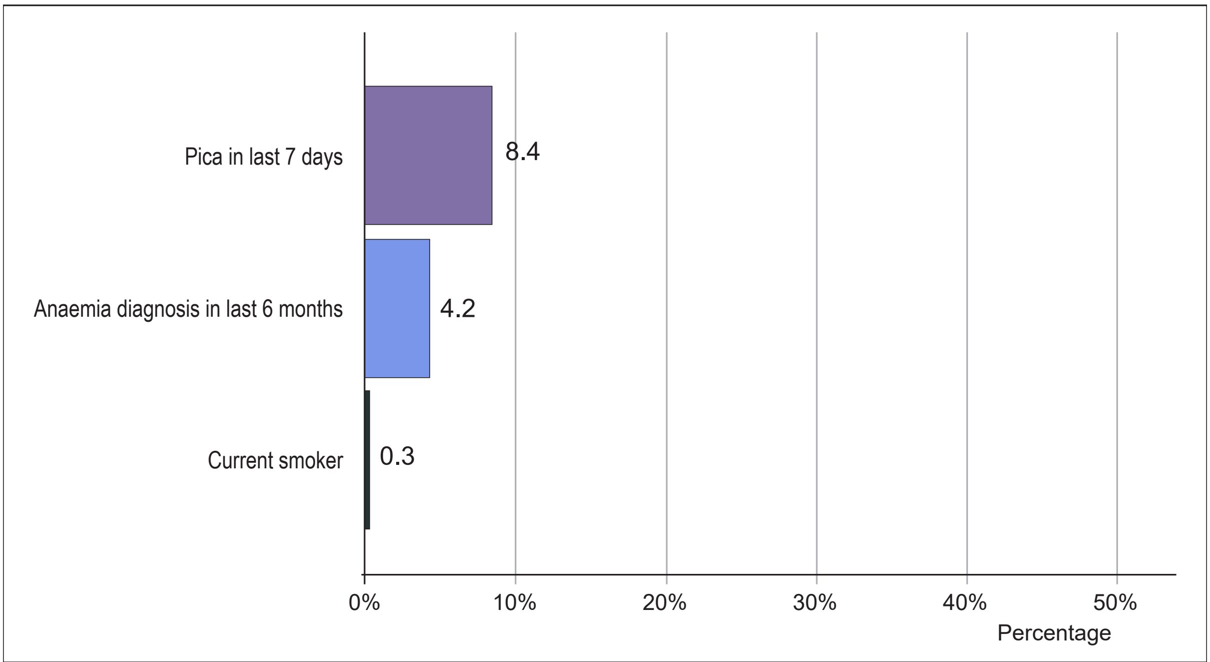


Figure 60. Prevalence of anaemia risk factors (pica, smoking and diagnosis of anaemia in the past six months) among adolescent girls (aged 10-14 years), Nigeria 2021
Data are weighted to account for survey design and non-response

Table 215 presents the prevalence of anaemia risk factors (pica and smoking) and diagnosis of anaemia in the past six months among adolescent girls stratified by age, residence, and wealth quintile.

a. **Pica**: There was no significant variation in the prevalence of pica in the past seven days among adolescent girls across the background characteristics.

b. **Smoking**: There was no significant variation in the prevalence of smoking among adolescent girls across the background characteristics.

c. **Diagnosis of anaemia by a healthcare provider in the past six months**: There was no significant variation across the background characteristics.

Table 215. Prevalence of pica, smoking, and diagnosis of anaemia in the past six months among adolescent girls (aged 10-14 years), Nigeria 2021

Characteristics	Ate earth, clay, mud, or soil from any source (e.g., walls of mud houses, the yard, purchased at the market) in the last seven days			Smoke tobacco (excluding powder or chew type)			Diagnosed with anaemia (by a healthcare provider) in the past six months		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	984	8.4	[6.0, 11.6]	984	0.3	[0.1, 0.7]	975	4.2	[2.6, 6.6]
Age category	(P = 0.712)			(P = 0.763)			(P = 0.756)		
10 years	264	7.9	[4.3, 13.9]	264	0.4	[0.1, 2.6]	261	5.3	[2.7, 9.9]
11 years	157	8.2	[3.6, 17.5]	157	0.0		154	2.6	[0.9, 7.2]
12 years	194	5.9	[2.8, 11.7]	194	0.5	[0.1, 2.0]	194	3.0	[1.1, 7.5]
13 years	193	10.3	[5.4, 18.6]	193	0.3	[0.0, 1.8]	193	4.2	[1.3, 12.9]
14 years	176	10.3	[6.1, 17.0]	176	0.0		173	5.1	[2.2, 11.8]
Residence	(P = 0.847)			(P = 0.279)			(P = 0.461)		
Urban	404	8.1	[4.5, 14.1]	404	0.1	[0.0, 0.8]	402	5.0	[2.3, 10.6]
Rural	580	8.6	[5.8, 12.7]	580	0.4	[0.1, 1.2]	573	3.6	[2.1, 5.9]
Wealth quintile	(P = 0.782)			(P = 0.484)			(P = 0.517)		
Lowest	176	8.0	[4.3, 14.5]	176	0.3	[0.0, 1.8]	173	2.5	[1.1, 5.4]
Second	160	6.6	[3.4, 12.3]	160	0.8	[0.2, 3.4]	160	4.8	[2.1, 10.8]
Middle	185	8.3	[4.5, 14.8]	185	0.0		183	6.1	[2.9, 12.3]
Fourth	215	7.5	[4.0, 13.6]	215	0.2	[0.0, 1.6]	213	3.6	[1.6, 8.0]
Highest	244	10.5	[6.4, 16.9]	244	0.0		242	3.9	[1.7, 8.6]

The data are based on questions wtt1, wah8, and wrf1 of the biomarker questionnaire wtt1. In the last seven days, have you eaten earth/clay/mud/soil from any source? wah8. Do you smoke? (Do not include the powder and chew type)
wrf1. Have you been diagnosed with anaemia in the past six months? Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Anaemia risk factors among women of reproductive age (aged 15-49 years)

Figure 61 presents the overall prevalence of anaemia risk factors - pica, smoking, and previous diagnosis of anaemia by a healthcare provider - among Women of Reproductive Age (WRA, aged 15-49 years). Nationally, the prevalence of smoking among WRA was low (0.5 percent). The prevalence of pica in the last seven days and anaemia diagnosis in the past six months among WRA were 5 and 6 percent, respectively.

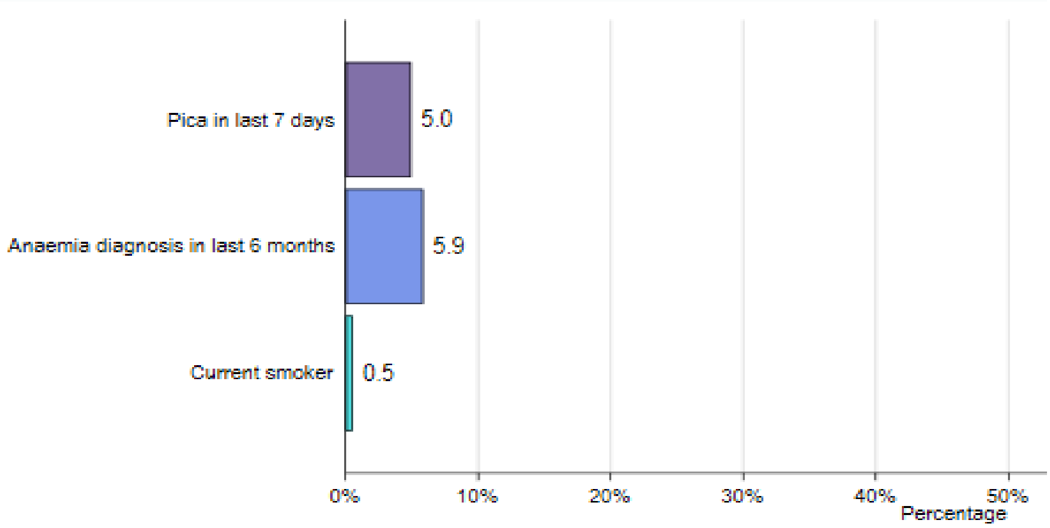


Figure 61. Prevalence of anaemia risk (pica and smoking) and diagnosis of anaemia in the past six months among WRA (aged 15-49 years), Nigeria 2021
Data are weighted to account for survey design and non-response
Number of women of reproductive who responded nationally: (n= 5238)

Table 216 presents the prevalence of anaemia risk factors (pica, smoking and previous diagnosis of anaemia) among Women of Reproductive Age (WRA, aged 15-49 years) stratified by age, residence, zone, wealth quintile, and level of education completed.

a. **Pica in the past seven days**: There was a statistically significant difference in the prevalence of pica in the past seven days among WRA between the zones (P < 0.001). The prevalence of pica in the past seven days was highest among WRA living in the South East zone (14 percent).

b. **Smoking**: There was a statistically significant difference in the prevalence of smoking among WRA between residence (P = 0.001). The percentage of smokers was higher among respondents residing in rural (0.9 percent) versus urban areas (0.1 percent).

c. **Diagnosis of anaemia by a healthcare provider in the last six months**: There was a statistically significant difference in the prevalence of diagnosis of anaemia by a healthcare provider in the past six months between the zones (P = 0.038). The percentage of WRA diagnosed with anaemia by a healthcare provider in the past six months was lowest among WRA in the South West zone (4 percent).

Table 216. Prevalence of pica, smoking, and diagnosis of anaemia in the past six months among WRA (15-49 years), Nigeria 2021

Characteristics	Ate earth, clay, mud, or soil from any source (e.g., walls of mud houses, the yard, purchased at the market) in the past 7 days			Smoked tobacco (excluding powder or chew type)			Diagnosed with anaemia by a healthcare provider in the past six months		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	5,342	5.0	[4.2, 5.9]	5,430	0.5	[0.3, 1.0]	5,295	5.9	[5.1, 6.8]
Age category	(P = 0.067)			(P = 0.706)			(P = 0.085)		
15-19 years	1,153	6.3	[4.7, 8.5]	1,163	0.7	[0.3, 2.1]	1,146	4.6	[3.3, 6.4]
20-29 years	1,649	5.4	[3.8, 7.4]	1,685	0.6	[0.3, 1.1]	1,631	5.2	[4.0, 6.6]
30-39 years	1,515	4.6	[3.4, 6.0]	1,550	0.4	[0.2, 0.9]	1,501	7.0	[5.5, 8.9]
40-49 years	1,025	3.2	[2.2, 4.6]	1,032	0.5	[0.2, 1.5]	1,017	6.9	[5.1, 9.3]
Residence	(P = 0.215)			(P = 0.001)**			(P = 0.559)		
Urban	2,094	4.3	[3.2, 5.7]	2,134	0.1	[0.1, 0.4]	2,087	5.6	[4.3, 7.1]
Rural	3,248	5.5	[4.3, 6.9]	3,296	0.9	[0.4, 1.6]	3,208	6.1	[5.1, 7.3]
Zone	(P < 0.001)***			(P = 0.599)			(P = 0.038)*		
North Central	871	4.2	[2.7, 6.5]	891	0.9	[0.3, 2.6]	865	6.1	[4.5, 8.0]
North East	862	6.5	[4.9, 8.7]	869	0.3	[0.1, 1.3]	837	7.6	[5.4, 10.5]
North West	939	5.8	[3.9, 8.4]	940	0.7	[0.2, 2.5]	933	4.9	[3.5, 6.9]
South East	883	14.3	[10.7, 18.8]	894	0.2	[0.0, 0.9]	883	4.9	[3.4, 7.0]
South South	880	1.6	[0.8, 3.0]	907	0.4	[0.2, 1.2]	872	8.0	[5.8, 10.9]
South West	907	1.3	[0.6, 2.7]	929	0.4	[0.1, 1.2]	905	4.3	[3.0, 6.0]
Wealth quintile	(P = 0.557)			(P = 0.608)			(P = 0.127)		
Lowest	959	4.0	[2.7, 5.9]	968	0.7	[0.3, 1.9]	938	7.8	[6.1, 10.0]
Second	907	6.0	[3.9, 9.1]	920	0.8	[0.3, 2.2]	897	6.3	[4.6, 8.7]
Middle	1,096	4.5	[3.3, 6.2]	1,121	0.4	[0.2, 1.1]	1,086	5.2	[3.6, 7.3]
Fourth	1,197	5.0	[3.6, 7.0]	1,221	0.3	[0.1, 0.8]	1,193	4.8	[3.6, 6.5]
Highest	1,163	5.3	[3.9, 7.1]	1,180	0.7	[0.2, 2.0]	1,161	5.5	[4.1, 7.3]
Level of education completed	(P = 0.621)			(P = 0.788)			(P = 0.147)		
None	1,066	5.1	[3.7, 7.1]	1,080	0.7	[0.2, 1.9]	1,040	7.5	[5.4, 10.2]
Primary	864	4.6	[3.2, 6.4]	883	0.5	[0.2, 1.5]	859	5.4	[3.7, 7.7]
Secondary	2,826	4.6	[3.7, 5.8]	2,869	0.6	[0.3, 1.2]	2,814	5.3	[4.3, 6.5]
Post-secondary	446	6.6	[4.1, 10.4]	457	0.1	[0.0, 0.7]	444	6.5	[4.2, 10.0]
Missing/don't know	10	6.1	[0.7, 35.5]	10	0.0		10	17.6	[4.7, 47.9]

The data are based on questions wtt1, wah8, and wrf1 of the biomarker questionnaire wtt1. In the last seven days, have you eaten earth/clay/mud/soil from any source? wah8. Do you smoke? (do not include the powder and chew type)
wrf1. Have you been diagnosed with anaemia in the past six months? Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Anaemia risk factors among pregnant women (15-49 years old)

Nationally, smoking prevalence among pregnant women (aged 15-49 years) was 0.4 percent. **Table 217** presents the prevalence of smoking among pregnant women (aged 15-49 years) stratified by age, residence, wealth quintile, and level of education completed. There was no significant variation in the prevalence of smoking among the respondents across the background characteristics.

Table 217. Prevalence of smoking among pregnant women, Nigeria 2021

Characteristics	Smoked tobacco (excluding powder or chew type)		
	N	%	[95/% CI]
National	803	0.4	[0.2, 1.1]
Age category	(P = 0.303)		
15-19 years	71	0.0	
20-29 years	431	0.4	[0.1, 1.4]
30-39 years	262	0.4	[0.1, 2.0]
40-49 years	39	2.1	[0.3, 14.1]
Residence	(P = 0.353)		
Urban	325	0.7	[0.2, 2.3]
Rural	478	0.3	[0.1, 1.2]
Wealth quintile	(P = 0.624)		
Lowest	160	0.4	[0.1, 3.0]
Second	139	0.4	[0.1, 3.1]
Middle	147	1.0	[0.2, 4.0]
Fourth	179	0.2	[0.0, 1.7]
Highest	176	0.0	
Highest schooling completed	(P = 0.960)		
None	166	0.4	[0.1, 1.6]
Primary	123	0.8	[0.1, 5.3]
Secondary	420	0.5	[0.1, 1.9]
Post-secondary	70	0.0	
Missing/don't know	2	0.0	

The data are based on question wah8 of the biomarker questionnaire wah8. Do you smoke? (Do not include the powder and chew type) Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies *P* <0.05, ** signifies *P* <0.01, *** signifies *P*<0.001).

Malaria, Helicobacter pylori (H. pylori), helminths, elevated plasma glucose, and elevated glycated haemoglobin (Hba1c)

The prevalence of malaria, Helicobacter pylori (H. pylori), helminths, elevated plasma glucose, and elevated glycated haemoglobin (HbA1c) in the target population is presented in this chapter.

Box 15. Key Findings on Malaria, Helicobacter Pylori (H. pylori), Helminths, Elevated Plasma Glucose, and Elevated Glycated Haemoglobin (Hba1c)

Malaria

Children 6-59 months: Nationally, the prevalence of malaria among children is 24 percent. Significant differences were observed among children by age (30 percent among 48-59 months and 15 among 6-11 months), residence (31 percent in rural and 11 percent in urban), wealth (33 percent among poor and 8 percent among rich), and level of education completed by caregiver (29 percent among those with no education and 7 percent among those with post-secondary).

Adolescent girls 10-14 years: Overall, 34 percent of adolescent girls had malaria, and was different by residence (45 percent in rural and 17 percent in urban areas) and wealth (53 percent among poor and 9 percent among rich).

Women of reproductive age: Only 13 percent women of reproductive age had malaria and differed by age (21 percent among 15-19 years and 8 percent among 40-49 years), residence (17 percent in rural and 7 percent in urban), wealth (19 percent among poor and 5 percent among rich), and level of education completed 14 percent among those with no education and 5 percent among those with post-secondary).

Pregnant women: 14 percent of pregnant women had malaria. Differences were observed for age (38 percent among 15-19 years and 8 percent among 30-39 years), residence (18 percent in rural and 7 percent in urban areas), and wealth (23 percent among poor and 4 percent among rich).

H. pylori

Children 6-59 months: Overall, H. pylori was prevalent among 36 percent of children, Significant difference were observed among children by age (42 percent among 48-59 months and 32 percent among 6-11 months), sex (38 percent among males and 34 percent among females), and zones (52 percent in South East and 36 percent in South West).

Adolescent girls 10-14 years: 55 percent among adolescent girls nationally and significantly different by age (43 percent among 11 years and 66 percent among 12 years).

Women of reproductive age: 64 percent prevalence among women of reproductive age nationally and differed by age (67 percent in 40-49 years and 62 percent in 15-19 years), residence (68 percent in rural and 59 percent in urban areas), zones (76 percent in South East and 54 percent in North West) and level of education completed (69 percent among those who completed primary and 64 percent in those with none).

Pregnant women: 59 percent prevalence among pregnant women nationally and differed by wealth (71 percent among middle wealth quintile and 51 percent among rich).

Helminths

Children 6-59 months: Helminth prevalence was 14 percent among children, A significant difference was observed among children by residence (16 percent in rural and 9 percent in urban areas), zones (24 percent in North Central and 0.4 percent in South East), wealth (21 percent among poor and 9 percent among rich), and level of education completed by caregiver (20 percent among those with no education and 9 percent among those with secondary).

Women of reproductive age: Helminth prevalence was 7 percent among women of reproductive age and differed by residence (8 percent rural and 5 percent in urban areas), zones (15 percent in North East and 2 percent in South East), wealth (12 percent among poor and 3 percent among rich), and level of education completed (11 percent among those with no education and 4 percent among those with post-secondary) among women of reproductive age.

Pregnant women: Overall, there was a 5 percent prevalence of helminth among pregnant women. There was no significant variation in the prevalence of helminth among pregnant women (aged 15-49 years) across the background characteristics.

Elevated plasma glucose (plasma glucose > 200 mmol/L or mg/dL) in women of reproductive age: The national prevalence of elevated plasma glucose among women of reproductive age (aged 15-49 years) was 0.7 percent. There was no significant variation in the prevalence of elevated plasma glucose across the background characteristics.

Elevated HbA1c (glycated haemoglobin > 5.6%) in women of reproductive age: The national prevalence of elevated HbA1c among women of reproductive age was 16 percent. Differences were observed for age (22 percent among 40-49 years and 13 percent among 20-29 years), residence (21 percent in urban and 13 percent in rural areas), wealth (21 percent among rich and 9 percent among poor), and anthropometry status (34 percent among obese and 13 percent among thin).

In addition to self-reported morbidity assessed using the biomarker questionnaire administered to all target groups, malaria, plasma glucose, Helicobacter pylori (H. pylori), helminth, and glycated haemoglobin (HbA1c) were assessed from biological samples for specific target groups (Table **218.** All sample collection started early in the morning and was completed before midday.

Table 218. Blood analysis done in the field and laboratory for respective respondents

Respondent	Malaria	Plasma glucose	H. pylori	Helminths	HbA1c	Haemoglobin genotype
Children (aged 6-59 months)	Yes	No	Yes	Yes	No	Yes
Adolescents (aged 10-14 years)	Yes	No	Yes	No	No	No
WRA (aged 15-49 years old)	Yes	Yes	Yes	Yes	Yes	Yes
Pregnant women (aged 15-49 years)	Yes	No	Yes	Yes	No	No

Malaria, H. pylori, and helminth: The field tests for malaria, H. pylori, and helminth provided dichotomous results (positive or negative/ sighted or not sighted for microscopy). *Plasmodium falciparum* malaria parasitemia in the venous blood sample was detected using a rapid diagnostic test kit (RDT). The presence of IgG antibodies specific to *Helicobacter pylori* (H. pylori) in the blood sample was detected using a rapid qualitative immune assay test RDT. For soil-transmitted helminths, the presence of helminth eggs in stool samples was detected using microscopy.

Plasma glucose: Plasma glucose measures the amount of glucose (sugar) currently in the blood system. Whole blood glucose concentration was measured using a HemoCue (Hb-201) instrument, and the results were converted to equivalent plasma values using a constant factor of 1.11 (Kuwa et al., 2001). Random plasma glucose tests were done between early morning and midday. As reported in the results, elevated plasma glucose is defined as plasma glucose > 200 mmol/L or mg/dL.

Plasma equivalent glucose (mmol/L or mg/dL) = Whole blood glucose (mmol/L or mg/dL) x 1.11.

HbA1c: Glycated haemoglobin is a form of haemoglobin chemically linked to sugar. Most monosaccharides, including glucose, spontaneously bond with haemoglobin when present in humans' bloodstream. The test is often called A1c or HbA1c. HbA1c reflects the average blood glucose (sugar) level for the last two to three months. Haemoglobin A1c was tested in blood samples using a Bio-Rad D10 auto-analyzer in a laboratory setting. Elevated HbA1c, as reported in the results, is defined as the amount of glucose attached to haemoglobin > 5.6 percent.

Figure 62 presents the prevalence at the national level of malaria, H. pylori, helminths, elevated plasma glucose, and elevated HbA1c as assessed in the target population.

a. **Malaria**: The national prevalence of malaria among children (aged 6-59 months), adolescent girls (aged 10-14 years), women of reproductive age (aged 15-49 years), and pregnant women (aged 15-49 years) was 24, 34, 13, and 14 percent, respectively.

b. **H. pylori**: The national prevalence of H. pylori among children (aged 6-59 months), adolescent girls (aged 10-14 years), women of reproductive age (aged 15-49 years), and pregnant women (aged 15-49 years) was 36, 55, 64, and 59 percent, respectively.

c. **Helminths:** The national prevalence of helminth among children (aged 6-59 months), women of reproductive age (aged 15-49 years), and pregnant women (aged 15-49 years) was 14, 7, and 5 percent, respectively.

d. **Elevated plasma glucose** (plasma glucose > 200 mmol/L or mg/dL): The national prevalence of elevated plasma glucose among women of reproductive age (aged 15-49 years) was 0.7 percent.

e. **Elevated HbA1c (**glycated haemoglobin > 5.6%): The national prevalence of elevated HbA1c among women of reproductive age (aged 15-49 years) was 16 percent.

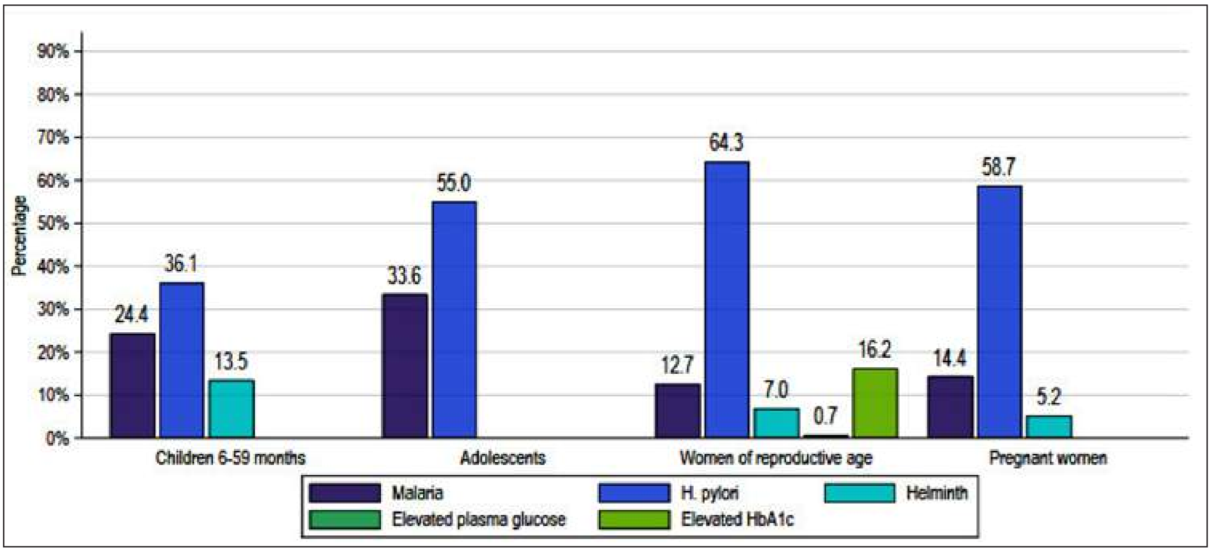


Figure 62. Overall prevalence of malaria, H. pylori, helminths, elevated plasma glucose, and elevated HbA1c among children 6-59 months, adolescent girls, WRA, and pregnant women, respectively, Nigeria 2021.
Malaria: the presence of Plasmodium falciparum malaria parasitemia in blood sample detected using a Rapid Diagnostic Test (RDT)
H. pylori: the presence of IgG antibodies specific to Helicobacter pylori (H. pylori) in blood sample detected using a rapid qualitative immune assay test RDT Helminth: the presence of helminth eggs in stool samples detected using microscopy
Plasma glucose: Random plasma glucose test taken in the AM. Elevated plasma glucose defined as > 200 mg/dl
HbA1c: Haemoglobin A1c was tested in a blood sample using a Bio-Rad D10 auto-analyzer. Elevated HbA1c defined as > 5.6%
Data are weighted to account for survey design and non-response

Prevalence of malaria, H. pylori, and helminths among children (aged 6-59 months)

Table 219 shows the prevalence of malaria, H. pylori, and helminths among children (aged 6-59 months).

Malaria: The prevalence of malaria among children (aged 6-59 months) stratified by age, sex, residence, zone, wealth quintile, and level of education completed by caregiver are shown in **Table Table 219.** There was a statistically significant difference in the prevalence of malaria among children (aged 6-59 months) between age category (P < 0.001), residence (P < 0.001), wealth quintile (P < 0.001), and level of education completed by caregiver (P < 0.001). The prevalence of malaria was lowest in the 6-11-months age category (15 percent). It was higher in children residing in rural (31 percent) compared to urban areas (11 percent). It was lowest in children in households in the highest wealth quintile (8 percent) and in children whose caregivers had attained post-secondary education (7 percent).

H. pylori: The prevalence of H. pylori among children (aged 6-59 months) stratified by age, sex, residence, zone, wealth quintile and level of education completed by caregiver is shown in **Table 219**. There was a statistically significant difference in the prevalence of H. pylori among children (aged 6-59 months) between age category (P = 0.025), sex (P= 0.031), and the zones (P = 0.005). The prevalence of H. pylori was higher in male (38 percent) versus female children (34 percent). It was highest in children in the 48-59-months age category (42 percent) and children in the South East zone (52 percent).

Helminth: The prevalence of helminth among children (aged 6-59 months) stratified by age, sex, residence, zone, wealth quintile and level of education completed by caregiver is shown in **Table 219**. There was a statistically significant difference in the prevalence of helminth among children (aged 6-59 months) between residence (P = 0.008), the zones (P < 0.001), wealth quintile (P = 0.001), and level of education completed by caregiver (P = 0.001). The prevalence of helminth was higher in children residing in rural (16 percent) compared to urban (9 percent) areas. It was lowest in the South East zone (0.4 percent). It was highest in children in the lowest wealth quintile (21 percent) and in children whose caregivers had no formal education (20 percent).

Table 219. Prevalence of malaria, H. pylori, and helminths among children (aged 6-59 months), Nigeria 2021

Characteristics	Malaria			H. pylori			Helminth		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	4,692	24.4	[20.9, 28.2]	4,685	36.1	[32.7, 39.6]	3,445	13.5	[11.3, 16.1]
Age category	(P < 0.001)***			(P = 0.025)*			(P = 0.101)		
6-11 months	486	14.8	[10.8, 19.8]	484	32.5	[25.9, 39.8]	341	8.5	[5.2, 13.7]
12-23 months	1,061	19.2	[15.4, 23.6]	1,057	32.0	[28.3, 35.9]	787	14.2	[10.4, 19.1]
24-35 months	1,199	26.2	[21.7, 31.1]	1,199	35.9	[31.7, 40.4]	911	11.8	[9.2, 14.9]
36-47 months	1,149	28.3	[23.4, 33.8]	1,148	38.4	[33.1, 44.1]	834	16.8	[13.0, 21.4]
48-59 months	797	29.7	[24.5, 35.5]	797	41.5	[35.5, 47.7]	572	13.8	[9.1, 20.3]
Sex	(P = 0.649)			(P = 0.031)*			(P = 0.426)		
Male	2,340	24.0	[20.1, 28.4]	2,340	38.0	[33.9, 42.2]	1,723	14.2	[11.3, 17.7]
Female	2,352	24.7	[21.0, 28.8]	2,345	34.3	[30.8, 37.9]	1,722	12.8	[10.4, 15.7]
Residence	(P < 0.001)***			(P = 0.188)			(P = 0.008)**		
Urban	1,885	11.2	[8.4, 14.8]	1,882	32.9	[27.2, 39.1]	1,317	9.2	[6.5, 12.9]
Rural	2,807	31.3	[26.7, 36.3]	2,803	37.8	[33.7, 42.1]	2,128	15.9	[12.8, 19.5]
Zone	(P = 0.132)			(P = 0.005)**			(P < 0.001)***		
North Central	733	19.1	[12.7, 27.7]	732	43.2	[35.2, 51.5]	557	23.5	[18.6, 29.3]
North East	798	18.3	[12.5, 26.1]	800	35.8	[27.3, 45.4]	591	22.4	[15.3, 31.7]
North West	851	29.0	[21.5, 38.0]	845	28.3	[22.3, 35.3]	602	13.0	[9.0, 18.4]
South East	692	22.3	[14.9, 32.1]	692	51.8	[43.0, 60.4]	587	0.4	[0.1, 1.5]
South South	809	28.1	[21.2, 36.2]	809	41.1	[34.4, 48.1]	657	4.2	[1.7, 9.9]
South West	809	24.7	[19.3, 31.1]	807	36.4	[29.5, 44.0]	451	5.4	[3.3, 8.7]
Wealth quintile	(P < 0.001)***			(P = 0.311)			(P = 0.001)**		
Lowest	860	31.7	[26.1, 37.8]	861	39.7	[34.2, 45.5]	652	21.1	[15.4, 28.1]
Second	809	32.8	[27.0, 39.1]	807	37.1	[31.5, 43.2]	600	15.3	[11.0, 20.8]
Middle	880	29.4	[23.6, 35.9]	876	35.9	[30.8, 41.3]	663	11.1	[7.4, 16.3]
Fourth	1,090	15.8	[12.8, 19.4]	1,089	35.2	[30.8, 39.7]	812	10.3	[7.2, 14.5]
Highest	1,033	8.4	[5.6, 12.4]	1,032	31.6	[24.8, 39.4]	707	8.7	[6.0, 12.5]
Level of education completed by caregiver	(P < 0.001)***			(P = 0.442)			(P < 0.001)***		
None	1,069	28.6	[24.3, 33.4]	1,067	35.1	[30.9, 39.5]	760	20.2	[15.5, 26.0]
Primary	746	25.8	[20.8, 31.5]	744	40.1	[33.8, 46.7]	604	13.2	[9.1, 18.7]
Secondary	2,299	22.5	[18.0, 27.7]	2,298	35.7	[31.7, 39.9]	1,716	9.4	[7.3, 11.9]
Post-secondary	413	7.1	[3.2, 14.9]	411	32.6	[25.1, 41.1]	270	11.0	[6.9, 17.1]
Missing/don't know	7	73.4	[33.1, 93.9]	7	52.8	[16.4, 86.4]	6	0.0	

Malaria: the presence of Plasmodium falciparum malaria parasitemia in blood sample detected using a Rapid Diagnostic Test (RDT) H. pylori: the presence of IgG antibodies specific to Helicobacter pylori (H. pylori) in blood sample detected using a rapid qualitative immune assay test (RDT) Helminth: the presence of helminth eggs in stool samples detected using microscopy Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence of malaria and H. pylori among adolescent girls (aged 10-14 years)

Table 220 shows the prevalence of malaria and H. pylori among adolescent girls (aged 10-14 years).

Malaria: **Table 220** shows the prevalence of malaria in adolescent girls (aged 10-14 years) stratified by age, residence, and wealth quintile. There was a statistically significant difference in the prevalence of malaria among adolescent girls (aged 10-14 years) between residence (P < 0.001) and wealth quintile (P < 0.001). The prevalence of malaria was higher in adolescent girls residing in the rural (45 percent) than in the urban areas (17 percent). The prevalence was lowest among adolescent girls in households in the highest wealth quintile (9 percent).

H. pylori: **Table 220** shows the prevalence of H. pylori in adolescent girls (aged 10-14 years) stratified by age, residence, and wealth quintile. There was a statistically significant difference in the prevalence of H. pylori among adolescent girls (aged 10-14 years) between the age category (P = 0.007). The prevalence was highest among adolescent girls aged 12-years (66 percent).

Table 220. Prevalence of malaria and H. pylori among adolescent girls (aged 10-14 years), Nigeria 2021

Characteristics	Malaria			H. pylori		
	N	%	[95/% CI]	N	%	[95/% CI]
National	980	33.6	[28.4, 39.2]	967	55.0	[49.8, 60.2]
Age category	(P = 0.858)			(P = 0.007)**		
10 years	262	35.7	[27.4, 44.9]	258	57.2	[48.7, 65.2]
11 years	158	32.9	[23.0, 44.6]	158	42.8	[32.8, 53.4]
12 years	191	34.6	[25.0, 45.7]	185	66.2	[57.1, 74.2]
13 years	194	29.3	[21.6, 38.4]	191	47.3	[38.0, 56.9]
14 years	175	34.5	[24.8, 45.6]	175	58.2	[47.4, 68.3]
Residence	(P < 0.001)***			(P = 0.112)		
Urban	402	17.2	[12.0, 23.9]	398	50.0	[42.1, 57.9]
Rural	578	44.9	[38.0, 52.1]	569	58.5	[51.6, 65.1]
Wealth quintile	(P < 0.001)***			(P = 0.821)		
Lowest	178	46.2	[35.5, 57.3]	175	56.6	[46.8, 65.9]
Second	157	53.2	[42.2, 63.9]	155	53.2	[41.5, 64.5]
Middle	185	34.9	[25.2, 46.0]	183	59.3	[48.7, 69.0]
Fourth	213	26.0	[19.3, 33.9]	209	52.4	[43.1, 61.4]
Highest	245	8.6	[5.1, 14.2]	243	53.0	[44.0, 61.9]

Malaria: the presence of Plasmodium falciparum malaria parasitemia in blood sample detected using a Rapid Diagnostic Test (RDT)
H. pylori: the presence of IgG antibodies specific to Helicobacter pylori (H. pylori) in blood sample detected using a rapid qualitative immune assay test (RDT) Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence of malaria, H. pylori, helminths, elevated plasma glucose, and elevated glycated haemoglobin (HbA1c) among women of reproductive age (aged 15-49 years)

Table 221 shows the prevalence of malaria, H. pylori, and helminths among women of reproductive age (aged 15-49 years).

Malaria: **Table 221** shows the prevalence of malaria in women of reproductive age (aged 15- 49 years) stratified by age, residence, zone, wealth quintile and level of education completed. There was a statistically significant difference in the prevalence of malaria among women of reproductive age (aged 15-49 years) between the age category (P < 0.001), residence (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P = 0.006). The prevalence of malaria was highest in the 15-19-years age category (21 percent). It was higher among women residing in rural (17 percent) versus urban areas (7 percent). It was lowest in women in households in the highest wealth quintile (5 percent) and women who had attained post-secondary education (5 percent).

H. pylori: **Table 221** shows the prevalence of H. pylori among women of reproductive age (aged 15-49 years) stratified by age, residence, zone, wealth quintile and level of education completed. There was a statistically significant difference in the prevalence of H. pylori among women of reproductive age (aged 15-49 years) between the age category (P = 0.042), residence (P = 0.003), zones (P < 0.001) and level of education completed (P = 0.040). The prevalence of H. pylori among women of reproductive age (aged 15-49 years) was lowest in the 15-19-years (62 percent) and the 20-29-years (62 percent) age categories. The prevalence was higher among women residing in rural (68 percent) versus urban areas (59 percent). It was lowest among women in the North West zone (54 percent) and highest among women who had primary education (69 percent).

Helminth: **Table 221** shows the prevalence of helminth among women of reproductive age (aged 15-49 years) stratified by age, residence, zone, wealth quintile and level of education completed. There was a statistically significant difference in the prevalence of helminth among women of reproductive age (aged 15-49 years) between residence (P = 0.036), zones (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P = 0.002). The prevalence of helminth was higher in women of reproductive age (aged 15-49 years) residing in rural (8 percent) versus urban areas (5 percent). It was highest among women in the North East zone (15 percent), and those in households in the lowest wealth quintile (12 percent). It was lowest among women who had post-secondary education (4 percent).

Table 221. Prevalence of malaria, H. pylori, and helminths among women of reproductive age (aged 15-49 years), Nigeria 2021

Characteristics	Malaria			H. pylori			Helminth		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	5,370	12.7	[11.1, 14.4]	5,369	64.3	[61.4, 67.1]	3,928	7.0	[5.7, 8.4]
Age category	(P < 0.001)***			(P = 0.042)*			(P = 0.850)		
15-19 years	1,156	21.3	[17.3, 25.8]	1,156	61.5	[56.8, 66.0]	813	7.3	[5.3, 10.1]
20-29 years	1,663	11.3	[9.4, 13.4]	1,663	62.4	[58.6, 66.2]	1,220	7.2	[5.3, 9.6]
30-39 years	1,532	10.2	[8.0, 12.9]	1,533	67.1	[63.2, 70.9]	1,133	7.0	[5.2, 9.3]
40-49 years	1,019	8.4	[5.6, 12.3]	1,017	66.7	[62.4, 70.7]	762	6.1	[4.4, 8.5]
Residence	(P < 0.001)***			(P = 0.003)**			(P = 0.036)*		
Urban	2,114	6.7	[5.0, 8.9]	2,113	59.3	[54.1, 64.2]	1,461	5.2	[3.5, 7.5]
Rural	3,256	17.3	[15.2, 19.5]	3,256	68.1	[65.1, 71.0]	2,467	8.4	[6.6, 10.5]
Zone	(P = 0.531)			(P < 0.001)***			(P < 0.001)***		
North Central	888	14.3	[10.8, 18.8]	886	71.6	[65.1, 77.3]	659	11.2	[8.2, 15.1]
North East	863	10.5	[7.6, 14.3]	864	60.9	[50.8, 70.1]	630	14.6	[10.0, 20.7]
North West	913	14.3	[10.9, 18.4]	912	53.9	[48.9, 58.9]	637	5.5	[3.4, 9.0]
South East	893	10.8	[7.2, 15.9]	892	75.7	[70.5, 80.3]	749	1.7	[0.4, 6.2]
South South	900	13.0	[9.0, 18.3]	902	75.4	[69.9, 80.2]	735	3.3	[1.7, 6.4]
South West	913	11.5	[8.5, 15.2]	913	63.3	[57.9, 68.4]	518	2.0	[0.8, 4.6]
Wealth quintile	(P < 0.001)***			(P = 0.749)			(P < 0.001)***		
Lowest	955	17.9	[15.1, 21.0]	955	64.0	[59.0, 68.6]	719	11.9	[8.5, 16.4]
Second	899	19.5	[15.7, 24.0]	899	66.6	[61.2, 71.5]	684	8.2	[5.6, 11.8]
Middle	1,108	13.7	[10.8, 17.1]	1,109	65.1	[60.7, 69.2]	809	6.7	[4.5, 10.0]
Fourth	1,216	9.1	[7.3, 11.4]	1,214	63.4	[58.3, 68.3]	889	5.9	[4.0, 8.7]
Highest	1,172	5.2	[3.4, 7.7]	1,172	62.6	[57.0, 67.9]	814	3.3	[1.9, 5.4]
Level of education completed	(P = 0.006)**			(P = 0.040)*			(P = 0.002)**		
None	1,057	13.9	[11.2, 17.1]	1,057	64.4	[60.6, 68.1]	743	11.1	[8.3, 14.8]
Primary	879	13.7	[10.8, 17.1]	878	69.0	[63.4, 74.0]	704	7.6	[5.1, 11.3]
Secondary	2,844	13.1	[11.1, 15.5]	2,846	62.0	[58.2, 65.7]	2,087	5.5	[4.1, 7.2]
Post-secondary	453	5.0	[2.9, 8.6]	451	68.2	[61.5, 74.3]	304	4.2	[2.3, 7.6]
Missing/don't know	10	11.3	[2.2, 41.5]	10	84.2	[53.6, 96.1]	7	16.3	[2.0, 64.9]

Malaria: the presence of Plasmodium falciparum malaria parasitemia in blood sample detected using a Rapid Diagnostic Test (RDT)
H. pylori: the presence of IgG antibodies specific to Helicobacter pylori (H. pylori) in blood sample detected using a rapid qualitative immune assay test (RDT) Helminth: the presence of helminth eggs in stool samples detected using microscopy
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Table 222 shows the prevalence of elevated plasma glucose, and elevated glycated haemoglobin (HbA1c) among women of reproductive age (aged 15-49 years).

Elevated plasma glucose (plasma glucose > 200 mg/dl): **Table 222** shows the prevalence of elevated plasma glucose among women of reproductive age (aged 15-49 years) stratified by age, residence, zone, wealth quintile, level of education completed and anthropometry status. There was no significant variation in the prevalence of elevated plasma glucose in women of reproductive age (aged 15-49 years) across the background characteristics.

Elevated glycated haemoglobin (HbA1c > 5.6%): **Table 222** shows the prevalence of elevated HbA1c among women of reproductive age (aged 15-49 years) stratified by age, residence, zone, wealth quintile, level of education completed and anthropometry status. There was a statistically significant difference in the prevalence of elevated HbA1c among women of reproductive age (aged 15-49 years) between the age category ($P < 0.001$), residence ($P < 0.001$), wealth quintile ($P < 0.001$), and anthropometry status ($P < 0.001$). The prevalence of elevated HbA1c among women of reproductive age (aged 15-49 years), was highest in the 40- 49-years age category (22 percent) and women with obesity (34 percent). It was higher in women residing in urban (21 percent) versus rural areas (13 percent). It was lowest among women in the lowest wealth quintile (9 percent).

Table 222. Prevalence of elevated plasma glucose and elevated HbA1c among women of reproductive age (aged 15-49 years), Nigeria 2021

Characteristics	Elevated plasma glucose			Elevated HbA1c		
	N	%	[95/% CI]	N	%	[95/% CI]
National	5,240	0.7	[0.4, 1.0]	5,198	16.2	[14.1, 18.6]
Age category	(P = 0.086)			(P < 0.001)***		
15-19 years	1,139	0.3	[0.1, 1.4]	1,119	14.3	[11.0, 18.4]
20-29 years	1,616	0.4	[0.1, 1.2]	1,604	13.2	[10.6, 16.2]
30-39 years	1,482	0.7	[0.3, 1.5]	1,477	17.8	[14.7, 21.4]
40-49 years	1,003	1.4	[0.8, 2.6]	998	21.5	[18.3, 25.1]
Residence	(P = 0.448)			(P < 0.001)***		
Urban	2,065	0.8	[0.4, 1.3]	2,046	20.8	[17.1, 25.1]
Rural	3,175	0.6	[0.3, 1.1]	3,152	12.6	[10.6, 14.9]
Zone	(P = 0.681)			(P = 0.375)		
North Central	855	0.3	[0.1, 1.3]	848	16.9	[13.0, 21.6]
North East	845	0.9	[0.3, 2.2]	849	18.5	[13.2, 25.3]
North West	904	0.7	[0.3, 1.7]	910	15.1	[10.3, 21.6]
South East	873	0.3	[0.1, 1.0]	857	21.3	[17.3, 26.0]
South South	873	0.8	[0.3, 1.9]	860	15.8	[12.5, 19.8]
South West	890	0.7	[0.3, 1.7]	874	13.0	[9.7, 17.2]
Wealth quintile	(P = 0.840)			(P < 0.001)***		
Lowest	934	0.5	[0.2, 1.7]	926	9.4	[6.9, 12.5]
Second	879	0.3	[0.0, 2.3]	880	14.2	[10.9, 18.2]
Middle	1,075	0.8	[0.3, 2.0]	1,072	16.1	[13.0, 19.9]
Fourth	1,180	0.7	[0.3, 1.7]	1,169	21.0	[16.9, 25.7]
Highest	1,152	0.8	[0.4, 1.6]	1,131	18.8	[14.8, 23.7]
Level of education completed	(P = 0.086)			(P = 0.183)		
None	1,031	0.9	[0.4, 2.3]	1,032	13.1	[10.5, 16.2]
Primary	855	1.5	[0.8, 2.9]	847	16.4	[13.3, 20.2]
Secondary	2,778	0.3	[0.1, 0.8]	2,750	16.4	[13.7, 19.5]
Post-secondary	441	0.9	[0.3, 2.9]	436	20.3	[15.4, 26.2]
Missing/don't know	10	0.0		10	28.1	[4.4, 76.7]
Anthropometry status	(P = 0.367)			(P < 0.001)***		
Normal	3,228	0.6	[0.3, 1.0]	3,201	13.5	[11.4, 15.8]
Thinness	637	0.5	[0.2, 1.7]	641	13.1	[9.4, 18.0]
Overweight	856	0.7	[0.3, 2.0]	847	20.9	[17.5, 24.7]
Obesity	489	1.4	[0.5, 3.8]	485	33.6	[27.5, 40.2]

Plasma glucose: random plasma glucose test taken in the AM. Elevated plasma glucose defined as > 200 mg/dl
HbA1c: Haemoglobin A1c was tested in a blood sample using a Bio-Rad D10 auto-analyzer. Elevated HbA1c defined as > 5.6%
Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence of malaria, H. pylori, and helminths among pregnant women (aged 15-49 years)

Table 223 shows the prevalence of malaria, H. pylori, and helminths among pregnant women (aged 15-49 years) stratified by age, residence, wealth quintile, and level of education completed.

Malaria: There was a statistically significant difference in the prevalence of malaria among pregnant women (aged 15-49 years) between the age category (P < 0.001), residence (P < 0.001) and wealth quintile (P = 0.014). The prevalence of malaria was highest among pregnant women in the 15-19-years age category (38 percent). It was lowest among pregnant women in households in the richest wealth quintile (4 percent). It was higher among pregnant women residing in rural (18 percent) versus urban areas (7 percent).

H. pylori: There was a statistically significant difference in the prevalence of H. pylori among pregnant women (aged 15-49 years) between wealth quintile (P = 0.031). The prevalence of H. pylori among pregnant women was highest among women in households in the middle wealth quintile (71 percent).

Helminth: There was no significant variation in the prevalence of helminth among pregnant women (aged 15-49 years) across the background characteristics.

Table 223. Prevalence of malaria, H. pylori, and helminths among pregnant women (aged 15-49 years), Nigeria 2021

Characteristics	Malaria			H. pylori			Helminth		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	795	14.4	[11.4, 18.0]	795	58.7	[53.8, 63.4]	551	5.2	[3.5, 7.8]
Age category	(P < 0.001)***			(P = 0.075)			(P = 0.840)		
15-19 years	69	37.6	[22.2, 55.9]	69	65.0	[50.2, 77.4]	43	7.7	[2.4, 21.9]
20-29 years	430	14.7	[10.9, 19.4]	429	59.3	[52.0, 66.2]	302	5.2	[3.0, 8.9]
30-39 years	258	7.9	[3.9, 15.4]	259	52.5	[43.0, 61.8]	178	5.1	[2.4, 10.3]
40-49 years	38	9.7	[3.2, 25.6]	38	81.4	[64.2, 91.4]	28	2.8	[0.4, 18.5]
Residence	(P < 0.001)***			(P = 0.131)			(P = 0.411)		
Urban	318	7.2	[4.6, 10.9]	318	53.5	[45.1, 61.6]	211	4.0	[1.7, 9.0]
Rural	477	18.0	[14.1, 22.8]	477	61.3	[55.3, 67.0]	340	5.9	[3.7, 9.3]
Wealth quintile	(P = 0.014)*			(P = 0.031)*			(P = 0.114)		
Lowest	161	12.7	[7.6, 20.3]	161	53.0	[43.9, 61.9]	112	9.5	[4.8, 17.9]
Second	139	23.1	[15.6, 32.8]	139	63.7	[54.0, 72.4]	102	3.7	[1.4, 9.4]
Middle	143	15.4	[9.4, 24.3]	143	70.7	[61.1, 78.7]	96	7.5	[3.3, 16.2]
Fourth	177	12.9	[6.9, 22.7]	177	51.4	[39.4, 63.2]	119	2.2	[0.9, 5.5]
Highest	173	4.4	[2.1, 9.2]	173	53.6	[43.9, 63.0]	120	2.9	[0.7, 11.2]
Level of education completed by caregiver	(P = 0.128)			(P = 0.445)			(P = 0.986)		
None	166	10.7	[6.4, 17.5]	166	55.9	[44.0, 67.2]	107	4.4	[1.9, 9.9]
Primary	121	15.7	[9.9, 23.9]	121	53.7	[41.5, 65.4]	84	5.7	[1.9, 15.8]
Secondary	414	16.5	[11.4, 23.2]	415	61.4	[55.1, 67.4]	295	5.5	[3.1, 9.6]
Post-secondary	69	3.4	[0.9, 12.3]	68	50.9	[38.5, 63.2]	50	4.8	[1.5, 14.2]
Missing/don't know	2	42.2	[4.3, 92.2]	2	100.0		1	0.0	

Malaria: the presence of Plasmodium falciparum malaria parasitemia in blood sample detected using a Rapid Diagnostic Test (RDT)
H. pylori: the presence of IgG antibodies specific to Helicobacter pylori (H. pylori) in blood sample detected using a rapid qualitative immune assay test (RDT) Helminth: the presence of helminth eggs in stool samples detected using microscopy
Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001

Haemoglobin genotype

Inherited blood disorders are common in many parts of Africa (Suchdev et al., 2014). The different blood disorders include α-thalassemia, β-thalassemia, sickle cell, haemoglobin E, and glucose-6-phosphate dehydrogenase deficiency (G6PD). These are broadly classified into structural or qualitative disorders (Modell et al., 2008).

Sickle Cell Disease (SCD) is a structural disorder of the blood characterized by a mutation in the beta-globin gene located on chromosome 11. The nucleotide adenine at position six is substituted with thymine causing a change in amino acid sequence from glutamic acid to valine. On the other hand, thalassaemias are a group of qualitative disorders that affect haemoglobin. People with thalassaemia produce either no or too little haemoglobin. .

Box 16. Key Findings of Haemoglobin Genotype

Haemoglobin genotype in children 6-59 months; Overall, 78 percent of children had normal haemoglobin (HbAA); 19 percent had the sickle cell trait (HbAS), and the prevalence of sickle cell disease (HbSS) was 0.7 percent. The prevalence of sickle cell trait (HbAS) was higher in children residing in rural (20.5 percent) versus urban areas (16.7 percent).

Haemoglobin genotype in women of reproductive age; The percentage of women of reproductive age with normal haemoglobin was 75 percent; 23 percent had the sickle cell trait and differed by zones (26 percent in North West and 20 percent in South West), and 0.2 percent had sickle cell disease and differed by residence (0.3 percent rural and 0 percent in urban areas) and wealth quintile (0.6 percent among moderately rich and 0 percent among rich).

A key objective of the survey was to assess haemoglobin genotype as an important factor associated with anaemia. Haemoglobin genotype of children (aged 6-59 months) and women of reproductive age (aged 15-49 years) was assessed using electrophoresis in a laboratory setting. The tests were done using HPLC. Capillary electrophoresis was used to confirm rare variants identified on HPLC.

Figure 63 presents the national prevalence of haemoglobin genotype among children (aged 6-59 months) and women of reproductive age (aged 15-49 years). The percentage of children (aged 6-59 months) with normal haemoglobin (HbAA) was 78 percent. The prevalence of sickle cell trait (HbAS) among children was 19 percent. The prevalence of SCD was 0.7 percent. The percentage of WRA with normal haemoglobin (HbAA) was 75 percent. The prevalence of sickle cell trait (HbAS) among children was 23 percent and prevalence of SCD is 0.2 percent.

Table 224 presents the prevalence of haemoglobin genotype among children (aged 6-59 months) stratified by age, sex, residence, zone, and wealth quintile. There was a statistically significant difference in the prevalence of sickle cell trait among children (aged 6-59 months) between residence (P = 0.043). The prevalence of sickle cell trait (HbAS) was higher in children residing in rural (20.5 percent) versus urban areas (16.7 percent).

Table 225 presents the prevalence of haemoglobin genotype among women of reproductive age (aged 15-49 years) stratified by residence, zone, and wealth quintile.

There was a statistically significant difference in the prevalence of sickle cell trait (HbAS) among women of reproductive age (aged 15-49 years) between the zones (P = 0.045). The prevalence of sickle cell trait was highest among women residing in the North West zone (26 percent).

- There was a statistically significant difference in the prevalence of sickle cell disease (HbSS) among women of reproductive age (aged 15-49 years) between residence (P = 0.003) and wealth quintile (P < 0.001). The prevalence of sickle cell disease (HbSS) was higher in women residing in rural (0.3 percent) versus urban areas (0.0 percent). It was highest among women in households in the middle wealth quintile (0.6 percent).

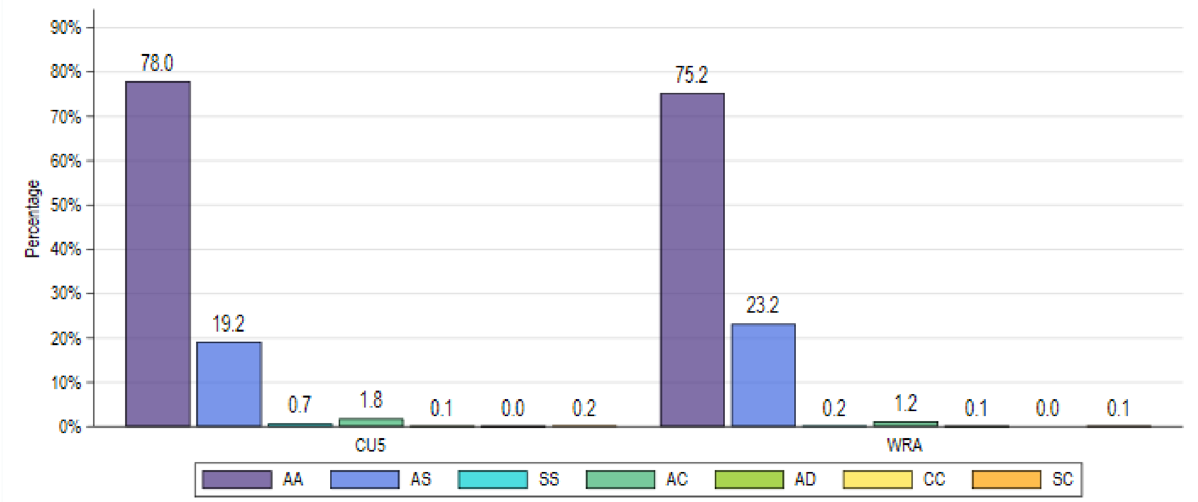


Figure 63. Prevalence of haemoglobin genotype by target group at national level (linked to Tables 88 and 89), Nigeria 2021

Haemoglobin genotype (blood disorders) was assessed using HPLC in a laboratory setting Capillary electrophoresis was used to confirm rare variants identified on HPLC
Data are weighted to account for survey design and non-response
Number of children (aged 6-59 months) who responded nationally: (n= 4548)
Number of children presenting with Hb: AA (n=3,469), AC (n=69); AD (n=7); AS (n= 877); CC (n=1); SS (n= 33) Number of WRA who responded nationally:(n= 5137)
Number of women presenting with Hb: AA (n=3,924), AC (n=58); AD (n= 5); AS (n=166); CC (n=0); SS (n= 11)

Table 224. Prevalence of haemoglobin genotype (HbAA, HbAS) and (HbSS) among children (aged 6-59 months), Nigeria 2021

Characteristics	HbAA			HbAS			HbSS		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	4,564	78.0	[75.8, 80.0]	4,564	19.2	[17.3, 21.3]	4,564	0.7	[0.4, 1.2]
Age category	(P = 0.814)			(P = 0.716)			(P = 0.138)		
6-11 months	462	77.0	[72.3, 81.1]	462	18.5	[14.5, 23.4]	462	1.6	[0.5, 4.9]
12-23 months	1,033	78.6	[75.4, 81.4]	1,033	18.6	[15.9, 21.7]	1,033	0.6	[0.3, 1.5]
24-35 months	1,170	76.8	[73.3, 79.9]	1,170	20.7	[17.7, 24.1]	1,170	0.6	[0.2, 1.4]
36-47 months	1,119	79.1	[75.5, 82.3]	1,119	18.1	[15.0, 21.5]	1,119	0.8	[0.4, 1.5]
48-59 months	780	77.9	[73.0, 82.2]	780	19.8	[15.9, 24.3]	780	0.2	[0.1, 0.7]
Sex	(P = 0.516)			(P = 0.686)			(P = 0.942)		
Male	2,277	77.4	[74.3, 80.2]	2,277	19.5	[16.9, 22.5]	2,277	0.7	[0.3, 1.5]
Female	2,287	78.6	[75.9, 81.0]	2,287	18.8	[16.5, 21.4]	2,287	0.7	[0.4, 1.4]
Residence	(P = 0.234)			(P = 0.043)*			(P = 0.480)		
Urban	1,833	79.6	[76.6, 82.2]	1,833	16.7	[14.3, 19.4]	1,833	0.9	[0.5, 1.6]
Rural	2,731	77.1	[74.2, 79.8]	2,731	20.5	[18.0, 23.3]	2,731	0.6	[0.3, 1.3]
Zone	(P = 0.086)			(P = 0.372)			(P = 0.749)		
North Central	702	82.9	[78.6, 86.5]	702	15.6	[12.2, 19.7]	702	0.4	[0.1, 1.2]
North East	785	78.7	[73.9, 82.8]	785	19.6	[15.5, 24.5]	785	0.9	[0.2, 3.1]
North West	835	78.3	[73.2, 82.7]	835	18.4	[14.3, 23.5]	835	0.8	[0.4, 2.0]
South East	682	78.1	[74.3, 81.4]	682	20.9	[17.6, 24.8]	682	0.2	[0.1, 0.8]
South South	787	76.6	[72.9, 79.9]	787	22.5	[19.1, 26.2]	787	0.5	[0.2, 1.5]
South West	773	72.5	[67.6, 76.8]	773	20.2	[16.9, 24.1]	773	0.8	[0.3, 2.1]
Wealth quintile	(P = 0.481)			(P = 0.404)			(P = 0.878)		
Lowest	831	78.8	[74.8, 82.3]	831	18.6	[15.2, 22.5]	831	0.7	[0.2, 2.0]
Second	794	76.0	[70.3, 80.9]	794	21.4	[17.4, 26.1]	794	0.6	[0.2, 2.5]
Middle	857	76.5	[72.2, 80.4]	857	20.2	[16.6, 24.3]	857	0.9	[0.4, 2.0]
Fourth	1,060	78.4	[75.4, 81.2]	1,060	18.9	[16.3, 21.7]	1,060	0.8	[0.4, 1.9]
Highest	1,003	80.8	[76.2, 84.7]	1,003	16.2	[12.1, 21.4]	1,003	0.5	[0.2, 1.0]

Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Table 225. Prevalence of haemoglobin genotype (HbAA, HbAS) and (HbSS) among WRA (aged 15-49 years), Nigeria 2021

Characteristics	HbAA			HbAS			HbSS		
	N	%	[95/% CI]	N	%	[95/% CI]	N	%	[95/% CI]
National	5,270	75.2	[73.6, 76.7]	5,270	23.2	[21.7, 24.8]	5,270	0.2	[0.1, 0.4]
Age category	(P = 0.784)			(P = 0.792)			(P = 0.102)		
15-19 years	1,134	76.3	[73.1, 79.2]	1,134	22.6	[19.8, 25.8]	1,134	0.3	[0.1, 0.6]
20-29 years	1,634	75.6	[72.7, 78.2]	1,634	22.5	[19.8, 25.4]	1,634	0.4	[0.1, 1.1]
30-39 years	1,495	74.1	[71.3, 76.8]	1,495	24.3	[21.8, 27.1]	1,495	0.0	[0.0, 0.3]
40-49 years	1,007	74.8	[70.8, 78.5]	1,007	23.4	[19.7, 27.6]	1,007	0.0	
Residence	(P = 0.656)			(P = 0.337)			(P = 0.003)**		
Urban	2,072	75.6	[73.0, 78.0]	2,072	22.3	[20.0, 24.8]	2,072	0.0	[0.0, 0.2]
Rural	3,198	74.9	[72.8, 76.8]	3,198	23.9	[21.9, 26.0]	3,198	0.3	[0.1, 0.7]
Zone	(P = 0.142)			(P = 0.045)*			(P = 0.918)		
North Central	863	76.1	[73.0, 78.9]	863	23.4	[20.6, 26.4]	863	0.2	[0.0, 0.6]
North East	855	77.3	[73.1, 81.1]	855	21.7	[18.3, 25.7]	855	0.2	[0.0, 1.1]
North West	915	72.2	[68.5, 75.6]	915	26.3	[22.7, 30.3]	915	0.3	[0.1, 1.2]
South East	875	78.3	[75.3, 81.0]	875	20.9	[18.2, 23.8]	875	0.1	[0.0, 0.9]
South South	873	75.8	[72.2, 79.0]	873	23.9	[20.7, 27.5]	873	0.2	[0.1, 0.5]
South West	889	75.3	[71.9, 78.4]	889	19.8	[17.0, 22.8]	889	0.1	[0.0, 0.6]
Wealth quintile	(P = 0.320)			(P = 0.338)			(P < 0.001)***		
Lowest	935	76.6	[72.4, 80.4]	935	22.3	[18.5, 26.6]	935	0.1	[0.0, 0.6]
Second	902	73.0	[69.0, 76.7]	902	26.1	[22.3, 30.2]	902	0.1	[0.0, 0.4]
Middle	1,083	73.7	[70.3, 76.9]	1,083	23.8	[21.0, 26.9]	1,083	0.6	[0.2, 1.7]
Fourth	1,181	75.0	[72.1, 77.7]	1,181	22.8	[20.2, 25.7]	1,181	0.0	[0.0, 0.3]
Highest	1,149	77.6	[74.0, 80.9]	1,149	21.0	[17.7, 24.8]	1,149	0.1	[0.0, 0.4]

Data are weighted to account for survey design and non-response N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Inflammation

Box 17. Key Findings on Inflammation

C-reactive protein (CRP):

Children 6-59 months: Nationally, 29 percent of children 6-59 months had elevated CRP and differed by age (34 percent in 6-11 months and 22 percent in 48-59 months), residence (34 percent in rural and 21 percent in urban areas), zone (32 percent in North West and South West and 25 percent in North East), wealth (37 among poor and 22 percent among rich) and level of education completed by caregiver (34 percent among those with primary education and 16 percent among those with post-secondary).

Adolescent girls 10-14 years: 11 percent of adolescent girls 10-14 years had elevated CRP. There was no significant variation in the prevalence of elevated CRP among adolescent girls (aged 10-14 years) across the background characteristics.

Women of reproductive age 15-49 years: Overall, 12 percent of women of reproductive age had elevated CRP and differed by age (9 percent in 15-19 years and 14 percent in 40-49 years) and zone (15 percent in South South and 9 percent in North Central),

Pregnant women: Nationally, 28 percent of pregnant women had elevated CRP. There was no significant variation in the prevalence of elevated CRP among pregnant women (aged 15-49 years) across the background characteristics.

Alpha-1-acid glycoprotein (α-1AGP)

Children 6-59 months: Overall, 57 percent of children 6-59 months and differed by age (59 percent among 12-23 months and 51 percent among 48-59 months), residence (65 percent in rural and 42 percent in urban), zones (64 percent in North West and 43 percent in South East), wealth (66 among poor and 41 percent among rich) and level of education completed by caregiver (66 percent among those with no education and 37 percent among those with post-secondary).

Adolescent girls 10-14 years: Overall, 19 percent of adolescent girls 10-14 years had elevated α-1AGP and differed by wealth (25 percent among poor and 13 percent among rich),

Women of reproductive age 15-49 years: Nationally, 17 percent of women of reproductive age and differed by age (18 percent in 15-19 years and 15 in 40-49 years), residence (19 percent in rural and 14 percent in urban), zones (24 percent in North West and 12 percent in South West), wealth (21 percent among poor and 14 percent among rich) and level of education completed (20 percent among those with no education and 11 percent among those with post-secondary),

Pregnant women: 13 percent of pregnant women had elevated α-1AGP nationally. There was no significant variation in the prevalence of elevated AGP among pregnant women (aged 15-49 years) across the background characteristics.

Any inflammation (both CRP and α-1AGP elevated):

Children 6-59 months: Nationally, 59 percent of children 6-59 months had both CRP and α-1AGP elevated and differed by age (62 percent among 12-23 months and 53 percent among 48-59 months), residence (67 percent in rural and 45 percent in urban), zones (66 percent in North West and 48 percent in South East), wealth (68 percent among poor and 44 percent among rich) and level of education completed by caregiver (67 percent among those with no education and 41 percent among those with post-secondary).

Adolescent girls 10-14 years: 21 percent of adolescent girls 10-14 years had both CRP and α-1AGP elevated nationally and differed by residence (22 percent in rural and 20 percent in urban) and wealth (27 percent among poor and 16 percent among rich).

Women of reproductive age 15-49 years: 22 percent of women of reproductive age had both CRP and α-1AGP elevated nationally and differed by residence (23 percent in rural and 21 percent in urban), zone (28 percent in North West and 17 percent in North Central), wealth (25 percent among poor and 19 percent among rich) and level of education completed (25 percent among those with no education and 17 percent among those with post-secondary),

Pregnant women: Overall, 35 percent of pregnant women had both CRP and AGP elevated. There was no significant variation in the prevalence of any inflammation among pregnant women (aged 15-49 years) across the background characteristics.

Subclinical inflammation may be associated with nutritional status and influence the interpretation of biomarkers. It has two phases. The first is a short (24-48 h) incubation period during which the pathogen can multiply or invade tissues; this initial phase may or may not be followed by clinical symptoms. The second phase occurs during convalescence after an acute illness.

Subclinical inflammation can only be identified biochemically in both periods. The biochemical changes in inflammatory biomarkers during subclinical inflammation strongly relate to alterations in many nutrient biomarkers. Hence, detecting the presence of subclinical inflammation using inflammatory biomarkers in apparently healthy people is important in population studies (Raiten et al, 2015).

Subclinical inflammation is often assessed using C-reactive protein (CRP), which measures acute inflammation and alpha-1-acid glycoprotein (α-1 acid glycoprotein, AGP), which measures chronic inflammation. Concentrations of CRP and AGP were used in the BRINDA adjustment as described in the Data Management and Analysis section.

Figure 64 presents the national prevalence of elevated C-reactive protein (CRP), elevated alpha-1-acid glycoprotein (α-1 acid glycoprotein, AGP), and any inflammation by target group. The percentage of children (aged 6-59 months) with elevated CRP, elevated AGP, and any inflammation was 29, 57, and 59 percent respectively. The percentage of adolescent girls (aged 10-14 years) with elevated CRP, elevated AGP, and any inflammation was 11, 19, and 21 percent respectively. The percentage of women of reproductive age (aged 15-49 years) with elevated CRP, elevated AGP, and any inflammation was 12, 17, and 22 percent respectively. The percentage of pregnant women (aged 15-49 years) with elevated CRP, elevated AGP, and any inflammation was 28, 13, and 35 percent respectively.

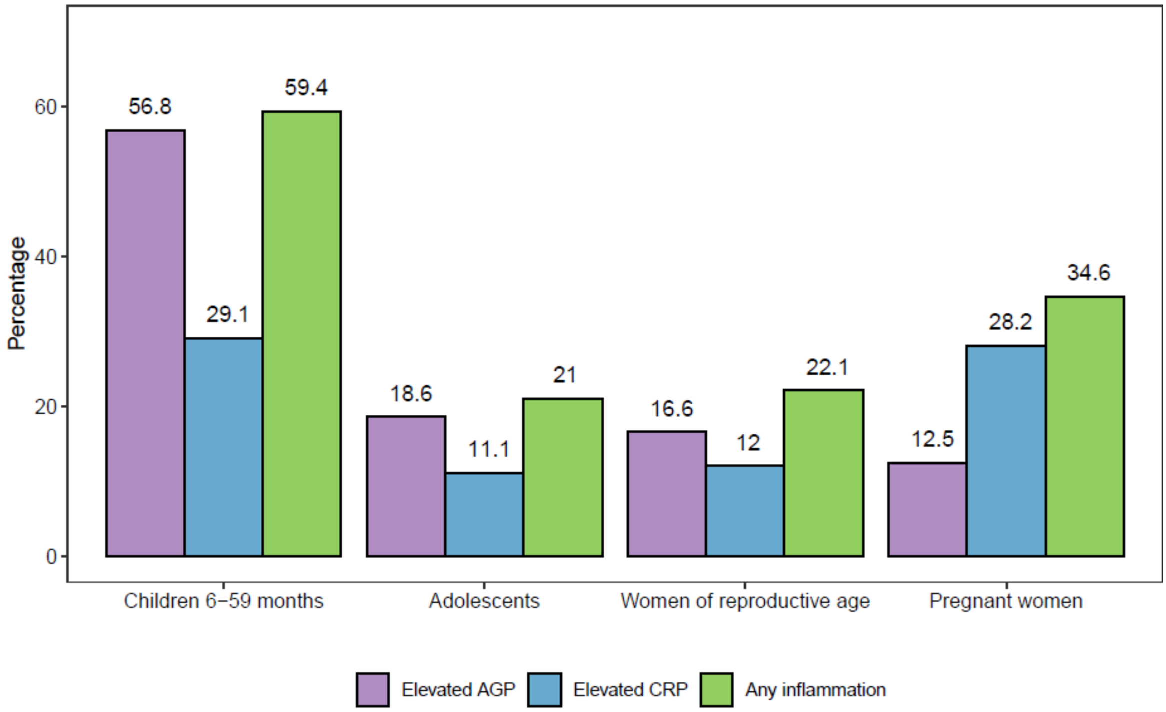


Figure 64. Prevalence of elevated C-reactive protein (CRP), elevated alpha-1-acid glycoprotein (α-1 acid glycoprotein, AGP), and any inflammation by target group at national level, Nigeria 2021
AGP: Alpha-1-acid glycoprotein. Elevated AGP >1 g/L. CRP: C-reactive protein. Elevated CRP >5 mg/L.
Any inflammation defined to be elevated AGP or CRP, or both.

Prevalence of inflammation among children (aged 6-59 months)

Table 226 presents the percentage of children (aged 6-59 months) with elevated CRP, elevated AGP, and any inflammation, stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

Elevated CRP: There was a statistically significant difference in the percentage of children (aged 6-59 months) with elevated CRP between age category (P < 0.001), residence (P < 0.001), zone (P = 0.033), wealth quintiles (P < 0.001) and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) with elevated CRP was lowest among children in the 48-59-months age category (22 percent). It was higher among children residing in rural (34 percent) versus urban areas (21 percent). It was lowest in the North East zone (25 percent) and among children in households in the highest wealth quintile (23 percent). It was lowest among children whose caregivers had post-secondary education (16 percent).

Elevated AGP: There was a statistically significant difference in the percentage of children (aged 6-59 months) with elevated AGP between age category (P < 0.001), residence (P < 0.001), zones (P <0.001), wealth quintiles (P < 0.001) and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) with elevated AGP was lowest among children in the 48-59-months age category (51 percent). The percentage of children (aged 6-59 months) with elevated AGP was higher among children residing in rural (65 percent) versus urban areas (42 percent). It was lowest among children in the South East zone (43 percent) and among children in households in the highest wealth quintile (41 percent). It was highest among children whose caregivers had no formal education (66 percent).

Any inflammation: There was a statistically significant difference in the percentage of children (aged 6-59 months) with any inflammation (elevated AGP or CRP) between age category (P < 0.001), residence (P < 0.001), zones (P < 0.001), wealth quintiles (P < 0.001) and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) with any inflammation was lowest among children in the 48-59-months age category (53 percent). The percentage of children (aged 6-59 months) with any inflammation was higher among children residing in rural (67 percent) versus urban areas (45 percent). It was lowest in the South East zone (48 percent) and among children in households in the highest wealth quintile (44 percent). It was lowest among children whose caregivers had post-secondary education (41 percent).

Table 226. Prevalence of elevated CRP, elevated AGP, and any inflammation, among children (aged 6-59 months), Nigeria 2021

Background characteristics	Elevated AGP		Elevated CRP		Any inflammation	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	4504	56.8[53.7, 59.8]	4504	29.1[26.6, 31.7]	4504	59.4[56.4, 62.3]
Age category		(P <0.001***)		(P <0.001***)		(P <0.001***)
6-11 months	453	55.9[50.4, 61.3]	453	34.2[28.8, 40.0]	453	58.9[53.3, 64.3]
12-23 months	1010	58.7[53.9, 63.3]	1010	29.1[25.2, 33.2]	1010	62.0[57.3, 66.6]
24-35 months	1151	58.8[54.5, 63.0]	1151	33.2[29.0, 37.6]	1151	61.3[57.1, 65.3]
36-47 months	1105	57.1[51.5, 62.6]	1105	27.6[23.6, 31.9]	1105	59.4[53.7, 64.9]
48-59 months	785	51.1[45.7, 56.5]	785	21.6[17.1, 26.7]	785	53.2[47.6, 58.6]
Sex		(P = 0.757)		(P = 0.678)		(P = 0.592)
Male	2262	57.0[53.1, 60.8]	2262	29.5[26.2, 33.0]	2262	59.3[55.4, 63.1]
Female	2242	56.5[53.2, 59.9]	2242	28.6[25.7, 31.7]	2242	59.4[56.0, 62.8]
Residence		(P <0.001***)		(P <0.001***)		(P <0.001***)
Urban	1810	42.0[38.5, 45.6]	1810	20.5[18.2, 23.0]	1810	45.0[41.3, 48.8]
Rural	2694	64.6[61.5, 67.5]	2694	33.6[30.4, 36.9]	2694	67.0[64.0, 69.8]
Zone		(P <0.001***)		(P = 0.0326*)		(P <0.001***)
North Central	714	59.9[52.5, 67.1]	714	27.3[22.8, 32.1]	714	61.7[54.5, 68.6]
North East	792	53.7[46.6, 60.7]	792	24.9[21.0, 29.1]	792	56.8[49.5, 63.8]
North West	866	64.1[58.2, 69.8]	866	32.2[26.5, 38.3]	866	65.7[59.9, 71.1]
South East	684	43.4[37.0, 49.9]	684	25.6[20.6, 31.0]	684	47.5[41.0, 54.0]
South South	697	45.6[38.4, 52.8]	697	26.8[21.0, 33.1]	697	49.8[42.4, 57.3]
South West	751	54.0[49.7, 58.2]	751	32.4[27.5, 37.5]	751	57.5[52.6, 62.4]
Wealth quintile		(P <0.001***)		(P <0.001***)		(P <0.001***)
Lowest	866	66.4[61.8, 70.9]	866	30.8[25.4, 36.6]	866	68.3[63.7, 72.5]
Second	784	65.9[61.0, 70.5]	784	37.2[31.8, 42.9]	784	68.0[63.3, 72.5]
Middle	833	57.2[52.0, 62.3]	833	27.8[23.4, 32.6]	833	59.6[54.4, 64.6]
Fourth	1035	48.3[43.1, 53.5]	1035	24.4[20.9, 28.1]	1035	52.3[47.5, 57.0]
Highest	967	40.7[36.5, 45.0]	967	22.5[19.2, 26.0]	967	43.8[39.6, 48.1]
Level of education completed by caregiver		(P <0.001***)		(P <0.001***)		(P<0.001***)
None	1048	65.6[61.7, 69.4]	1048	30.1[25.7, 34.9]	1048	66.9[63.2, 70.5]
Primary	708	57.2[51.1, 63.1]	708	34.1[27.3, 41.4]	708	60.3[54.2, 66.1]
Secondary	2201	53.8[50.0, 57.4]	2201	29.5[26.2, 32.9]	2201	56.8[53.2, 60.4]
Post-secondary	385	36.5[30.4, 42.8]	385	16.0[11.7, 21.1]	385	40.5[34.3, 47.0]
Missing/don't know	7	78.0[31.9, 98.7]	7	32.3[0.0, 99.7]	7	78.0[31.9, 98.7]

AGP: Alpha-1-acid glycoprotein. Elevated AGP >1 g/L. CRP: C-reactive protein. Elevated CRP >5 mg/L.
Any inflammation defined to be elevated AGP or CRP, or both.
1Smaller total due to non-response in household questionnaire.
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Prevalence of inflammation among adolescent girls (aged 10-14 years)

Table 227 presents the percentage of adolescent girls (aged 10-14 years) with elevated CRP, elevated AGP, and any inflammation, stratified by age category, residence, and wealth quintile.

Elevated CRP: There was no significant variation in the prevalence of elevated CRP among adolescent girls (aged 10-14 years) across the background characteristics.

Elevated AGP: There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years) with elevated AGP between wealth quintiles (P = 0.009). The prevalence of elevated AGP was lowest among adolescent girls in households in the highest wealth quintile (13 percent).

Any inflammation: There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years) with any inflammation between residence (P = 0.046) and wealth quintiles (P = 0.007). The prevalence of elevated AGP was higher among adolescent girls residing in rural (22 percent) versus urban areas (20 percent) It was lowest among adolescent girls in households in the highest wealth quintile (16 percent).

Table 227. Prevalence of elevated CRP, elevated AGP, and any inflammation, among adolescent girls (aged 10-14 years), Nigeria 2021

Background characteristics	Elevated AGP		Elevated CRP		Any inflammation	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	950	18.6[15.6, 21.9]	950	11.1[8.6, 14.0]	950	21.0[17.7, 24.7]
Age		(P = 0.193)		(P = 0.462)		(P = 0.159)
10 years	257	23.2[17.2, 29.9]	257	14.2[9.5, 20.0]	257	25.5[19.5, 32.2]
11 years	152	15.6[8.7, 24.9]	152	10.6[4.7, 19.4]	152	18.7[9.9, 30.3]
12 years	185	16.4[10.7, 23.4]	185	9.2[5.2, 14.7]	185	19.1[13.0, 26.4]
13 years	189	21.4[14.7, 29.3]	189	12.8[7.6, 19.5]	189	23.3[16.4, 31.4]
14 years	167	13.5[8.3, 20.2]	167	7.0[3.8, 11.5]	167	15.8[10.2, 22.8]
Residence		(P = 0.066)		(P = 0.750)		(P = 0.046*)
Urban	392	17.1[12.6, 22.3]	392	12.7[8.3, 18.3]	392	20.0[14.5, 26.4]
Rural	558	19.6[15.7, 24.0]	558	9.9[7.2, 13.2]	558	21.7[17.7, 26.2]
Wealth quintile		(P = 0.009**)		(P = 0.566)		(P = 0.007**)
Lowest	167	24.6[17.0, 33.4]	167	12.2[7.2, 18.7]	167	27.4[19.6, 36.4]
Second	157	18.8[12.3, 26.8]	157	10.3[5.2, 17.7]	157	20.5[13.7, 28.7]
Middle	182	16.0[10.3, 23.1]	182	9.3[5.4, 14.5]	182	17.9[11.8, 25.4]
Fourth	207	21.1[14.4, 29.1]	207	12.3[7.2, 18.9]	207	23.8[16.9, 31.8]
Highest	235	12.8[7.8, 19.1]	235	11.5[6.1, 18.9]	235	15.7[9.7, 23.3]

AGP: Alpha-1-acid glycoprotein. Elevated AGP >1 g/L. CRP: C-reactive protein. Elevated CRP >5 mg/L.
Any inflammation defined to be elevated AGP or CRP, or both.
1Smaller total due to non-response in household questionnaire.
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Prevalence of inflammation among women of reproductive age (aged 15-49 years)

Table 228 presents the percentage of women of reproductive age (aged 15-49 years) with elevated CRP, elevated AGP, and any inflammation, stratified by age category, residence, zone, wealth quintile, and level of education completed.

Elevated CRP: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with elevated CRP between age category ($P < 0.001$) and zone ($P < 0.001$). The percentage of women of reproductive age (aged 15-49 years) with elevated CRP was lowest among women in the 15-19-years age category (9 percent), and lowest among women in the North Central zone (9 percent).

Elevated AGP: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with elevated AGP between age category ($P = 0.048$), residence ($P < 0.001$), zones ($P < 0.001$), wealth quintiles ($P < 0.001$) and level of education completed ($P < 0.001$). The percentage of women of reproductive age (aged 15-49 years) with elevated AGP was lowest among women in the 40-49-years age category (15 percent). The prevalence was higher among women residing in rural (19 percent) versus urban areas (14 percent). It was highest among women in the North West zone (24 percent) and among women in households in the lowest and second wealth quintiles (21 percent). It was lowest among women with post-secondary education (11 percent).

Any inflammation: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with any inflammation between residence ($P = 0.015$), zone ($P < 0.001$), wealth quintiles ($P = 0.010$) and level of education completed ($P = 0.028$). The percentage of women of reproductive age (aged 15-49 years) with any inflammation was higher among those residing in rural (23 percent) versus urban areas (21 percent). The prevalence of any inflammation was highest among women in the North West zone (28 percent) and among women in households in the lowest wealth quintile (25 percent). It was lowest among women with post-secondary education (18 percent).

Table 228. Prevalence of elevated CRP, elevated AGP, and any inflammation, among women of reproductive age (aged 15-49 years), Nigeria 2021

Background characteristics	Elevated AGP		Elevated CRP		Any inflammation	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	5234	16.6 [14.9, 18.4]	5234	12.0 [10.9, 13.2]	5234	22.1 [20.4,23.9]
Age category		(P = 0.048*)		(P <0.001***)		(P = 0.360)
15-19 years	1108	17.9[14.5, 21.7]	1108	9.3[7.4, 11.5]	1108	21.0[17.8, 24.4]
20-29 years	1625	16.9[14.5, 19.5]	1625	12.0[10.2, 13.9]	1625	22.5[19.9, 25.2]
30-39 years	1497	16.1[13.8, 18.5]	1497	12.8[10.3, 15.5]	1497	22.2[19.3, 25.3]
40-49 years	1004	15.2[11.4, 19.4]	1004	14.4[11.9, 17.1]	1004	22.8[19.0, 27.0]
Residence		(P <0.001***)		(P = 0.523)		(P = 0.015*)
Urban	2059	14.0[11.4, 16.9]	2059	12.9[11.2, 14.7]	2059	20.5[17.8, 23.3]
Rural	3175	18.6[16.4, 21.0]	3175	11.4[10.0, 12.9]	3175	23.4[21.2, 25.7]
Zone		(P <0.001***)		(P <0.001***)		(P <0.001***)
North Central	874	12.4[8.0, 17.9]	874	9.2[7.1, 11.7]	874	17.0[13.0, 21.6]
North East	870	19.1[14.3, 24.5]	870	13.4[10.5, 16.8]	870	25.0[19.9, 30.6]
North West	915	24.0[20.5, 27.6]	915	10.4[8.3, 12.9]	915	28.0[24.6, 31.6]
South East	892	11.2[8.8, 13.9]	892	13.2[11.2, 15.4]	892	17.9[15.5, 20.6]
South South	805	12.1[9.0, 15.7]	805	15.0[11.7, 18.7]	805	18.9[15.1, 23.1]
South West	878	11.5[9.2, 14.0]	878	13.2[10.8, 15.8]	878	18.4[15.7, 21.3]
Wealth quintile		(P <0.001***)		(P = 0.101)		(P = 0.010*)
Lowest	950	20.8[17.0, 25.1]	950	10.1[8.0, 12.4]	950	25.0[20.8, 29.5]
Second	895	20.7[16.9, 24.9]	895	10.1[7.5, 13.2]	895	24.8[21.0, 29.0]
Middle	1064	14.5[11.3, 18.2]	1064	14.4[11.8, 17.2]	1064	21.4[17.8, 25.3]
Fourth	1181	13.8[11.1, 16.8]	1181	12.5[10.2, 15.0]	1181	19.1[16.0, 22.5]
Highest	1125	14.1[10.5, 18.3]	1125	12.7[10.4, 15.3]	1125	21.1[17.3, 25.2]
Level of education completed		(P <0.001***)		(P = 0.123)		(P = 0.028*)
None	1058	20.2[16.5, 24.1]	1058	11.0[8.8, 13.6]	1058	25.2[21.9, 28.8]
Primary	855	13.8[10.8, 17.3]	855	13.0[10.6, 15.6]	855	19.9[16.5, 23.7]
Secondary	2740	16.5[14.5, 18.8]	2740	11.9[10.2, 13.6]	2740	21.6[19.4, 24.0]
Post-secondary	436	10.7[6.4, 16.3]	436	11.8[8.7, 15.5]	436	17.5[12.8, 23.0]
Missing /don't know	9	29.6[5.6, 66.8]	9	4.9[0.0, 33.9]	9	29.6[5.6, 66.8]

AGP: Alpha-1-acid glycoprotein. Elevated AGP >1 g/L. CRP: C-reactive protein. Elevated CRP >5 mg/L.
Any inflammation defined to be elevated AGP or CRP, or both. 1Smaller total due to non-response in household questionnaire. Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Prevalence of inflammation among pregnant women (aged 15-49 years)

Table 229 presents the percentage of pregnant women (aged 15-49 years) with elevated CRP, elevated AGP, and any inflammation, stratified by age category, residence, wealth quintile, and level of education completed.

Elevated CRP: There was no significant variation in the prevalence of elevated CRP among pregnant women (aged 15-49 years) across the background characteristics.

Elevated AGP: There was no significant variation in the prevalence of elevated AGP among pregnant women (aged 15-49 years) across the background characteristics.

Any inflammation: There was no significant variation in the prevalence of any inflammation among pregnant women (aged 15-49 years) across the background characteristics.

Table 229. Prevalence of elevated CRP, elevated AGP, and any inflammation, among pregnant women (aged 15-49 years), Nigeria 2021

Background characteristics	Elevated AGP		Elevated CRP		Any inflammation	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	764	12.5[9.6, 15.9]	764	28.2[23.7, 32.9]	764	34.6[30.1, 39.2]
Age category		(P = 0.115)		(P = 0.732)		(P = 0.700)
15-19 years	66	19.8[7.2, 38.6]	66	32.3[18.1, 49.3]	66	44.7[28.5, 61.7]
20-29 years	409	10.0[6.9, 13.9]	409	28.8[22.6, 35.7]	409	32.8[26.0, 40.0]
30-39 years	251	14.6[8.4, 22.7]	251	25.1[19.0, 31.9]	251	34.6[26.9, 42.8]
40-49 years	38	11.7[1.0, 39.4]	38	33.3[14.0, 57.5]	38	34.8[15.2, 59.0]
Residence		(P = 0.240)		(P = 0.802)		(P = 0.836)
Urban	308	10.7[7.0, 15.5]	308	33.4[27.3, 39.9]	308	37.8[31.4, 44.4]
Rural	456	13.4[9.5, 18.0]	456	25.5[20.0, 31.6]	456	33.0[27.3, 39.0]
Wealth quintile		(P = 0.282)		(P = 0.285)		(P = 0.444)
Lowest	158	12.2[6.9, 19.5]	158	21.0[12.7, 31.4]	158	27.6[17.3, 39.8]
Second	133	15.6[8.2, 25.5]	133	27.0[18.7, 36.7]	133	35.9[27.3, 45.1]
Middle	135	9.6[4.7, 16.7]	135	23.7[15.9, 32.9]	135	28.5[19.7, 38.7]
Fourth	171	14.9[7.7, 24.6]	171	38.5[28.8, 48.8]	171	46.8[39.2, 54.5]
Highest	165	8.7[4.2, 15.2]	165	34.0[24.1, 44.8]	165	35.6[25.8, 46.3]
Level of education completed		(P = 0.144)		(P = 0.125)		(P = 0.125)
None	164	13.5[7.7, 21.1]	164	17.0[10.4, 25.4]	164	25.4[17.5, 34.7]
Primary	114	5.9[2.1, 12.3]	114	36.8[26.8, 47.7]	114	38.1[28.0, 48.9]
Secondary	395	14.0[9.3, 19.9]	395	32.4[26.9, 38.3]	395	38.5[32.1, 45.2]
Post-secondary	65	13.5[5.5, 25.8]	65	29.4[17.6, 43.3]	65	39.2[25.8, 53.9]
Missing/don't know	2	57.8[NA, NA]	2	42.2[NA, NA]	2	100

AGP: Alpha-1-acid glycoprotein. Elevated AGP >1 g/L. CRP: C-reactive protein. Elevated CRP >5 mg/L.
Any inflammation defined to be elevated AGP or CRP, or both.
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001)

Anaemia

Box 18. Key Findings on Anaemia

Children (6-59 months old)

Any anaemia: Nationally, 31 percent of children (6-59 months old) had any anaemia nationally. There was a statistically significant difference in the prevalence of any anaemia among children (aged 6-59 months) by age (42 percent in 6-11 months and 22 percent in 48-59 months), residence (36 percent in rural and 21 percent in urban), zones (42 percent in North West and 23 percent in North Central), wealth (38 percent among poor and 18 percent among rich), and level of education completed by caregivers (36 percent among those with no education and 16 percent among those with tertiary education).

Mild anaemia: 19 percent of children 6-59 months had mild anaemia. There was a significant variation in the prevalence of mild anaemia among children (aged 6-59 months) by age (25 percent in 6-11 months and 14 percent in 48-59 months), residence (20 percent in rural and 15 percent in urban), zones (23 percent in North West and 15 percent in North Central and South West), wealth (21 percent among poor and 13 percent among rich), and level of education completed by caregivers (22 percent among those with no education and 12 percent among those with tertiary education).

Moderate anaemia: Overall, 12 percent of children 6-59 months had moderate anaemia. There was a significant variation in the prevalence of moderate anaemia among children (aged 6-59 months) by age (17 percent among 6-11 months and 8 percent among 48-59 months), residence (15 percent in rural and 5 percent in urban), zones (17 percent in North West and 8 percent in South South), and wealth (17 percent among poor and 5 percent among rich).

Severe anaemia: Only 0.5 percent of children 6-59 months had severe anaemia. There was a significant variation in the prevalence of severe anaemia among children (aged 6-59 months) by level of education completed by caregivers (1 percent among those with no education and 0.2 percent among those with secondary education).

Adolescent girls (10-14 years old)

Any anaemia: Anaemia was present in 20 percent of adolescent girls nationally. There was a statistically significant difference in the *pr*evalence of any anaemia among adolescent girls (aged 10-14 years) by age (28 percent in 12 year old and 11 percent in 11 year old) and wealth (27 percent among poor and 15 percent among rich).

Mild anaemia: The prevalence of mild anaemia was 14 percent. There was a statistically significant difference in the prevalence of mild anaemia among adolescent girls by age (22 percent among 12 year old and 7 percent among 10 year old) and wealth quintile (18 percent among poor and 9 percent among rich).

Moderate anaemia: The prevalence of moderate anaemia was 6 percent. There was no significant variation in the prevalence of moderate anaemia among adolescent girls (aged 10-14 years) across the background characteristics.

Severe anaemia: The prevalence of *mild anaemia was 0.6 percent.* There was no significant variation in the prevalence of moderate anaemia among adolescent girls (aged 10-14 years) across the background characteristics.

Women of reproductive age (15-49 years old)

Any anaemia: Nationally, anaemia was present in 23 percent of women of reproductive age. There was a statistically significant difference in the prevalence of any anaemia among women of reproductive age (aged 15-49 years) by age (21 percent among 15-19 years and 27 percent among 40-49 years), residence (28 percent in rural and 18 percent in urban), zones (26 percent in North West, South East, South South and 17 percent in South West), wealth (30 percent among poor and 20 percent among rich) and level of education completed (27 percent among those with no education and 17 percent among those with post-secondary education).

Mild anaemia: 16 percent of women of reproductive age had mild anaemia nationally. There was a statistically significant difference in the prevalence of mild anaemia among women of reproductive age (aged 15-49 years) by residence (18 percent in rural and 13 percent in urban), zone (18 percent in South East, South South and 16 percent in North Central), and wealth (19 percent among poor and 13 percent among rich).

Moderate anaemia: Overall, 7 percent of women of reproductive age had moderate anaemia. There was a statistically significant difference in the prevalence of moderate anaemia among women of reproductive age (aged 15-49 years) by residence (9 percent in rural and 4 percent in urban), zone (9 percent in North East and 4 percent in South West) wealth (9 percent among poor and 5 percent among rich), and level of education completed (12 percent among those with no education and 4 percent among those with post-secondary education).

Severe anaemia: Severe anaemia was present in 0.6 percent of women of reproductive age nationally. There was a statistically significant difference in the prevalence of severe anaemia among women of reproductive age (aged 15-49 years) by residence (0.8 percent in rural and 0.3 percent in urban), and wealth (1.5 percent among poor and 0.4 percent among rich).

Pregnant women (15-49 years old)

Any anaemia: Anaemia was present in 32 percent of pregnant women nationally. There was a statistically significant difference in the prevalence of any anaemia among pregnant women (aged 15-49 years) between residence (37 percent in rural and 21 percent in urban).

Mild anaemia: Overall, 22 percent of pregnant women had mild anemia. The prevalence of any anemia was higher in pregnant women residing in rural (26 percent) versus urban areas (15 percent).

Moderate anaemia: Only 9 percent of pregnant women had moderate anaemia. There was no significant variation in the prevalence of moderate anaemia among pregnant women (aged 15-49 years) across the background characteristics.

Severe anaemia: Severe anaemia was observed in 0.5 percent of pregnant women. There was no significant variation in the prevalence of severe anaemia among pregnant women (aged 15-49 years) across the background characteristics.
This section presents results on anaemia in the target population assessed from whole blood samples analyzed in the field.

Anaemia is possibly the most evident consequence of iron deficiency. Iron deficiency could explain one third of cases of anemia in Africa. It is associated with significant morbidity and has been the focus for evaluating iron status (Lynch et al., 2018). Anaemia is characterized by low levels of haemoglobin (the protein in RBC responsible for carrying oxygen) in the blood. Iron is an essential component of haemoglobin, and iron deficiency is estimated to contribute to approximately one-half of anaemia cases worldwide (Kassebaum et al., 2013). Self- reported anaemia risk and use of multivitamin/ iron supplements were assessed from the questionnaire for all target groups.

Other micronutrient deficiencies (i.e., vitamin B12, folate, and vitamin A) and non-nutritional causes (i.e., blood disorders, malaria, hookworm, and other helminths) can also cause anaemia. Anaemia impairs children's physical growth and development, increases susceptibility to infections, and results in fatigue and reduced work capacity among adults. Anaemia also increases the risk of child and maternal mortality.[1]

Anaemia, for all target groups, was assessed by measuring haemoglobin levels (grams per liter) in whole venous blood using a HemoCue (Hb-301) instrument. The cut-offs (WHO, 2011) for the respective target groups for diagnosis of anaemia based on haemoglobin levels (grams per liter) are as follows (**Table 230**):

Table 230. Anaemia cut-offs for the respective target groups

Anaemia (low haemoglobin)				
Target group	Non-anaemia	Mild	Moderate	Severe
Children (aged 6-59 months)	Hb≥ 110 g/L	100-109 g/L	70-99 g/L	< 70 g/L
Adolescent girls (10-11 years)	Hb≥ 115 g/L	110-114 g/L	80-109 g/L	< 80 g/L
Adolescent girls (12-14 years) WRA (aged 15-49 years)	Hb≥ 120 g/L	110-119 g/L	80-109 g/L	< 80 g/L
Pregnant women (aged 15-49 years)	Hb≥ 110 g/L	100-109 g/L	70-99 g/L	< 70 g/L

Individual haemoglobin values (g/dl) presented in the results were adjusted (Sullivan et al., 2008) to account for:

- Pregnancy: first trimester (+1.0), second (+1.5), third (+1.0), trimester unknown (+1.0).
- Altitude: Hb adjustment = -0.032 x (altitude x 0.0032808) + 0.022 x $(\text{altitude} \times 0.0032808)^2$;
- Ethnicity: African extraction (+1.0); and
- Cigarette smoking: smoker, amount unknown (- 0.3).

The results provided here are lower than those presented in the preliminary report due to a coding error in adjusting haemoglobin values for anaemia based on pregnancy, altitude, ethnicity, and smoking in the preliminary report analysis (Federal Government of Nigeria & International Institute of Tropical Agriculture, 2022).

Figure 65 presents the national prevalence of anaemia by the target group.

- **Children (6-59 months old)**: Anaemia was present in 31 percent of children (6-59 months old). The prevalence of mild, moderate, and severe anaemia was 19, 12, and 0.5 percent, respectively.
- **Adolescent girls (10-14 years old)**: Anaemia was present in 20 percent of adolescent girls. The prevalence of mild, moderate, and severe anaemia was 14, 6, and 0.6 percent, respectively.
- **WRA (15-49 years old)**: Anaemia was present in 23 percent of WRA. The prevalence of mild, moderate, and severe anaemia was 16, 7, and 0.6 percent, respectively.
- **Pregnant women (15-49 years old)**: Anaemia was present in 32 percent of pregnant women. The prevalence of mild, moderate, and severe anaemia was 22, 9, and 0.5 percent, respectively.

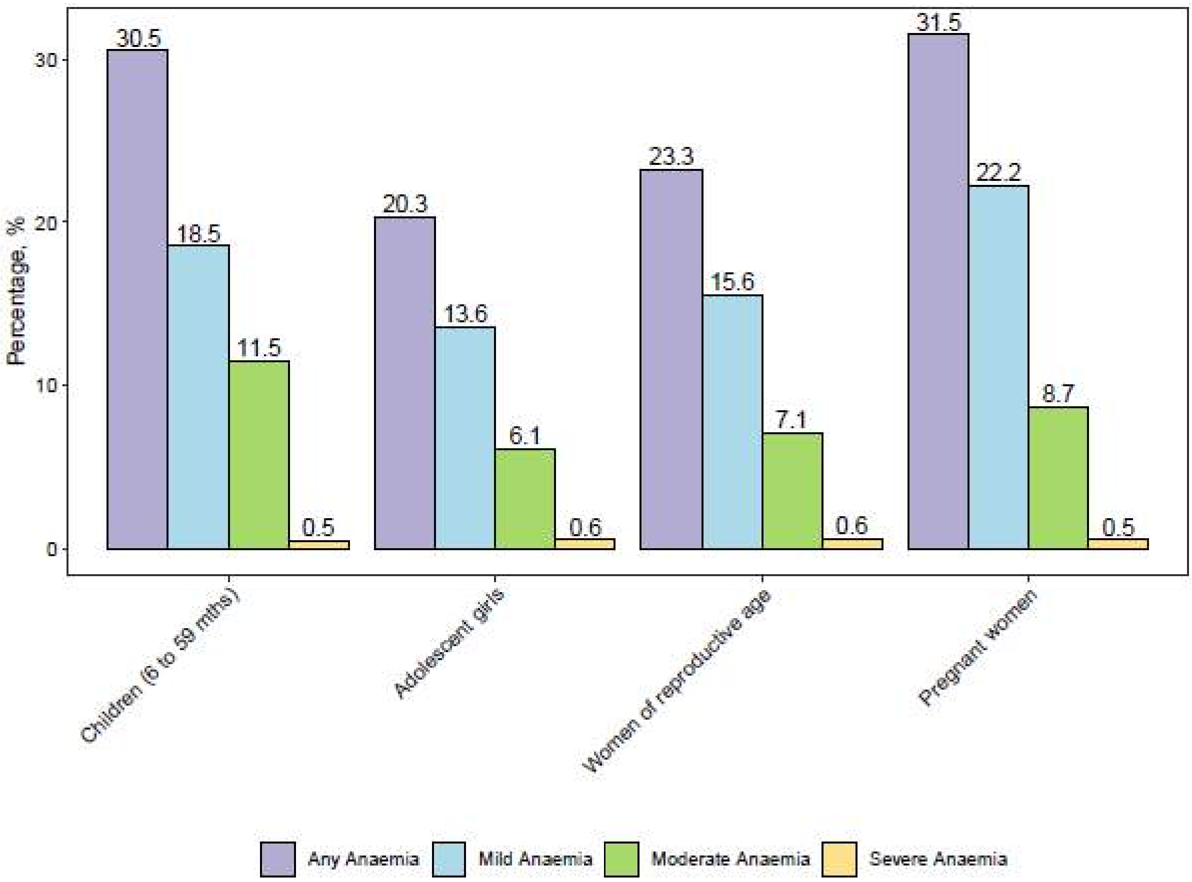


Figure 65. Overall prevalence of any, mild, moderate, and severe anaemia by target group, Nigeria 2021
Anaemia was measured in the field from a venous blood sample using a HemoCue (Hb-301) instrument Haemoglobin measurements were adjusted to account for pregnancy, altitude, and cigarette smoking as needed Data are weighted to account for survey design and non-response

Prevalence of anaemia among children (aged 6-59 months)

The prevalence of anaemia among children (aged 6-59 months) stratified by age, sex, residence, zone, wealth quintile and education level of caregiver is shown in **Table 231.**

a. **Any anaemia**: There was a statistically significant difference in the prevalence of any anaemia among children (aged 6-59 months) between age category (P < 0.001), residence (P < 0.001), zones (P < 0.001), wealth quintiles (P < 0.001), and level of education completed by caregivers (P < 0.001). The prevalence of any anaemia was highest in the 6-11-months age category (42 percent). It was higher in children residing in rural (36 percent) than in the urban (21 percent) areas. It was highest in children in the North West zone (42 percent). The prevalence of any anaemia was lowest in children in the highest wealth quintile (18 percent) and in children whose caregivers had no formal education (36 percent).

b. **Mild anaemia**: There was a significant variation in the prevalence of mild anaemia among children (aged 6-59 months) between age category (P < 0.001), residence (P = 0.015), zones (P = 0.004), wealth quintiles (P < 0.001), and level of education completed by caregivers (P = 0.015). The prevalence of mild anemia was highest in the 6-11 months age category (25 percent). It was higher in children residing in rural (20 percent) versus urban areas (15 percent). It was highest in children in the North West zone (23 percent). The prevalence of mild anemia was lowest in children in household in the highest wealth quintile (13 percent) and highest among children whose caregivers had no formal education (22 percent).

c. **Moderate anaemia**: There was a significant variation in the prevalence of moderate anaemia among children (aged 6-59 months) between age category (P < 0.001), residence (P < 0.001), zones (P < 0.001), and wealth quintiles (P < 0.001). The prevalence of moderate anemia was highest in the 6-11 months age category (17 percent). It was higher in children residing in rural (15 percent) versus urban areas (5 percent). It was highest in children in the North West zone (17 percent). The prevalence of moderate anemia was lowest in children in household in the highest wealth quintile (5 percent).

d. **Severe anaemia**: There was a significant variation in the prevalence of severe anaemia among children (aged 6-59 months) between level of education completed by caregivers (P = 0.014). The prevalence was highest among children whose care givers had no formal education (1 percent).

Table 231. Prevalence of anaemia among children (aged 6-59 months), Nigeria 2021

Background characteristics	Any anaemia		Mild anaemia		Moderate anaemia		Severe anaemia	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	4754	30.5[27.4, 33.8]	4754	18.5[16.4, 20.7]	4754	11.5[9.6, 13.6]	4754	0.5[0.3, 0.8]
Age category		(P <0.001***)		(P <0.001***)		(P <0.001***)		(P =0.124)
6-11 months	406	41.8[34.9, 48.9]	406	24.5[19.5, 30.0]	406	17.3[12.1, 23.4]	406	0
12-23 months	1070	38.3[33.9, 42.8]	1070	22.9[19.3, 26.9]	1070	14.5[11.8, 17.5]	1070	0.8[0.3, 1.7]
24-35 months	1196	30.5[25.8, 35.4]	1196	17.3[14.4, 20.4]	1196	12.3[9.0, 16.3]	1196	0.9[0.3, 1.8]
36-47 months	1168	25.4[21.2, 29.9]	1168	16.9[13.3, 21.0]	1168	8.1[6.0, 10.7]	1168	0.3[0.1, 0.7]
48-59 months	914	22.0[17.4, 27.1]	914	13.8[10.7, 17.3]	914	8.0[5.2, 11.6]	914	0.2[0.0, 0.6]
Sex		(P = 0.840)		(P = 0.272)		(P = 0.151)		(P = 0.683)
Male	2374	30.8[26.2, 35.5]	2374	17.6[14.9, 20.5]	2374	12.6[10.1, 15.6]	2374	0.6[0.3, 1.0]
Female	2380	30.3[27.1, 33.5]	2380	19.4[16.9, 22.2]	2380	10.4[8.3, 12.8]	2380	0.5[0.2, 0.9]
Residence		(P < 0.001***)		(P = 0.015*)		(P < 0.001***)		(P = 0.345)
Urban	1906	20.6[17.9, 23.4]	1906	15.2[12.4, 18.3]	1906	5.0[3.8, 6.5]	1906	0.4[0.1, 0.8]
Rural	2848	35.8[31.6, 40.1]	2848	20.3[17.6, 23.2]	2848	14.9[12.3, 17.7]	2848	0.6[0.3, 1.0]
Zone		(P < 0.001***)		(P = 0.004**)		(P < 0.001***)		(P = 0.393)
North Central	736	22.5[17.6, 27.9]	736	14.8[11.3, 18.8]	736	7.3[4.8, 10.5]	736	0.4[0.1, 0.9]
North East	822	26.2[21.4, 31.4]	822	16.5[12.8, 20.8]	822	9.0[5.4, 13.8]	822	0.6[0.2, 1.6]
North West	873	41.5[34.5, 48.8]	873	23.4[18.7, 28.6]	873	17.4[13.2, 22.2]	873	0.7[0.3, 1.5]
South East	695	26.7[20.8, 33.1]	695	16.2[12.8, 20.1]	695	10.0[6.4, 14.6]	695	0.5[0.1, 1.2]
South South	815	26.2[22.4, 30.2]	815	17.7[15.0, 20.6]	815	8.0[5.6, 10.9]	815	0.5[0.2, 1.2]
South West	813	23.8[19.7, 28.2]	813	15.1[11.5, 19.3]	813	8.6[5.9, 11.9]	813	0.0[0.0, 0.2]
Wealth quintile		(P < 0.001***)		(P < 0.001***)		(P < 0.001***)		(P = 0.151)
Lowest	890	37.7[33.6, 41.8]	890	21.2[17.6, 25.2]	890	15.4[12.0, 19.3]	890	1.0[0.4, 2.1]
Second	815	39.0[32.0, 46.3]	815	21.4[16.9, 26.4]	815	17.2[13.0, 22.1]	815	0.3[0.1, 0.8]
Middle	890	32.6[27.8, 37.7]	890	21.7[17.6, 26.1]	890	10.6[6.9, 15.3]	890	0.3[0.1, 0.8]
Fourth	1096	21.0[17.5, 24.8]	1096	13.5[10.8, 16.6]	1096	6.8[5.1, 8.9]	1096	0.7[0.2, 1.7]
Highest	1043	18.3[15.8, 21.0]	1043	13.1[10.6, 15.9]	1043	5.0[3.0, 7.7]	1043	0.2[0.1, 0.5]
Level of education completed by caregiver		(P < 0.001***)		(P = 0.015*)		(P = 0.074)		(P = 0.014*)
None	1091	36.1[31.8, 40.5]	1091	21.7[17.9, 25.8]	1091	13.4[10.4, 16.9]	1091	1.0[0.4, 1.9]
Primary	752	28.3[22.7, 34.4]	752	15.2[12.0, 18.7]	752	12.2[7.0, 19.2]	752	0.9[0.2, 2.4]
Secondary	2320	28.4[24.6, 32.3]	2320	17.0[14.8, 19.4]	2320	11.2[8.8, 13.9]	2320	0.2[0.1, 0.3]
Tertiary	414	16.4[11.5, 22.2]	414	12.3[7.5, 18.5]	414	3.7[1.6, 7.2]	414	0.4[0.1, 1.0]

Anaemia was measured in the field from a venous blood sample using a HemoCue (Hb-301) instrument Non-anaemia in children (aged 6-59 months) is defined as Hb≥ 100 g/L
Anaemia in children (aged 6-59 months) is defined as mild (100-109 g/L), moderate (70-99 g/L), or severe (< 70 g/L) Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence of anaemia among adolescent girls (aged 10-14 years)

The prevalence of anaemia among adolescent girls stratified by age, residence, and wealth quintile is shown in **Table 232.**

a. **Any anaemia**: There was a statistically significant difference in the *pre*valence of any anaemia among adolescent girls (aged 10-14 years) between the age category (P = 0.005) and wealth quintile (P = 0.005). The prevalence was lowest in 11-year old adolescent girls (11 percent). The prevalence was highest in adolescent girls in households in the lowest wealth quintile (27 percent).

b. **Mild anaemia**: There was a statistically significant difference in the prevalence of mild anaemia among adolescent girls between the age category (P < 0.001) and wealth quintile (P = 0.040). The prevalence of mild anemia was highest among adolescent girls 12-years old (22 percent). The prevalence was lowest among adolescent girls in households in the highest wealth quintile (8 percent).

c. **Moderate anaemia**: There was a statistically significant difference in the prevalence of moderate anaemia among adolescent girls (aged 10-14 years) between residence (P = 0.029). The prevalence of moderate anemia was higher among adolescent girls residing in rural (7 percent) versus urban areas (4 percent).

d. **Severe anaemia**: There was no significant variation in the prevalence of severe anaemia among adolescent girls (aged 10-14 years) across the background characteristics.

Table 232. Prevalence of anaemia among adolescent girls (aged 10-14 years), Nigeria 2021

Background characteristics	Any anaemia		Mild anaemia		Moderate anaemia		Severe anaemia	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	983	20.3[16.8, 24.1]	983	13.6[10.9, 16.7]	983	6.1[4.3, 8.4]	983	0.6[0.1, 1.5]
Age		(P = 0.005**)		(P <0.001***)		(P = 0.254)		(P = 0.727)
10 years	263	17.2[11.5, 24.2]	263	7.2[4.2, 11.3]	263	9.1[5.0,14.8]	263	0.9[0.0, 3.9]
11 years	159	11.4[5.4, 20.2]	159	8.7[3.3, 17.5]	159	2.7[0.8, 6.2]	159	0
12 years	192	28.2[20.6, 36.7]	192	22.0[15.4, 29.8]	192	5.1[2.1, 9.9]	192	1.1[0.1, 4.6]
13 years	194	27.8[19.4, 37.6]	194	21.3[14.2, 29.7]	194	6.6[2.8,12.6]	194	0
14 years	175	15.0[9.4, 22.0]	175	9.2[5.0, 15.2]	175	5.1[2.2, 9.8]	175	0.6[0.0, 2.6]
Residence		(P = 0.126)		(P = 0.102)		(P = 0.331)		(P = 0.172)
Urban	404	17.9[12.7, 24.0]	404	13.4[8.6, 19.5]	404	4.4[2.1, 8.1]	404	0
Rural	579	22.0[17.3, 27.1]	579	13.7[10.6, 17.2]	579	7.3[4.8,10.4]	579	1.0[0.2, 2.5]
Wealth quintile		(P = 0.005**)		(P = 0.036*)		(P = 0.337)		(P = 0.142)
Lowest	178	26.9[18.2, 37.1]	178	18.2[12.2, 25.5]	178	8.7[4.4,14.8]	178	0
Second	157	21.8[14.6, 30.4]	157	11.8[6.7, 18.8]	157	7.6[3.4,14.1]	157	2.4[0.4, 7.4]
Middle	186	15.2[9.3, 22.8]	186	11.5[6.5, 18.2]	186	3.8[1.5, 7.6]	186	0
Fourth	214	22.2[15.6, 30.1]	214	18.0[11.6, 25.8]	214	3.7[1.5, 7.4]	214	0.5[0.0, 2.4]
Highest	246	15.6[10.2, 22.3]	246	8.7[4.8, 14.3]	246	6.9[3.0,13.0]	246	0

Anaemia was measured in the field from a venous blood sample using a HemoCue (Hb-301) instrument Non-anaemia in adolescent girls (aged 10-11 years) is defined as Hb≥ 115 g/L
Anaemia in adolescent girls (aged 10-11 years) is defined as mild (110-114 g/L), moderate (80-109 g/L), or severe (< 80 g/L)
Non-anaemia in adolescent girls (aged 12-14 years) is defined as Hb≥ 120 g/L
Anaemia in adolescent girls (aged 12-14 years) is defined as mild (110-119 g/L), moderate (80-109 g/L) or severe < 80 g/L)
Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence of anaemia among women of reproductive age (aged 15-49 years)

The prevalence of anaemia among women of reproductive age stratified by age, residence, zone, wealth quintile, and level of educational completed is shown in **Table 233.**

a. **Any anaemia:** There was a statistically significant difference in the prevalence of any anaemia among women of reproductive age (aged 15-49 years) between age category (P = 0.047), residence (P < 0.001), zones (P = 0.004), wealth quintiles (P < 0.001) and level of education completed (P = 0.002). The prevalence of any anaemia in women of reproductive age was lowest among women of reproductive age in the 15-19 years age category (21 percent). It was higher in women residing in rural (28 percent) than in urban (18 percent) areas. It was lowest in women in the South West zone (17 percent). It was highest among women of reproductive age in households in the lowest wealth quintile (30 percent) and among those with no formal education (27 percent).

b. **Mild anaemia:** There was a statistically significant difference in the prevalence of mild anaemia among women of reproductive age (aged 15-49 years) between residence (P = 0.002), zone (P = 0.023), and wealth quintile (P = 0.014). The prevalence of mild anemia was higher in women of reproductive age residing in rural (18 percent) versus urban areas (13 percent). It was highest among women in the South South zone (18 percent). The prevalence of mild anemia was highest among women of reproductive age in households in the lowest wealth quintile (19 percent).

c. **Moderate anaemia:** There was a statistically significant difference in the prevalence of moderate anaemia among women of reproductive age (aged 15-49 years) between residence (P < 0.001), zone (P = 0.026) wealth quintiles (P < 0.001), and level of education completed (P < 0.001). The prevalence of moderate anaemia was higher in women of reproductive age residing in rural (9 percent) than in urban (4 percent) areas. It was lowest in the South West zone (4 percent). It was highest among women of reproductive age in households in the middle wealth quintile (10 percent), and lowest among women of reproductive age who had completed tertiary education (4 percent).

e. **Severe anaemia:** There was a statistically significant difference in the prevalence of severe anaemia among women of reproductive age (aged 15-49 years) between residence (P < 0.035), and wealth quintile (P = 0.022). The prevalence of severe anaemia was higher in women of reproductive age residing in rural (0.8 percent) than in urban (0.3 percent) areas. It was highest among women of reproductive age in households in the lowest wealth quintile (2 percent).

Table 233. Prevalence of anaemia among Women of Reproductive Age (WRA, aged 15-49 years), Nigeria 2021

Background characteristics	Any anaemia		Mild anaemia		Moderate anaemia		Severe anaemia	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	5396	23.3[21.5, 25.1]	5396	15.6[14.2, 17.0]	5396	7.1[6.2, 8.1]	5396	0.6[0.4, 0.9]
Age category		(P = 0.047*)		(P = 0.412)		(P = 0.085)		(P =0.240)
15-19 years	1161	20.6[17.6, 23.7]	1161	15.1[12.4, 18.0]	1161	5.0[3.5, 6.8]	1161	0.5[0.2, 1.0]
20-29 years	1666	24.1[21.4, 27.1]	1666	15.4[13.0, 18.0]	1666	7.9[6.1, 10.1]	1666	0.8[0.3, 1.7]
30-39 years	1537	22.1[19.3, 25.2]	1537	14.5[12.1, 17.1]	1537	7.3[5.9, 9.0]	1537	0.3[0.1, 0.7]
40-49 years	1032	26.7[23.2, 30.4]	1032	17.9[14.6, 21.6]	1032	7.9[6.0, 10.1]	1032	0.9[0.4, 1.6]
Residence		(P <0.001***)		(P = 0.002**)		(P <0.001***)		(P = 0.035*)
Urban	2125	17.7[15.6, 19.8]	2125	12.9[10.9, 15.1]	2125	4.4[3.5, 5.6]	2125	0.3[0.2, 0.6]
Rural	3271	27.6[25.1, 30.2]	3271	17.6[15.8, 19.5]	3271	9.2[7.8, 10.7]	3271	0.8[0.5, 1.4]
Zone		(P = 0.004**)		(P = 0.023**)		(P = 0.026**)		(P = 0.678)
North Central	889	23.5[19.5, 27.8]	889	16.3[13.3, 19.6]	889	6.7[4.8, 9.0]	889	0.4[0.1, 1.1]
North East	868	21.9[18.3, 25.7]	868	12.7[9.9, 15.8]	868	8.9[6.6, 11.5]	868	0.3[0.1, 0.8]
North West	917	25.9[21.8, 30.4]	917	17.1[13.7, 20.9]	917	8.0[5.9, 10.5]	917	0.9[0.3, 2.0]
South East	897	26.1[22.2, 30.2]	897	17.8[14.7, 21.2]	897	7.7[5.3, 10.6]	897	0.6[0.2, 1.5]
South South	904	26.2[22.1, 30.5]	904	18.1[15.3, 21.3]	904	7.4[5.3, 9.9]	904	0.7[0.3, 1.3]
South West	921	16.7[13.6, 20.2]	921	12.2[9.7, 15.0]	921	3.9[2.4, 5.8]	921	0.6[0.3, 1.3]
Wealth quintile		(P <0.001***)		(P = 0.014*)		(P <0.001***)		(P = 0.022*)
Lowest	960	29.9[25.7, 34.3]	960	19.3[15.2, 23.9]	960	9.2[6.9, 11.8]	960	1.5[0.6, 3.0]
Second	900	26.6[22.2, 31.3]	900	18.8[15.0, 23.0]	900	7.4[5.2, 10.1]	900	0.4[0.2, 0.9]
Middle	1113	23.8[21.1, 26.7]	1113	13.3[11.3, 15.6]	1113	9.9 [7.6, 12.6]	1113	0.6[0.2, 1.2]
Fourth	1219	18.3[15.6, 21.2]	1219	13.3[10.9, 16.0]	1219	4.6[3.3, 6.3]	1219	0.4[0.1, 0.8]
Highest	1184	19.7[16.9, 22.7]	1184	14.4[11.8, 17.3]	1184	4.9[3.5, 6.6]	1184	0.4[0.1, 0.9]
Level of education completed		(P = 0.002**)		(P = 0.509)		(P <0.001***)		(P = 0.518)
None	1059	27.1[23.6, 30.8]	1059	15.0[12.4, 17.7]	1059	11.5[9.3, 14.0]	1059	0.6[0.3, 1.3]
Primary	883	24.7[20.9, 28.8]	883	17.1[13.6, 21.0]	883	7.1[5.2, 9.4]	883	0.5[0.2, 1.1]
Secondary	2854	21.7[19.8, 23.6]	2854	15.2[13.5, 16.9]	2854	5.8[4.8, 7.1]	2854	0.6[0.3, 1.2]
Post-secondary	453	17.1[12.9, 21.9]	453	13.2[9.6, 17.4]	453	3.8[2.0, 6.5]	453	0.1[0.0, 0.5]
Not answered	10	33.8[6.6, 72.5]	10	29.8[4.5, 70.4]	10	4.0[0.0, 27.6]	10	0

Anaemia was measured in the field from a venous blood sample using a HemoCue (Hb-301) instrument Non-anaemia in WRA (aged 15-49 years) is defined as Hb≥ 120 g/L
Anaemia in WRA (aged 15-49 years) is defined as mild (110-119 g/L), moderate (80-109 g/L), or severe (< 80 g/L) Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence of anaemia among pregnant women (aged 15-49 years)

The prevalence of anaemia among pregnant women stratified by age, residence, wealth quintile, and level of education completed is shown in Table 232.

a. **Any anaemia:** There was a statistically significant difference in the prevalence of any anaemia among pregnant women (aged 15-49 years) between residence (P < 0.001). The prevalence of any anemia was higher in pregnant women residing in rural (37 percent) versus urban areas (21 percent).

b. **Mild anaemia:** There was a statistically significant difference in the prevalence of mild anaemia among pregnant women (aged 15-49 years) between residence. The prevalence of any anemia was higher in pregnant women residing in rural (26 percent) versus urban areas (15 percent).

c. **Moderate anaemia:** There was no significant variation in the prevalence of moderate anaemia among pregnant women (aged 15-49 years) across the background characteristics.

d. **Severe anaemia:** There was no significant variation in the prevalence of severe anaemia among pregnant women (aged 15-49 years) across the background characteristics.

Table 234. Prevalence of anaemia among pregnant women (aged 15-49 years), Nigeria 2021

Background characteristics	Any anaemia		Mild anaemia		Moderate anaemia		Severe anaemia	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
National	795	31.5[26.4, 36.9]	795	22.2[17.8, 27.1]	795	8.7[6.5, 11.3]	795	0.5[0.2, 1.3]
Age category		(P = 0.818)		(P = 0.626)		(P = 0.332)		(P = 0.847)
15-19 years	69	35.5[21.5, 51.4]	69	22.1[12.0, 35.0]	69	13.4[5.4, 25.8]	69	0
20-29 years	430	29.8[23.4, 36.7]	430	20.9[15.3, 27.4]	430	8.1[5.5, 11.3]	430	0.8[0.2, 2.1]
30-39 years	258	32.5[25.2, 40.5]	258	22.9[16.7, 30.0]	258	9.2[5.6, 14.1]	258	0.4[0.0, 1.8]
40-49 years	38	36.5[14.1, 64.0]	38	33.6[11.5, 62.4]	38	2.9[0.4, 9.6]	38	0
Residence		(P <0.001***)		(P = 0.005**)		(P = 0.060)		(P = 0.439)
Urban	318	20.8[15.6, 26.6]	318	14.9[10.6, 20.0]	318	5.6[2.9, 9.5]	318	0.3[0.0, 1.2]
Rural	477	36.9[30.0, 44.3]	477	26.0[19.9, 32.7]	477	10.3[7.4, 13.8]	477	0.7[0.2, 1.8]
Wealth quintile		(P = 0.081)		(P = 0.325)		(P = 0.081)		(P = 0.315)
Lowest	161	38.3[25.7, 52.2]	161	24.0[14.9, 35.1]	161	12.5[6.9, 20.1]	161	1.8[0.4, 4.9]
Second	139	27.7[18.6, 38.2]	139	18.6[11.0, 28.3]	139	9.1[4.9, 14.8]	139	0
Middle	142	39.7[28.1, 52.1]	142	28.3[18.2, 40.1]	142	11.0[6.0, 17.8]	142	0.5[0.0, 2.2]
Fourth	178	28.6[19.5, 39.1]	178	24.3[15.6, 34.7]	178	4.4[1.9, 8.3]	178	0
Highest	173	19.9[14.2, 26.6]	173	15.0[9.9, 21.3]	173	4.9[2.1, 9.2]	173	0
Level of education completed		(P = 0.173)		(P = 0.205)		(P = 0.623)		(P = 0.607)
None	165	33.4[23.5, 44.5]	165	25.7[16.0, 37.3]	165	7.4[4.1, 12.0]	165	0.4[0.0, 1.7]
Primary	122	39.0[27.7, 51.1]	122	25.8[16.6, 36.5]	122	11.7[5.9, 19.9]	122	1.5[0.1, 6.6]
Secondary	415	28.9[22.8, 35.6]	415	19.1[14.2, 24.7]	415	9.4[6.2, 13.3]	415	0.5[0.1, 1.5]
Post-secondary	68	17.3[8.7, 29.2]	68	10.4[3.7, 21.5]	68	7.0[1.9, 16.6]	68	0
Not answered	2	42.2[NA, NA]	2	42.2[NA, NA]	2	0	2	0

Anaemia was measured in the field from a venous blood sample using a HemoCue (Hb-301) instrument Non-anaemia in pregnant women is defined as Hb≥ 110 g/L
Anaemia in pregnant women is defined as mild (100-109 g/L), moderate (70-99 g/L), or severe (< 70 g/L) Data are weighted to account for survey design and non-response
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, ** signifies P <0.01, *** signifies P <0.001).

Prevalence, severity, and distribution of specific micronutrient deficiencies

Box 19. Key Findings on Micronutrient Status of Children (aged 6-59 months), Adolescent Girls (10-14 years) and Women of Reproductive Age (15-49 years)

Iron deficiency and iron deficiency anaemia

Children (6-59 months old): Nationally, the unadjusted prevalence of iron deficiency in children (aged 6-59 months) was 10 percent, while the adjusted prevalence was 21 percent and significantly different by age (36 percent in 12-23 months and 8 percent in 48-59 months), zone (28 percent in North East and 9 percent in South South), and level of education completed by caregiver (27 percent among those with no education and 18 percent among those with tertiary education). There was a statistically significant difference in the percentage of children (aged 6-59 months) with iron deficiency anemia by age (17 percent among 12-23 months and 1 percent among 48-59 months), zone (13 percent in North West and 4 percent in South South), and wealth (11 percent among poor and 6 percent among rich).

Adolescent girls (10-14 years old): The unadjusted prevalence of iron deficiency in adolescent girls (aged 10- 14 years) was 3 percent, while the adjusted prevalence was 4 percent. There was no significant variation in the percentage of adolescent girls with iron deficiency anemia across the background characteristics.

Women of reproductive age (15-49 years old): The unadjusted prevalence of iron deficiency in women of reproductive age (aged 15-49 years) was 7 percent, while the adjusted prevalence was 10 percent. There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years), with iron deficiency between zone (16 percent in North East and 5 percent in South West), wealth quintiles (8 percent among poor and 13 percent among rich), and use of iron/folic acid supplement in the last 7 days prior to the survey (7 percent among those who used supplement and 10 percent among those who did not use it). There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years), with iron deficiency anemia between zone (6 percent in North East and 2 percent in South West).

Pregnant women (15-49 years old: The unadjusted prevalence of iron deficiency in pregnant women (aged 15-49 years) was about 11 percent, while the adjusted prevalence was about 26 percent. There was no significant variation in the percentage of pregnant women (aged 15-49 years) with iron deficiency or with iron deficiency anemia across the background characteristics.

Vitamin A

Children (6-59 months old): Nationally, the unadjusted prevalence of vitamin A deficiency in children (aged 6-59 months) was 54 percent, while the adjusted prevalence was 31 percent. Significant differences were observed based on serum retinol for age (34 percent among 36-47 months and 24 percent among 6-11 months), sex (34 percent among males and 29 percent among females), residence (34 percent in rural and 26 percent in urban), zone (51 percent in North West and 6 percent in South East), wealth (40 percent among poor and 21 percent among rich) and level of education completed by caregiver (37 percent among those with no education and 22 percent among those with tertiary education). In addition, there was a statistically significant difference in the percentage of children (aged 6-59 months) with vitamin A deficiency based on MRDR by age (3 percent among 24-35 months and 0.2 percent among 48-59 months) and residence (1.8 percent in rural and 0.1 percent in urban).

Adolescent girls (10-14 years old): The unadjusted prevalence of vitamin A deficiency in adolescent girls (aged 10-14 years) was 32 percent, while the adjusted prevalence was 24 percent. There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years) with vitamin A deficiency between wealth quintiles (37 percent among poor and 11 percent among rich).

Women of reproductive age (15-49 years old): 12 percent of women of reproductive age (aged 15-49 years) were vitamin A deficient based on serum retinol, while the prevalence based on Modified Relative Dose Response (MRDR) was 0 percent. There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with vitamin A deficiency based on serum retinol by residence (15 percent in rural and 7 percent in urban), zone (22 percent in North West and 3 percent in South East), wealth (19 percent among poor and 5 percent among rich), level of education completed (15 percent among those with no education and 5 percent among those who completed post-secondary education), and use of multivitamin supplement in the last 6 months prior to the survey (12 percent among non-users and 8 percent among users). There was no significant variation in the prevalence of vitamin A deficiency based on MRDR among women of reproductive age (aged 15-49 years) across the background characteristics.

Pregnant women (15-49 years old: The prevalence of vitamin A deficiency in pregnant women (aged 15-49 years) based on serum retinol was 22 percent. There was no significant variation in the percentage of pregnant women (aged 15-49 years) with vitamin A deficiency across the background characteristics.

Vitamin B12

Children (6-59 months old): Nationally, vitamin B12 deficiency in children (aged 6-59 months) was low (3 percent). There was a statistically significant difference in the percentage of children with vitamin B12 insufficiency (<220 pmol/L) by age (23 percent among 6-11 months and 9 percent among 36-47 months), residence (17 percent in rural and 4 percent in urban), zone (19 percent in North West, North East and 1 percent in South South), wealth (24 percent among poor and 2 percent among rich) and level of education completed by caregiver (19 percent among those with no education and 5 percent among those with tertiary education). Similarly, there were significant differences in children with vitamin B12 deficiency ((at risk of megaloblastic anaemia) and defined as serum B12 concentration <148 pmol/L) by age category (8 percent among 6-11 months and 1 percent among 36-47 months), residence (4 percent in rural and 0.1 percent in urban), zone (5 percent in North West and 0 percent in South West), wealth (6 percent among poor and 0.2 percent among rich), and level of education completed by caregiver (4 percent among those with no education and 0.5 percent among those with tertiary education).

Adolescent girls (10-14 years old): The prevalence of vitamin B12 deficiency was low (2 percent). Significant differences in vitamin B12 insufficiency were observed for residence (11 percent rural and 2 percent urban) and wealth (13 percent among poor and 2 percent among rich) and by residence (3 percent in rural and 0.3 percent in urban) for vitamin B12 deficiency.

Women of reproductive age (15-49 years old): The prevalence of vitamin B12 deficiency was low (2 percent). Significant differences in the percentage of women of reproductive age (aged 15-49 years) with vitamin B12 insufficiency were observed between residence (14 percent rural and 3 percent urban), zone (21 percent in the North East and 0.5 percent in South West), wealth (19 percent among poor and 1 percent among rich), level of education completed (19 percent among those with no education and 2 percent among those with pose secondary education), and use of the multivitamin supplement in the last 6 months prior to the survey 10 percent among those who did not use and 5 percent among those who used a multivitamin supplement). There was a significant difference in the percentage of women of reproductive age (aged 15-49 years) with vitamin B12 deficiency between residence (2 percent in rural and 0.6 percent in urban), zone (4 percent in North East and 0 percent in South West), wealth (4 percent among poor and 02 percent among rich), and level of education completed (4 percent among those with no education and 0.2 percent among those with post-secondary education).

Pregnant women (15-49 years old: The prevalence of vitamin B12 deficiency was 12 percent. Vitamin B12 insufficiency: There was a statistically significant difference in the percentage of pregnant women (aged 15-49 years) with vitamin B12 insufficiency between age categories (46 percent in 15-19 years and 5 percent in 40-49 years), residence (40 percent in rural and 17 percent in urban), wealth (52 percent among poor and 10 percent among rich), and level of education completed 47 percent among those with no education and 10 percent among those with post-secondary education). Similarly, significant differences in the percentage of pregnant women (aged 15-49 years) with vitamin B12 deficiency were observed for age (18 percent among 30-39 years and 4 percent among 40-49 years), residence (16 percent in rural and 4 percent in urban), wealth (24 percent among poor and 2 percent among rich), and level of education completed (23 percent among those with no education and 2 percent among those with post-secondary education).

Zinc deficiency

Children (6-59 months old): Nationally, zinc deficiency in children (aged 6-59 months) was 35.2 percent. There was a statistically significant difference in the percentage of children (aged 6-59 months) with zinc deficiency between residence (41 percent in rural and 24 percent in urban), zone (57 percent in North West and 12 percent in South East), wealth (45 percent among poor and 23 percent among rich) and level of education completed by caregiver (42 percent among those with no education and 20 percent among those with tertiary education).

Adolescent girls (10-14 years old): The percentage of adolescent girls (aged 10-14 years) with zinc deficiency was 34 percent nationally. Significant differences in the percentage of adolescent girls (aged 10-14 years), with zinc deficiency were observed for residence (41 percent in rural and 23 percent in urban), and wealth (43 percent among poor and 20 percent among the rich).

Women of reproductive age (15-49 years old): 35 percent of women of reproductive age were zinc deficient nationally. There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with zinc deficiency between age categories (38 percent among 20-29 years and 34 percent among 40-49 years), residence (41 percent in rural and 27 percent in urban), zone (60 percent in North West and 16 percent in South East), wealth (49 percent among poor and 25 percent among rich), level of education completed (49 percent among those with no education and 23 percent among those with post-secondary education), and use of multivitamin supplement in the last 6 months prior to the survey (36 percent among those who did not use and 27 percent among those who used a multivitamin supplement).

Folate

Adolescent girls (10-14 years old): The percentage of adolescent girls with folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 91 percent. There was no significant variation in the percentage of adolescent girls with RBC folate deficiency across the background characteristics. In addition, there was no significant variation in the percentage of adolescent girls with serum folate deficiency at risk of elevated homocysteine or risk of megaloblastic anaemia across the background characteristics.

Women of reproductive age (15-49 years old): The prevalence of folate deficiency based on analysis of serum folate was 47 percent for the risk of elevated homocysteine and 23 percent for the risk of megaloblastic anaemia. There was no significant variation in the percentage of women of reproductive age with serum folate deficiency at risk of elevated homocysteine and megaloblastic anaemia across the background characteristics. Folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 95 percent.

There were significant differences in the percentage of women of reproductive age (aged 15-49 years) with RBC folate insufficiency (RBC folate concentration <748 nmol/L) by age (97 percent among 15-19 years and 94 percent among 40-49), residence (97 percent in rural and 94 percent in urban), zone (99 percent in North East, North West and 87 percent in South West), wealth (99 percent among poor and 93 percent among rich), level of education completed (99 percent among those with no education and 92 percent among those who completed post-secondary education), and use of iron/folic acid supplement in the last 6 months prior to the survey (91 percent among those who used and 96 percent among those who did not use). In addition, there was a significant difference in the percentage of women of reproductive age (aged 15-49 years) with RBC folate deficiency (RBC folate concentration <624 nmol/L) between residence (94 percent in rural and 88 percent in urban), zone (98 percent in North East and 77 percent in South West), wealth (97 percent among poor and 85 percent among rich), level of education completed (97 percent among those with no education and 82 percent among those who completed post-secondary education), and use of iron/folic acid supplement in the last 6 months prior to the survey (83 percent among those who used and 93 percent among those who did not use).

Pregnant women (15-49 years old): The prevalence of folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 85 percent, while serum folate deficiency **(**risk of elevated homocysteine**)** was 43 percent and serum folate deficiency **(**risk of megaloblastic anemia**)** was 20 percent. There was a statistically significant difference in the percentage of pregnant women with serum folate deficiency at risk of elevated homocysteine by residence (47 percent in rural and 38 percent in urban). Similarly, there was a significant difference in the percentage of pregnant women at risk of megaloblastic anaemia by residence (23 percent in rural and 15 percent in urban). There was a statistically significant difference in the percentage of pregnant women (aged 15-49 years) with RBC folate deficiency by residence (89 percent in rural and 77 percent in urban), wealth (93 percent among poor 70 percent among rich), and level of education completed (95 percent among those with no formal education and 61 percent among those who completed post-secondary education).

Vitamin B1

Women of reproductive age (15-49 years old): The percentage of women of reproductive age (aged 15-49 years) at high risk of vitamin B1 deficiency was 2 percent. There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) who are at low risk and moderate risk of vitamin B1 deficiency by the level of education completed

(75 percent among those with no education and 83 percent among those who completed post-secondary education for low risk), and those at moderate risk (23 percent among those with no education and 16 percent among those who completed post-secondary education for moderate risk). There was no significant variation in the prevalence of high-risk of vitamin B1 deficiency among women of reproductive age (aged 15-49 years) across the background characteristics.

Vitamin B2

Women of reproductive age (15-49 years old): *The prevalence* of vitamin B2 deficiency was 79 percent. There was a statistically significant difference in the prevalence of vitamin B2 deficiency among women of reproductive age (aged 15-49 years) between residence (82 percent in rural and 74 percent in urban), and level of education completed (85 percent among those with no education and 67 percent among those who completed post-secondary education).

Iodine

Non-lactating women of reproductive age (aged 15-49 years): Overall, the median urinary iodine was 292.7 µg/L and differed by age (337 µg/L among 15-19 years and 263 µg/L among 40-49 years), residence (258 µg/L in rural and 332 µg/L in urban), zone (423 µg/L in South West and 248 µg/L in North West), wealth (234 µg/L among poor and 346 µg/L among rich), and level of education completed (240 µg/L among those with no education and 316 µg/L among those who completed post-secondary education).

Lactating women of reproductive age (aged 15-49 years): The overall median level of urinary iodine among lactating women of reproductive age (aged15-49 years) was 217.6 µg/L. There was a statistically significant difference in the urinary iodine concentrations of lactating women of reproductive age (aged 15-49 years) by age (279 µg/L among 15-19 years and 190 µg/L among 40-49 years), residence (261 µg/L in urban and 202 µg/L in rural), zone (163 µg/L in North West and 372 µg/L in South West), wealth (180 µg/L among poor and 282 µg/L among rich), and level of education completed (182 µg/L among those with no education and 314 µg/L among those with post-secondary education).

Pregnant women (15-49 years old): The overall median level of urinary iodine among pregnant women was 237.5 µg/L. There was a significant difference in the urinary iodine concentrations of pregnant women (aged 15-49 years) by wealth (277 µg/L among the rich and 185 µg/L among the poor).

Micronutrient deficiencies cause morbidity and mortality in individuals, affecting human potential globally. Deficiencies in iron, zinc, folate, vitamin A, B1, B2, B12 and iodine can each have severe consequences, including increased susceptibility to infections, birth defects, blindness, reduced growth, cognitive impairment, decreased school performance and work productivity, and even death (Stevens, 2022). Adolescent girls (aged 10-14 years), women of reproductive age (aged 15-49 years), pregnant and lactating women (aged 15-49 years), and young children (aged 6-59 months) are particularly susceptible to the effects of micronutrient malnutrition due to high requirements and were the focus of the National Food Consumption and Micronutrient Survey (NFCMS), 2021.

Unfortunately, the global prevalence and number of people with micronutrient deficiencies is not well quantified. This is partially because most micronutrient deficiencies remain undiagnosed due to unclear specific symptoms and biomarkers for micronutrient status are rarely included in population-based surveys, which has left an important evidence gap on the burden of micronutrient malnutrition within countries and worldwide (Stevens, 2022). The NFCMS 2021 is therefore a ground-breaking population survey, closing the data gap in Nigeria and providing crucial insights for improving nutrition in the country.

A primary objective for the survey (objective 4) was to estimate the prevalence, severity, and distribution of specific micronutrient deficiencies among the survey target groups as shown in **Figure 66.**

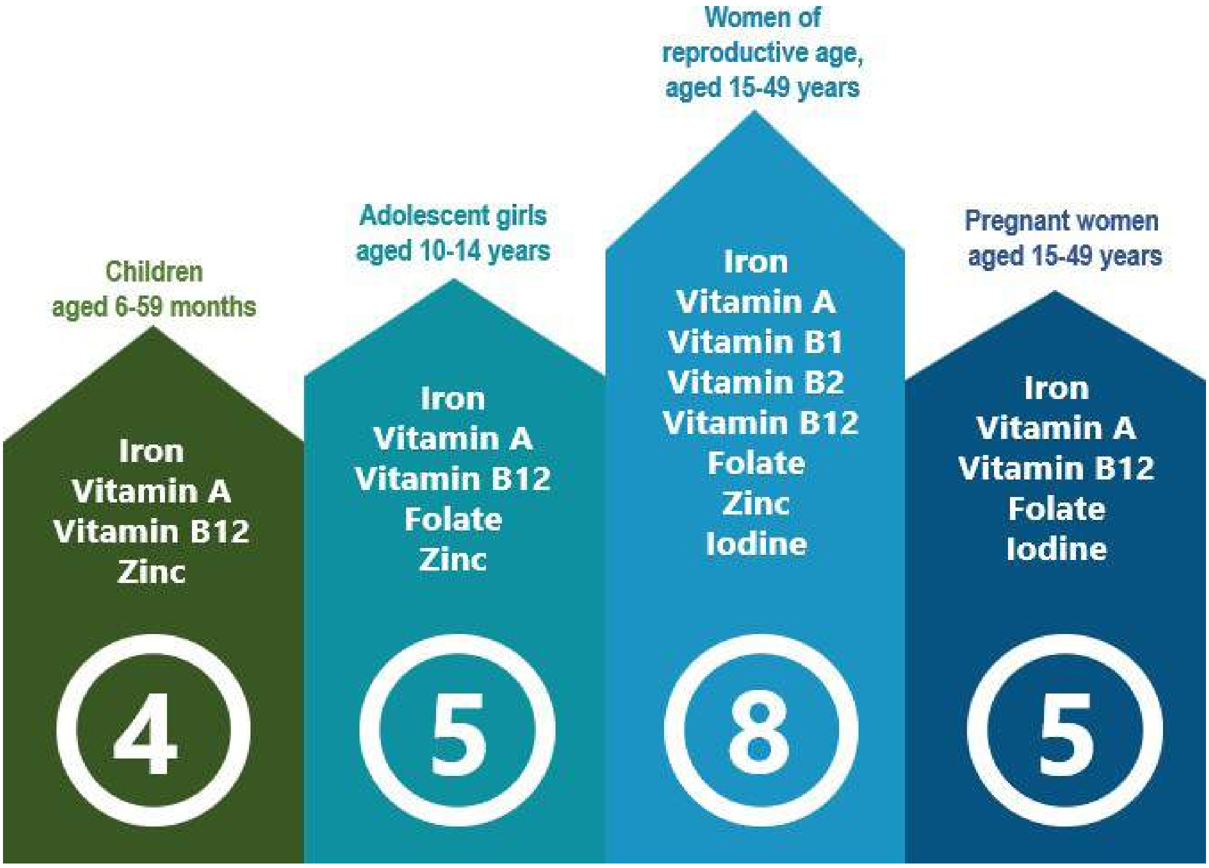


Figure 66. Micronutrient status assessed in the survey by target group, Nigeria

Iron deficiency and Iron deficiency anemia: Iron deficiency is a common nutritional deficiency characterized by a depletion of iron stores in the body, which impairs the production of hemoglobin and subsequently affects the oxygen-carrying capacity of red blood cells. Iron is an essential element involved in various metabolic processes, including oxygen transport, DNA synthesis, and energy production. When the body does not have enough iron, it cannot produce enough hemoglobin, a protein in red blood cells that carries oxygen to tissues.

Vitamin A deficiency: Vitamin A deficiency is a nutritional deficiency characterized by insufficient levels of vitamin A, an essential micronutrient necessary for various physiological functions such as vision, immune system support, cellular differentiation, and growth. Vitamin A deficiency is particularly concerning in children and pregnant women, as it plays a crucial role in growth and development. One of the most notable manifestations of vitamin A deficiency is night blindness, where an individual finds it difficult to see in low light conditions.

Vitamin A deficiency was assessed based on serum retinol for all target groups and Modified Relative Dose Response (MRDR) in a 20% sub-sample of children (aged 6-59 months) and women of reproductive age (15-49 years). Serum retinol levels provide information on current vitamin A levels in the blood, while the MRDR test provides insight into the liver's vitamin A reserves and how efficiently the body can mobilize and use this essential nutrient. During the MRDR test, a small amount of 3,4-didehydroretinol is administered, and the increase in its serum concentration relative to retinol is measured. If the ratio is high, it indicates low liver vitamin A stores, signifying a deficiency. Thus, serum retinol and MRDR are linked in their capacity to assess vitamin A status in the body.

Vitamin B1: B1 deficiency, also known as thiamine deficiency, occurs when there is inadequate intake or absorption of vitamin B1 (thiamine). Thiamine is an essential nutrient that plays a critical role in energy metabolism by helping to convert carbohydrates into energy that the body can use. It is also involved in the proper functioning of the nervous system. If the deficiency is severe, it can lead to beriberi, a condition characterized by damage to the nervous system and heart.

Vitamin B2: B2 deficiency, also known as riboflavin deficiency, occurs when there is an inadequate intake or absorption of vitamin B2 (riboflavin). Riboflavin is an essential vitamin that plays a key role in energy metabolism and the functioning of antioxidants in the body. It acts as a precursor for the coenzymes flavin adenine dinucleotide (FAD) and flavin mononucleotide (FMN), which are vital for the metabolism of carbohydrates, fats, and proteins.

Vitamin B12: Vitamin B12 deficiency is a condition characterized by insufficient levels of vitamin B12, a water-soluble vitamin that is crucial for the normal functioning of the brain, and nervous system, and the formation of red blood cells. It also plays a critical role in DNA synthesis and methylation, as well as the metabolism of fatty acids and amino acids. Vitamin B12 insufficiency refers to the early stage of inadequate vitamin B12 levels in the body, where stores are diminishing but not yet critically low. When the depletion progresses to a vitamin B12 deficiency, the levels are too low to support normal cell metabolism, particularly affecting rapidly dividing cells like those in the bone marrow. This leads to the production of abnormally large and immature red blood cells, a condition known as megaloblastic anemia.

Folate deficiency: Serum folate deficiency refers to low levels of folate in the bloodstream, which can have two significant health implications: the risk of elevated homocysteine levels and the risk of megaloblastic anemia. Folate is essential for the metabolism of homocysteine, an amino acid. Specifically, it acts as a coenzyme in the conversion of homocysteine to methionine. When serum folate levels are low, this conversion process is impaired, leading to an accumulation of homocysteine in the blood, known as hyperhomocysteinemia. Elevated homocysteine levels are associated with an increased risk of cardiovascular diseases and have been implicated in neurodegenerative disorders. On the other hand, folate is also crucial for the synthesis of DNA and RNA, which are essential for the production and maturation of red blood cells. When there is a deficiency of folate, the production of DNA and RNA is hampered, leading to the formation of abnormally large and immature red blood cells, a condition known as megaloblastic anemia. Both elevated homocysteine and megaloblastic anemia are serious consequences of serum folate deficiency and underscore the importance of maintaining adequate folate levels for optimal health.

Serum folate levels reflect the amount of folate present in the blood at a given time and can fluctuate based on recent dietary intake. Red Blood Cells (RBC) folate levels are indicative of the folate stored within the red blood cells. Since red blood cells have a lifespan of about 120 days, the RBC folate levels provide a more long-term view of folate status in the body as well as the status of other micronutrients needed to transform folic acid/dietary folate into actively metabolic folate. RBC folate deficiency implies that there has been a chronic lack of folate, affecting the incorporation of folate into the red blood cells during their synthesis in the bone marrow.

In women of reproductive age, RBC folate insufficiency may indicate risk of neural tube defects in offspring. Folate is essential for the proper development of the neural tube during the early stages of pregnancy. The neural tube is the embryonic structure that eventually develops into the brain and spinal cord. When there is insufficient folate, the neural tube may not close properly, leading to neural tube defects such as spina bifida and anencephaly. Low RBC folate levels suggest that the body's stores of folate are depleted, which is a concern especially during early pregnancy when the neural tube is developing. Adequate folate levels are crucial before conception and during the first few weeks of pregnancy to reduce the risk of neural tube defects. Low RBC folate levels may also suggest other inadequacies than constraint the transformation of folic acid/dietary folate into metabolically active folate.

Zinc deficiency: Zinc deficiency is a nutritional deficiency that occurs when there is an inadequate intake or absorption of zinc, an essential trace element. Zinc plays a vital role in various physiological functions, including immune response, cell growth, DNA synthesis, wound healing, and enzymatic reactions. It is also crucial for proper growth and development during pregnancy, childhood, and adolescence.

Iodine deficiency: Iodine deficiency is a nutritional deficiency characterized by inadequate intake of iodine, an essential trace element that is vital for the synthesis of thyroid hormones, thyroxine (T4) and triiodothyronine (T3). These hormones are crucial for the regulation of metabolism, growth, and development. Iodine deficiency is particularly detrimental during pregnancy and infancy, as thyroid hormones are critical for brain development. When there is insufficient iodine intake, the thyroid gland may not be able to produce adequate amounts of thyroid hormones, leading to hypothyroidism. A common manifestation of iodine deficiency is goiter, an enlargement of the thyroid gland as it attempts to capture more iodine from the blood. In pregnant women, iodine deficiency can lead to cretinism in the child, which is characterized by intellectual disability, delayed physical development, and other abnormalities. This section estimates the **population iodine status** based on median urinary iodine concentration using casual urine sample collection.

Micronutrient status of children (aged 6-59 months)

Figure 67 presents the overall prevalence of micronutrient deficiencies among children (aged 6-59 months). The prevalence of vitamin B12 deficiency was low (3 percent). The percentage of children (aged 6-59 months) with zinc deficiency was 36 percent nationally. Correction for inflammation was applied to both serum ferritin (iron status) and serum retinol (vitamin A status). The unadjusted prevalence of iron deficiency in children (aged 6-59 months) was 10 percent, while the adjusted prevalence was 21 percent. The unadjusted prevalence of vitamin A deficiency in children (aged 6-59 months) was 54 percent, while the adjusted prevalence was 31 percent.

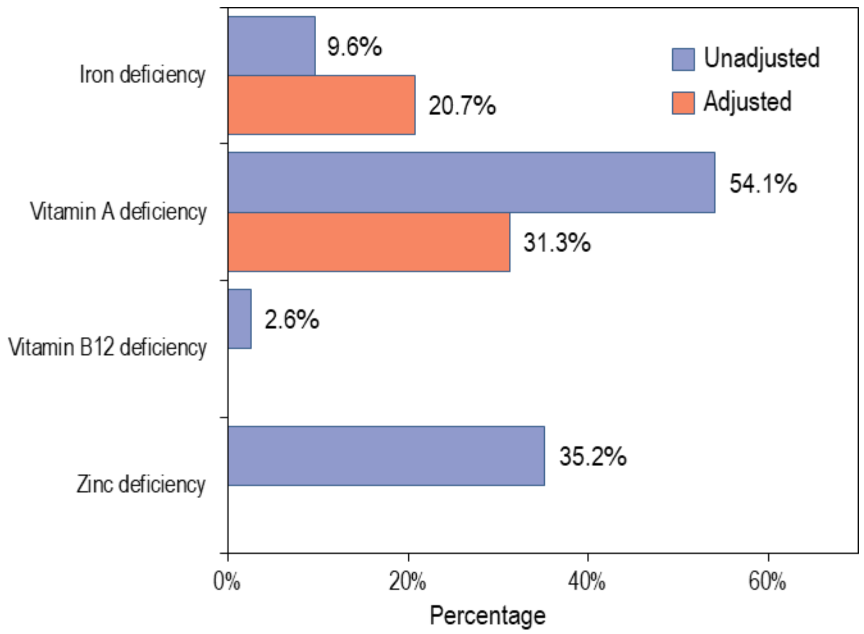


Figure 67: Prevalence of micronutrient deficiencies for children (aged 6-59 months), Nigeria 2021
Iron deficiency is defined as serum ferritin <12µg/L, adjusted for inflammation
Vitamin A deficiency is defined as serum retinol <0.70 µmol/L, using BRINDA adjusted serum retinol Vitamin B12 deficiency (risk of megaloblastic anemia) is defined as serum B12 concentration <148 pmol/L.
Zinc deficiency is defined as serum zinc concentration <65 µg/dL (for morning blood collection, non-fasting samples). Estimates calculated using weights that account for survey design and non-response.

Iron deficiency and Iron deficiency anemia among children aged 6-59 months

Table 235 presents inflammation-corrected iron deficiency and iron deficiency anemia for children (aged 6-59 months), stratified by age category, sex, residence, zone, wealth quintile, level of education completed by caregiver and use of iron and micronutrient powder in the last six months prior to the survey.

There was a statistically significant difference in the percentage of children (aged 6-59 months) with iron deficiency between age category (P < 0.001), zone (P < 0.001), and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) with iron deficiency was highest among children in the 12-23-months age category (36 percent). It was highest among children in the North East zone (28 percent). It was highest among children whose caregivers had no formal education (27 percent).

There was a statistically significant difference in the percentage of children (aged 6-59 months) with iron deficiency anemia between age category (P < 0.001), zone (P < 0.001), and wealth quintiles (P < 0.001). The percentage of children (aged 6-59 months) with iron deficiency anemia was highest among children in the 12-23-months age category (17 percent). It was highest among children in the North West zone (13 percent) and among children in households in the second wealth quintile (11 percent).

Table 235: Prevalence of iron deficiency and iron deficiency anemia in children (aged 6-59 months), Nigeria 2021.

Background characteristics	Iron deficiency		Iron deficiency Anemia	
	N	% [95% CI]	N	% [95% CI]
National	4504	20.7[18.5, 23.0]	4453	8.4[7.0, 10.0]
Age category		P <0.001***		P<0.001***
6-11 months	453	30.6[25.8, 35.7]	449	14.2[10.2, 19.1]
12-23 months	1010	35.5[31.3, 40.0]	994	16.8[13.4, 20.6]
24-35 months	1151	19.5[16.1, 23.2]	1135	7.7[5.4, 10.7]
36-47 months	1105	11.6[8.8, 14.8]	1098	3.4[2.0, 5.4]
48-59 months	785	7.9[5.0, 11.7]	777	1.0[0.3, 2.4]
Sex		P = 0.519		P = 0.138
Male	2262	21.2[18.4, 24.2]	2239	9.3[7.5, 11.2]
Female	2242	20.2[17.7, 22.8]	2214	7.6[5.8, 9.6]
Residence		P = 0.675		P = 0.078
Urban	1810	20.0[16.6, 23.7]	1794	6.4[4.2, 9.3]
Rural	2694	21.0[18.3, 24.0]	2659	9.5[7.8, 11.4]
Zone		P <0.001***		P <0.001***
North Central	714	20.7[14.7, 27.7]	703	8.0[5.8, 10.6]
North East	792	27.9[23.2, 33.1]	781	7.5[4.9, 10.7]
North West	866	25.5[20.8, 30.5]	844	13.0[9.8, 16.6]
South East	684	11.5[8.7, 14.7]	680	3.8[2.3, 5.9]
South South	697	9.4[7.0, 12.2]	696	4.0[2.5, 6.1]
South West	751	10.8[8.0, 14.1]	749	4.4[2.7, 6.8]
Wealth quintile		P = 0.063		P = 0.025*
Lowest	866	21.7[18.4, 25.2]	852	10.2[8.1, 12.6]
Second	784	24.5[18.9, 30.7]	770	10.6[7.0, 15.0]
Middle	833	19.8[16.6, 23.4]	827	8.9[6.4, 11.8]
Fourth	1035	19.3[16.3, 22.5]	1027	5.9[4.1, 8.0]
Highest	967	16.4[13.1, 20.2]	958	5.5[3.4, 8.3]
Level of education completed by caregiver		P <0.001***		P = 0.084
None	1048	27.4[23.7, 31.4]	1034	11.3[8.8, 14.2]
Primary	708	17.4[12.9, 22.5]	705	7.5[3.9, 12.9]
Secondary	2201	18.1[15.3, 21.1]	2180	7.1[5.3, 9.2]
Tertiary	385	18.1[11.9, 25.7]	381	6.2[2.9, 11.2]
Use of iron and micronutrient powder in last 6 months		P = 0.211		P = 0.367
Yes	101	27.8[19.9, 36.8]	99	12.0[5.9, 20.8]
No	1325	34.5[30.9, 38.2]	1310	16.5[13.5, 19.8]

Iron deficiency is defined as serum ferritin concentration <12µg/L, adjusted for inflammation
Iron deficiency anemia is defined as serum ferritin concentration <12µg/L, adjusted for inflammation and adjusted haemoglobin <11 g/dL
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted)

Vitamin A deficiency among children aged 6-59 months

Vitamin A deficiency among children (aged 6-59 months) was assessed based on serum retinol and Modified Relative Dose Response (MRDR) in 20% sub-sample of children (aged 6-59 months).

Table 236 presents inflammation-corrected vitamin A deficiency based on serum retinol for children (aged 6-59 months) and Modified Relative Dose Response (MRDR) in a sub-sample of children (aged 6-59 months), stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver. **Figure 68** present the distribution of MRDR values for children (aged 6-59 months) while **Figure 69** presents MRDR against serum retinol values, with vitamin A deficiency defined as serum retinol < 0.7 μmol/L or MRDR ≥ 0.06 for children aged 6-59 months.

Serum retinol: There was a statistically significant difference in the percentage of children (aged 6-59 months) with vitamin A deficiency based on serum retinol between age category (P < 0.046), sex (P = 0.020), residence (P = 0.035), zone (P < 0.001), wealth quintiles (P < 0.001) and level of education completed by caregiver (P = 0.001). The percentage of children (aged 6-59 months) with vitamin A deficiency was highest among children in the 36-47 months age category (34 percent). It was higher among male (34 percent) versus female (29 percent) and among children residing in rural (34 percent) versus urban areas (26 percent). It was highest among children in the North West zone (51 percent). It was lowest among children in households in the highest wealth quintile (21 percent). It was highest among children whose caregivers had no formal education (37 percent).

MRDR: There was a statistically significant difference in the percentage of children (aged 6-59 months) with vitamin A deficiency based on MRDR between age category (P = 0.028) and residence (P = 0.003). The percentage of children (aged 6-59 months) with vitamin A deficiency was highest among children in the 24-35 age category and higher among children residing in rural (1.8 percent) versus urban areas (0.1 percent).

Table 236: Prevalence of vitamin A deficiency in children (aged 6-59 months), Nigeria 2021.

Background characteristics	Vitamin A deficiency (Serum retinol)		Vitamin A deficiency (MRDR)	
	N	% [95% CI]	N	% [95% CI]
National	4438	31.3[27.7, 35.1]	1070	1.2[0.4, 2.6]
Age category		P = 0.046*		P = 0.028*
6-11 months	447	23.7[18.8, 29.0]	107	0.5[0.0, 2.0]
12-23 months	992	33.0[27.9, 38.3]	217	2.0[0.5, 5.2]
24-35 months	1138	31.0[26.3, 36.0]	245	2.7[0.5, 7.9]
36-47 months	1087	33.7[28.8, 38.9]	285	0.5[0.1, 1.2]
48-59 months	774	31.0[25.6, 36.9]	216	0.2[0.0, 0.8]
Sex		P = 0.020*		P = 0.415
Male	2228	33.9[29.3, 38.7]	611	1.4[0.4, 3.4]
Female	2210	28.7[25.0, 32.7]	459	0.9[0.2, 2.3]
Residence		P = 0.035*		P = 0.003**
Urban	1774	25.5[19.9, 31.8]	456	0.1[0.0, 0.6]
Rural	2664	34.4[29.8, 39.2]	614	1.8[0.6, 4.1]
Zone		P <0.001***		P = 0.288
North Central	713	15.5[9.3, 23.6]	153	0.9[0.0, 4.2]
North East	786	31.7[24.5, 39.5]	161	0.6[0.1, 1.8]
North West	866	50.6[43.4, 57.7]	156	2.4[0.4, 7.4]
South East	675	6.1[3.8, 9.2]	224	2.5[0.9, 5.4]
South South	686	18.8[12.3, 26.7]	205	0
South West	712	18.5[14.3, 23.4]	171	0
Wealth quintile		P <0.001***		P = 0.147
Lowest	862	39.9[34.0, 46.1]	157	0
Second	775	36.8[30.6, 43.2]	167	2.9[0.6, 8.0]
Middle	821	31.7[26.6, 37.1]	197	2.3[0.3, 8.2]
Fourth	1014	23.3[18.7, 28.5]	264	0.3[0.0, 1.5]
Highest	947	21.0[12.7, 31.3]	277	0.3[0.0, 1.2]
Level of education completed by caregiver		P = 0.001**		P = 0.618
None	1043	36.6[31.5, 42.0]	192	0.8[0.0, 3.4]
Primary	703	25.6[21.2, 30.5]	178	0.9[0.2, 2.2]
Secondary	2158	29.2[24.8, 33.9]	539	1.6[0.4, 3.9]
Tertiary	373	21.9[14.6, 30.7]	125	0
Use of iron and micronutrient powder in last 6 months		P = 0.475		P = 0.543
Yes	288	28.5[20.3, 37.7]	66	0
No	4044	31.8[28.1, 35.8]	978	1.3[0.5, 2.9]

Vitamin A deficiency defined as serum retinol concentration <0.7 µmol/L using BRINDA adjusted serum retinol
Vitamin A deficiency defined as Modified Relative Dose Response (MRDR) ≥0.060. Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted).

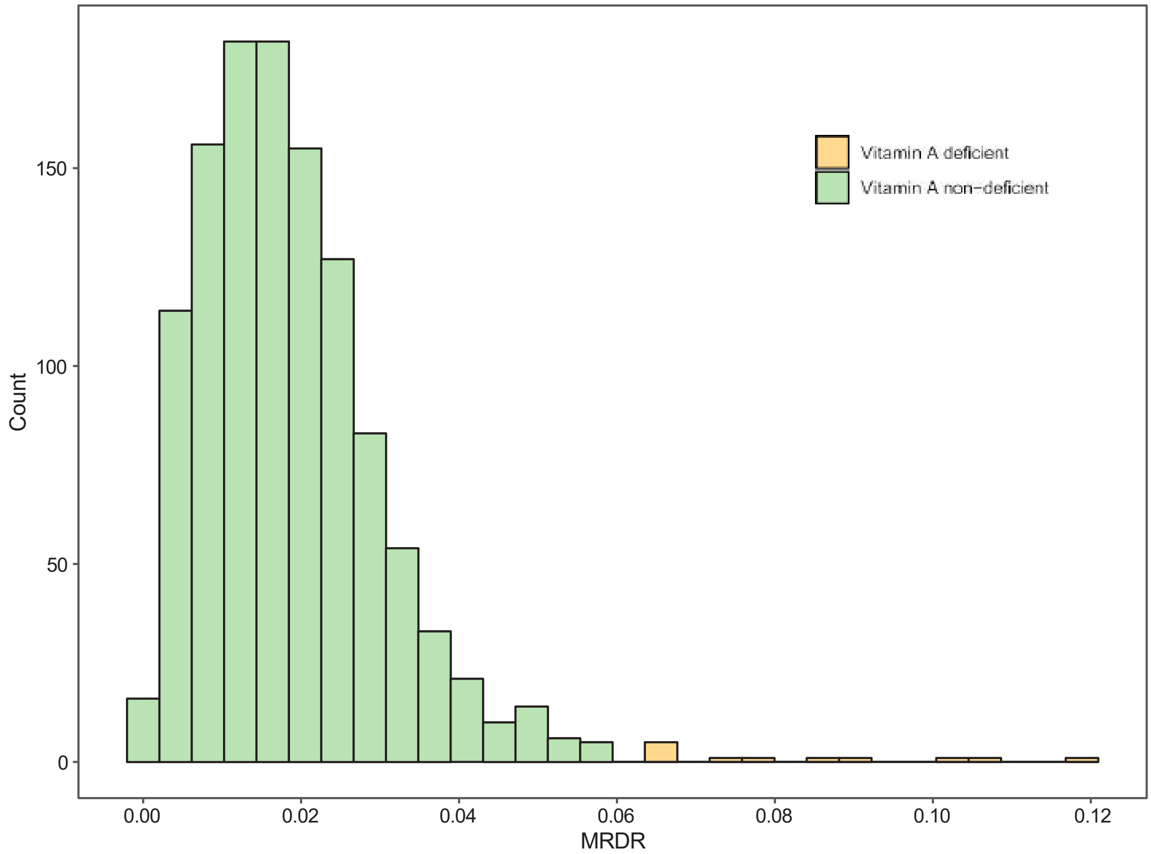


Figure 68: Distribution of MRDR values for children (aged 6-59 months), Nigeria 2021
Vitamin A deficiency is defined as Modified Relative Dose Response (MRDR) ≥0.060.
Data are weighted to account for survey design and non-response

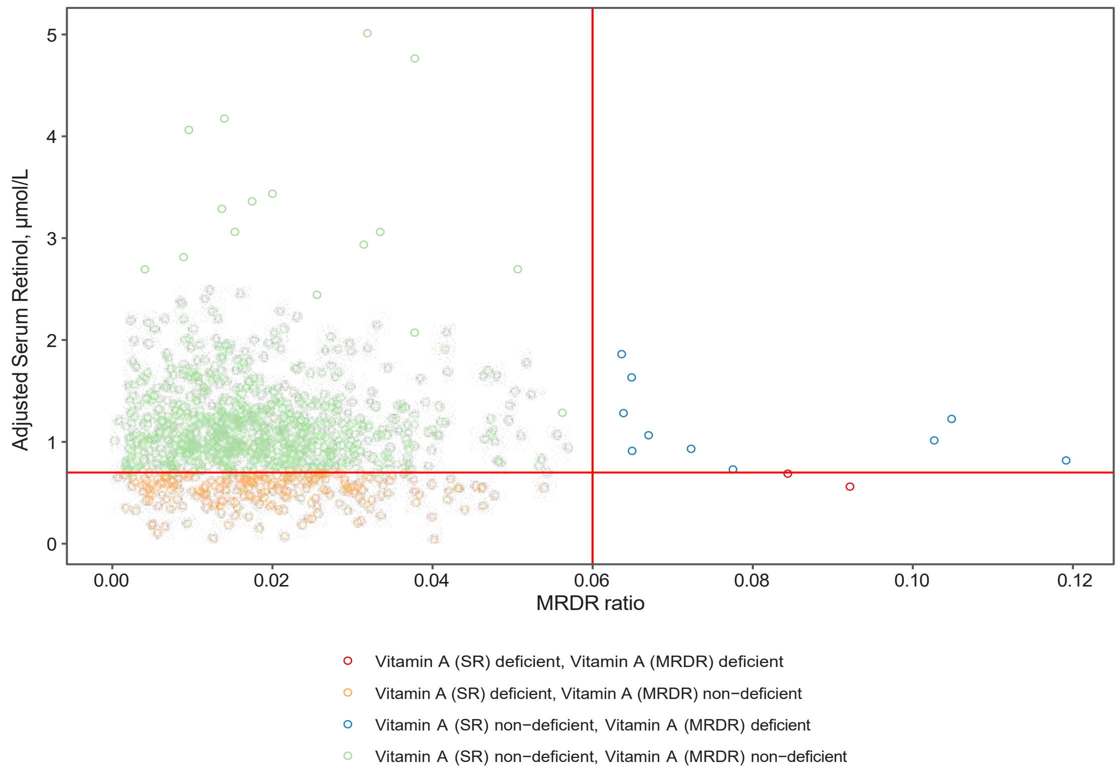


Figure 69. Mapping of MRDR versus serum retinol (SR) values in sub-sample of children. Vitamin A deficiency is defined as serum retinol < 0.7 µmol/L or MRDR ≥ 0.06 for children (aged 6-59 months), Nigeria 2021.
Vitamin A deficiency defined as Modified Relative Dose Response (MRDR) ≥0.060.
Vitamin A deficiency defined as serum retinol concentration <0.7 µmol/L using BRINDA adjusted serum retinol Data are weighted to account for survey design and non-response

Vitamin B12 deficiency among children aged 6-59 months

Table 237 presents the prevalence of vitamin B12 insufficiency and deficiency in children (aged 6-59 months) stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver.

Vitamin B12 insufficiency: There was a statistically significant difference in the percentage of children (aged 6-59 months) with vitamin B12 insufficiency between age category (P < 0.001), residence (P < 0.001), zone (P < 0.001), wealth quintiles (P < 0.001) and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) with vitamin B12 insufficiency was highest among children in the 6-11 months age category (23 percent). It was higher among children residing in rural (17 percent) versus urban areas (4 percent). It was highest among children in the North East and North West zones (19 percent). It was lowest among children in households in the highest wealth quintile (2 percent). It was highest among children whose caregivers had no formal education (19 percent).

Vitamin B12 deficiency: There was a statistically significant difference in the percentage of children (aged 6-59 months) with vitamin B12 deficiency between age category (P < 0.001), residence (P < 0.001), zone (P < 0.001), wealth quintiles (P < 0.001), and level of education completed by caregiver (P = 0.012). The percentage of children (aged 6-59 months) with vitamin B12 deficiency was highest among children in the 6-11 months age category (8 percent). The prevalence was higher among children residing in rural (3.9 percent) versus urban areas (0.1 percent). It was highest among children in the North West zone (5 percent). It was lowest among children in households in the highest wealth quintile (0.2 percent) and among children whose caregivers had post-secondary education (0.5 percent).

Table 237: Prevalence of vitamin B12 insufficiency and deficiency in children (aged 6-59 months), Nigeria 2021.

Background characteristics	Vitamin B12 insufficiency		Vitamin B12 deficiency	
	N	% [95% CI]	N	% [95% CI]
National	4653	12.6[10.7, 14.7]	4653	2.6[1.8, 3.5]
Age category		P <0.001***		P <0.001***
6-11 months	381	22.7[16.0, 30.4]	381	7.6[3.5, 13.6]
12-23 months	1042	15.7[12.5, 19.4]	1042	3.3[2.1, 4.9]
24-35 months	1180	11.7[9.1, 14.7]	1180	2.2[1.1, 3.8]
36-47 months	1151	8.8[6.5, 11.4]	1151	1.1[0.5, 2.1]
48-59 months	899	9.9[6.6, 13.9]	899	1.8[0.6, 4.0]
Sex		P = 0.099		P = 0.974
Male	2331	13.8[11.5, 16.3]	2331	2.6[1.6, 4.0]
Female	2322	11.4[9.1, 14.1]	2322	2.6[1.7, 3.9]
Residence		P <0.001***		P <0.001***
Urban	1860	3.7[2.6, 5.0]	1860	0.1[0.0, 0.3]
Rural	2793	17.3[14.8, 20.1]	2793	3.9[2.8, 5.2]
Zone		P <0.001***		P <0.001***
North Central	712	10.7[6.3, 16.5]	712	1.1[0.4, 2.2]
North East	799	19.4[13.3, 26.6]	799	4.1[2.0, 7.2]
North West	879	19.4[15.5, 23.8]	879	4.5[2.9, 6.6]
South East	676	3.4[1.5, 6.5]	676	1.1[0.3, 2.6]
South South	800	1.0[0.4, 2.2]	800	0.2[0.0, 0.7]
South West	787	1.9[0.9, 3.4]	787	0
Wealth quintile		P <0.001***		P <0.001***
Lowest	880	24.4[19.8, 29.4]	880	6.1[4.0, 8.9]
Second	806	16.7[13.5, 20.4]	806	3.6[1.7, 6.5]
Middle	868	10.8[7.7, 14.5]	868	1.6[0.8, 2.9]
Fourth	1069	5.2[3.7, 7.0]	1069	0.3[0.1, 0.8]
Highest	1011	2.1[1.2, 3.3]	1011	0.2[0.0, 0.6]
Level of education completed by caregiver		P <0.001***		P = 0.012*
None	1073	18.7[15.4, 22.4]	1073	3.8[2.3, 5.8]
Primary	732	8.9[6.3, 12.1]	732	1.3[0.4, 3.0]
Secondary	2278	11.2[8.8, 14.0]	2278	2.1[1.2, 3.3]
Tertiary	402	4.6[2.4, 7.6]	402	0.5[0.1, 1.5]
Use of iron and micronutrient powder in last 6 months		P = 0.919		P = 0.574
Yes	304	12.1[7.2, 18.5]	304	2.0[0.7, 4.5]
No	4240	12.4[10.4, 14.5]	4240	2.6[1.8, 3.6]

Vitamin B12 insufficiency (vitamin B12 depletion, at risk of vitamin B12 deficiency) is defined as serum B12 concentration <220 pmol/L.
Vitamin B12 deficiency (at risk of megaloblastic anaemia) is defined as serum B12 concentration <148 pmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Zinc deficiency among children aged 6-59 months

Table 238 presents zinc deficiency among children (aged 6-59 months), stratified by age category, sex, residence, zone, wealth quintile, and level of education completed by caregiver. There was a statistically significant difference in the percentage of children (aged 6-59 months) with zinc deficiency between residence (P < 0.001), zone (P < 0.001), wealth quintiles (P < 0.001) and level of education completed by caregiver (P < 0.001). The percentage of children (aged 6-59 months) with zinc deficiency was higher among children residing in rural (41 percent) versus urban areas (24 percent). The prevalence of zinc deficiency was highest among children in the North West zone (57 percent). It was lowest among children in households in the highest wealth quintile (23 percent). It was highest among children whose caregivers had no formal education (42 percent).

Table 238: Prevalence of zinc deficiency in children (aged 6-59 months), Nigeria 2021.

Background characteristics	Zinc insufficiency	
	N	% [95% CI]
National	4501	35.2[31.4, 39.2]
Age category		P = 0.083
6-11 months	364	32.2[24.7, 40.3]
12-23 months	998	31.4[27.0, 36.1]
24-35 months	1135	39.6[33.9, 45.5]
36-47 months	1124	36.8[31.1, 42.8]
48-59 months	880	33.6[28.2, 39.3]
Sex		P = 0.450
Male	2267	36.0[31.4, 40.8]
Female	2234	34.5[30.6, 38.6]
Residence		P <0.001***
Urban	1787	23.6[18.8, 28.8]
Rural	2714	41.4[36.6, 46.4]
Zone		P <0.001***
North Central	704	23.4[15.9, 32.1]
North East	762	31.2[24.4, 38.5]
North West	835	56.5[48.9, 63.9]
South East	659	11.8[7.4, 17.4]
South South	790	22.4[15.2, 31.0]
South West	751	22.7[17.2, 28.9]
Wealth quintile		P <0.001***
Lowest	844	44.9[38.3, 51.6]
Second	782	42.6[36.5, 48.9]
Middle	840	36.2[29.7, 43.1]
Fourth	1030	25.7[21.4, 30.4]
Highest	986	22.9[19.1, 27.1]
Level of education completed by caregiver		P <0.001***
None	1032	41.9[35.9, 48.0]
Primary	718	33.9[27.4, 41.0]
Secondary	2203	32.6[28.4, 37.0]
Tertiary	386	20.0[14.0, 27.1]

Zinc deficiency is defined as serum zinc concentration <65 μg/dL (for morning blood collection, non-fasting samples). Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Micronutrient status of adolescent girls (aged 10-14 years)

Figure 70 presents the overall prevalence of micronutrient deficiencies among adolescent girls (aged 10-14 years). The prevalence of vitamin B12 deficiency was low (2 percent). The percentage of adolescent girls (aged 10-14 years) with zinc deficiency was 34 percent nationally. The BRINDA adjustment (correction) for inflammation was applied to both serum ferritin (iron status) and serum retinol (vitamin A status). The unadjusted prevalence of iron deficiency in adolescent girls (aged 10-14 years) was 3 percent, while the adjusted prevalence was 4 percent. The unadjusted prevalence of vitamin A deficiency in adolescent girls (aged 10-14 years) was 32 percent, while the adjusted prevalence was 24 percent. The percentage of adolescent girls with folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 91 percent.

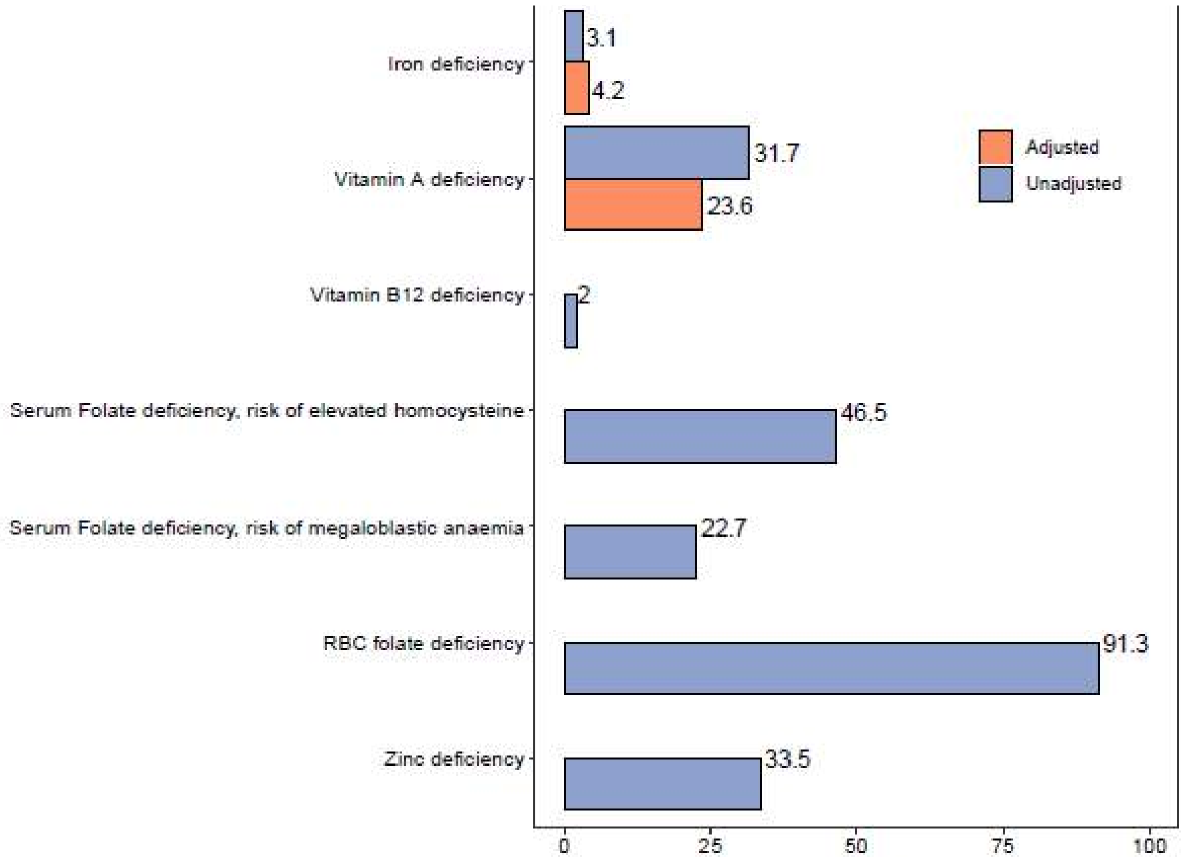


Figure 70: Prevalence of micronutrient deficiencies among adolescent girls (aged 10-14 years), Nigeria 2021
Iron deficiency is defined as serum ferritin <12µg/L, adjusted for inflammation
Vitamin A deficiency is defined as serum retinol <0.70 µmol/L, using BRINDA adjusted serum retinol Vitamin B12 depletion (risk of megaloblastic anaemia) is defined as serum B12 concentration <148 pmol/L.
Serum folate deficiency based on risk of elevated homocysteine, is defined as serum folate concentration <14 nmol/L. Serum folate deficiency based on risk of megaloblastic anaemia, is defined as serum folate concentration <6.8 nmol/L. Red blood cell (RBC) folate deficiency is defined as RBC folate concentration <624 nmol/L.
Zinc deficiency is defined as serum zinc concentration <65 µg/dL (for morning blood collection, non-fasting samples). Estimates calculated using weights that account for survey design and non-response.

Iron deficiency and Iron deficiency anemia among adolescent girls (aged 10-14 years)

Table 239 presents inflammation-corrected iron deficiency and iron deficiency anemia for adolescent girls (aged 10-14 years), stratified by age category, residence, wealth quintile, and use of iron/folic acid supplement in the last 6 months and in the last 7 days prior to the survey.

There was no significant variation in the percentage of adolescent girls with iron deficiency or with iron deficiency anemia across the background characteristics.

Table 239: Prevalence of iron deficiency and iron deficiency anemia in adolescent girls (aged 10-14 years), Nigeria 2021.

Background characteristics	Iron deficiency		Iron deficiency Anemia	
	N	% [95% CI]	N	% [95% CI]
National	950	4.2[2.6, 6.3]	943	1.5[0.7, 2.8]
Age category		P = 0.076		P = 0.214
10 years	257	5.0[2.3, 9.2]	255	2.7[0.8, 6.2]
11 years	152	0.2[0.0, 0.9]	152	0.2[0.0, 0.9]
12 years	185	1.8[0.5, 4.6]	183	0.4[0.0, 1.9]
13 years	189	7.0[3.2, 12.7]	187	1.8[0.3, 5.5]
14 years	167	6.0[1.5, 15.0]	166	1.5[0.2, 4.9]
Residence		P = 0.210		P = 0.115
Urban	392	5.7[3.0, 9.5]	389	2.5[0.8, 5.4]
Rural	558	3.2[1.5, 5.9]	554	0.8[0.2, 2.1]
Wealth quintile		P = 0.058		P = 0.675
Lowest	167	1.4[0.3, 3.9]	167	0.5[0.0, 2.2]
Second	157	4.6[1.6, 10.0]	153	1.7[0.2, 6.0]
Middle	182	8.6[3.5, 16.5]	180	2.5[0.6, 6.7]
Fourth	207	3.4[1.4, 6.8]	207	1.6[0.3, 4.6]
Highest	235	2.9[0.9, 6.8]	234	1.0[0.1, 4.0]
Use of iron/folic acid supplement in last 6 months				
		P = 0.260		P = 0.474
Yes	120	1.9[0.3, 6.1]	119	0.8[0.0, 3.4]
No	818	4.4[2.6, 6.8]	813	1.6[0.7, 3.1]
Use of iron/folic acid supplement in last 7 days				
		P = 0.020*		P = 0.094
0-3 days	88	0	87	0
4-7 days	32	7.5[0.8, 24.6]	32	3.0[0.1, 14.0]

Iron deficiency is defined as serum ferritin < 15 µg/L corrected for inflammation
Iron deficiency anemia defined as serum ferritin concentration <15 µg/L, adjusted for inflammation and adjusted haemoglobin <11.5 g/dL for adolescent girls 10-11 years and haemoglobin <12 g/dL for adolescent girls 12-14 years
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted).
CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Vitamin A deficiency among adolescent girls (aged 10-14 years)

Vitamin A deficiency among adolescent girls (aged 10-14 years) was assessed based on serum retinol. **Table 240** presents vitamin A deficiency among adolescent girls (aged 10-14 years), stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months and in the last 7 days prior to the survey.

There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years) with vitamin A deficiency between wealth quintiles (P = 0.008). The percentage of adolescent girls (aged 10-14 years) with vitamin A deficiency was lowest among adolescent girls in households in the highest wealth quintile (11 percent).

Vitamin B12 deficiency among adolescent girls (aged 10-14 years)

Table 241 presents the prevalence of vitamin B12 insufficiency and deficiency in adolescent girls (aged 10-14 years) stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months and in the last 7 days prior to the survey.

Vitamin B12 insufficiency: There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years) with vitamin B12 insufficiency between residence (P = 0.002) and wealth quintiles (P < 0.001). The prevalence of vitamin B12 insufficiency was higher among adolescent girls residing in rural (11 percent) versus urban areas (2 percent). It was lowest among adolescent girls in households in the highest wealth quintile (2 percent).

Vitamin B12 deficiency: There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years) with vitamin B12 deficiency between residence (P = 0.015). The prevalence of vitamin B12 deficiency was higher among adolescent girls residing in rural (3.1 percent) versus urban areas (0.3 percent).

Table 240: Prevalence of vitamin A deficiency in adolescent girls (aged 10-14 years), Nigeria 2021.

Background characteristics	Vitamin A deficiency	
	N	% [95% CI]
National	936	23.6[18.7, 29.1]
Age category		P = 0.127
10 years	255	25.9[17.7, 35.5]
11 years	150	14.6[7.4, 24.6]
12 years	179	32.1[21.7, 43.8]
13 years	187	20.4[13.2, 29.1]
14 years	165	21.5[12.8, 32.5]
Residence		P = 0.335
Urban	386	20.2[12.2, 30.2]
Rural	550	26.0[20.0, 32.8]
Wealth quintile		P <0.008**
Lowest	165	37.0[27.8, 46.9]
Second	152	30.2[19.3, 42.9]
Middle	179	23.2[11.2, 39.0]
Fourth	206	16.7[10.5, 24.5]
Highest	232	11.2[5.0, 20.4]
Use of multivitamin supplement in last 6 months		P = 0.308
Yes	81	14.2[2.9, 35.7]
No	842	24.6[19.6, 30.2]
Use of multivitamin supplement in last 7 days		P = 0.001**
0-3 days	52	3.0[0.4, 10.0]
4-7 days	29	36.5[6.5, 77.6]

Vitamin A deficiency is defined as serum retinol <0.70 µmol/L using BRINDA adjusted serum retinol Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001)

Table 241: Prevalence of vitamin B12 insufficiency and deficiency among adolescent girls (aged 10-14 years), Nigeria 2021.

Background characteristics	Vitamin B12 insufficiency		Vitamin B12 deficiency	
	N	% [95% CI]	N	% [95% CI]
National	977	7.3[5.1, 9.9]	977	2.0[0.8, 3.9]
Age category		P = 0.921		P = 0.503
10 years	262	7.8[4.2, 12.8]	262	2.1[0.5, 5.6]
11 years	157	5.2[2.0, 10.6]	157	1.2[0.1, 5.3]
12 years	192	6.7[3.1, 12.2]	192	1.4[0.1, 5.3]
13 years	194	7.7[3.8, 13.4]	194	0.8[0.1, 2.6]
14 years	172	8.4[2.9, 17.9]	172	4.3[0.5, 14.7]
Residence		P = 0.002**		P = 0.015*
Urban	405	2.4[0.7, 5.6]	405	0.3[0.0, 1.5]
Rural	572	10.7[7.4, 14.6]	572	3.1[1.2, 6.2]
Wealth quintile		P <0.001***		P = 0.417
Lowest	171	13.1[8.3, 19.3]	171	2.3[0.4, 7.0]
Second	158	13.3[6.7, 22.6]	158	4.2[0.6, 13.6]
Middle	186	5.4[1.9, 11.3]	186	2.1[0.3, 6.3]
Fourth	214	3.3[1.4, 6.3]	214	1.3[0.2, 3.8]
Highest	245	1.6[0.3, 4.8]	245	0
Use of multivitamin supplement in last 6 months		P = 0.223		P = 0.933
Yes	87	3.2[0.4, 10.6]	87	2.2[0.1, 9.6]
No	876	7.8[5.4, 10.7]	876	2.0[0.7, 4.1]
Use of multivitamin supplement in last 7 days		P = 0.285		P = 0.165
0-3 days	56	1.6[0.1, 7.2]	56	0
4-7 days	31	6.4[0.2, 30.1]	31	6.4[0.2, 30.1]

Vitamin B12 insufficiency (vitamin B12 depletion, at risk of vitamin B12 deficiency) is defined as serum B12 concentration <220 pmol/L. Vitamin B12 deficiency (at risk of megaloblastic anaemia) is defined as serum B12 concentration <148 pmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Folate deficiency among adolescent girls (aged 10-14 years)

Table 242 presents the prevalence of serum folate deficiency depicting risk of elevated homocysteine and risk of megaloblastic anaemia among adolescent girls (aged 10-14 years) stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months and in the last 7 days prior to the survey.

Serum folate deficiency: There was no significant variation in the percentage of adolescent girls with serum folate deficiency at risk of elevated homocysteine or risk of megaloblastic anaemia across the background characteristics.

Table 243 presents the prevalence of RBC folate deficiency among adolescent girls (aged 10-14 years) stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months and in the last 7 days prior to the survey.

Red Blood Cells (RBC) folate deficiency: There was no significant variation in the percentage of adolescent girls with RBC folate deficiency across the background characteristics.

Table 242: Prevalence of serum folate deficiency in adolescent girls (aged 10-14 years), Nigeria 2021.

Background characteristics	Serum folate deficiency risk of elevated homocysteine		Serum folate deficiency risk of megaloblastic anaemia	
	N	% [95% CI]	N	% [95% CI]
National	980	46.2[42.1, 50.4]	980	22.5[18.5, 26.8]
Age category		P = 0.977		P = 0.581
10 years	262	45.8[38.5, 53.1]	262	22.5[16.0, 30.0]
11 years	158	46.6[36.7, 56.8]	158	25.1[16.0, 35.9]
12 years	193	45.9[38.2, 53.8]	193	18.5[12.6, 25.6]
13 years	194	44.7[35.9, 53.8]	194	20.8[14.6, 28.0]
14 years	173	48.7[38.3, 59.1]	173	26.7[17.7, 37.2]
Residence		P = 0.700		P = 0.959
Urban	406	45.3[40.1, 50.6]	406	22.3[17.7, 27.6]
Rural	574	46.9[40.8, 53.0]	574	22.6[16.8, 29.1]
Wealth quintile		P = 0.069		P = 0.540
Lowest	172	40.2[32.5, 48.2]	172	18.8[12.4, 26.5]
Second	159	45.3[35.3, 55.6]	159	23.1[15.3, 32.3]
Middle	186	57.1[47.6, 66.3]	186	27.7[18.5, 38.4]
Fourth	214	42.0[33.8, 50.6]	214	21.5[14.4, 29.9]
Highest	246	46.5[39.0, 54.1]	246	21.1[15.2, 28.0]
Use of iron/folic acid supplement in last 6 months		P = 0.606		P = 0.977
Yes	124	43.5[33.7, 53.7]	124	22.2[13.9, 32.4]
No	844	46.3[41.9, 50.8]	844	22.4[18.1, 27.1]
Use of multivitamin supplement in last 7 days		P = 0.467		P = 1.217
0-3 days	89	41.3[29.5, 53.9]	89	25.0[14.6, 37.9]
4-7 days	35	49.7[31.2, 68.3]	35	14.4[5.3, 28.7]

Folate deficiency based on risk of elevated homocysteine, is defined as serum folate concentration <14 nmol/L. Folate deficiency based on risk of megaloblastic anaemia, is defined as serum folate concentration <6.8 nmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Table 243: Prevalence of Red Blood Cell (RBC) folate deficiency in adolescent girls (aged 10-14 years), Nigeria 2021.

Background characteristics	RBC folate deficiency	
	N	% [95% CI]
National	947	91.2[87.9, 93.9]
Age category		P = 0.546
10 years	254	93.2[89.4, 96.1]
11 years	151	90.9[80.3, 97.0]
12 years	189	88.6[80.8, 94.2]
13 years	189	89.1[80.9, 94.8]
14 years	164	93.7[88.7, 97.0]
Residence		P = 0.668
Urban	386	90.4[86.2, 93.7]
Rural	561	91.7[86.6, 95.4]
Wealth quintile		P = 0.699
Lowest	174	94.0[86.1, 98.2]
Second	153	91.3[81.2, 97.2]
Middle	176	92.3[87.6, 95.7]
Fourth	211	90.1[85.2, 93.9]
Highest	231	89.2[83.1, 93.7]
Use of multivitamin supplement in last 6 months		P = 0.106
yes	85	95.3[90.7, 98.2]
No	851	90.7[87.1, 93.7]
Use of multivitamin supplement in last 7 day		P = 0.019*
0-3 days	54	93.3[85.9, 97.6]
4-7 days	31	99.2[96.2, 100.0]

Red blood cell (RBC) folate deficiency is defined as RBC folate concentration <624 nmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Zinc deficiency among adolescent girls (aged 10-14 years)

Table 244 presents zinc deficiency among adolescent girls (aged 10-14 years), stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months prior to the survey.

There was a statistically significant difference in the percentage of adolescent girls (aged 10-14 years), with zinc deficiency between residence (P < 0.001), and wealth quintiles (P = 0.006) and use of multivitamin supplements in the last 6 months (P = 0.029) prior to the survey. The percentage of adolescent girls (aged 10-14 years) with zinc deficiency was higher among those residing in rural (41 percent) versus urban areas (23 percent). The prevalence of zinc deficiency was lowest among adolescent girls in households in the highest wealth quintile (20 percent).

Table 244: Prevalence of zinc deficiency in adolescent girls (aged 10-14 years), Nigeria 2021.

Background characteristics	Zinc deficiency	
	N	% [95% CI]
National	955	33.5[28.2, 39.1]
Age category		P = 0.916
10 years	255	34.2[25.4, 43.7]
11 years	153	31.4[21.5, 42.7]
12 years	191	34.9[26.5, 44.0]
13 years	184	30.6[22.3, 39.7]
14 years	172	35.6[25.2, 47.0]
Residence		P <0.001***
Urban	394	22.6[17.0, 29.0]
Rural	561	41.0[33.3, 49.1]
Wealth quintile		P = 0.006**
Lowest	165	43.4[31.3, 56.0]
Second	156	35.2[23.6, 48.1]
Middle	183	41.9[30.9, 53.5]
Fourth	211	27.8[20.1, 36.5]
Highest	237	19.7[13.6, 26.8]
Use of multivitamin supplement in last 6 months		P = 0.003**
Yes	85	14.9[7.2, 25.9]
No	857	35.1[29.4, 41.2]
Use of multivitamin supplement in last 7 days		P = 0.006*
0-3 days	55	6.6[2.0, 15.0]
4-7 days	30	31.5[8.5, 63.8]

Zinc deficiency is defined as serum zinc concentration <66 µg/dL (for morning blood collection, non-fasting samples). Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Micronutrient status of women of reproductive age (aged 15-49 years)

Figure 71 presents the overall prevalence of micronutrient deficiencies among women of reproductive age (aged 15-49 years). The prevalence of vitamin B12 deficiency was low (2 percent). The percentage of women of reproductive age (aged 15-49 years) with zinc deficiency was 35 percent nationally. The BRINDA adjustment (correction) for inflammation was applied to serum ferritin (iron status). The unadjusted prevalence of iron deficiency in women of reproductive age (aged 15-49 years) was about 7 percent, while the adjusted prevalence was 10 percent. The prevalence of vitamin A deficiency in women of reproductive age (aged 15-49 years) based on serum retinol was 12 percent, while the prevalence based on Modified Relative Dose Response (MRDR) was 0 percent. The percentage women of reproductive age (aged 15-49 years) at high risk of vitamin B1 deficiency was 2 percent. While the prevalence of B2 deficiency was 79 percent. The prevalence of folate deficiency based on analysis of serum folate was 47 percent for risk of elevated homocysteine and 23 percent for risk of megaloblastic anaemia. Folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 95 percent.

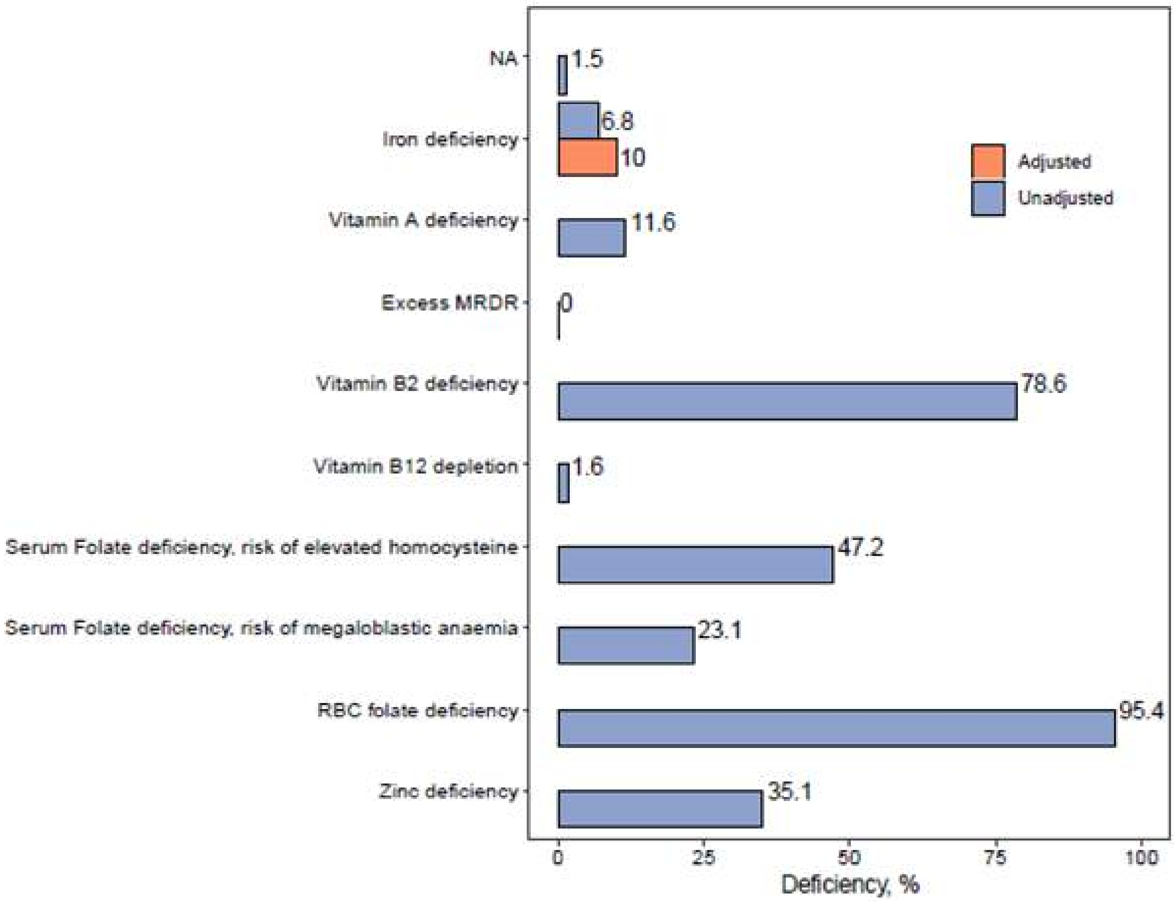


Figure 71. Prevalence of micronutrient deficiencies among women of reproductive age (aged 15-49 years), Nigeria 2021

Iron deficiency is defined as serum ferritin <12μg/L, adjusted for inflammation
Vitamin A deficiency is defined as serum retinol <0.70 μmol/L, using BRINDA adjusted serum retinol Vitamin A deficiency defined as Modified Relative Dose Response (MRDR) ≥0.060.
Vitamin B1 (Thiamine) ETK >1.25 high risk of deficiency.
Vitamin B2 deficiency is defined as Erythrocyte Glutathione Reductase Activation Coefficient (EGRac) >1.4. Vitamin B12 depletion (risk of vitamin B12 deficiency) is defined as serum B12 concentration <220 pmol/L.
Serum folate deficiency based on risk of elevated homocysteine, is defined as serum folate concentration <14 nmol/L. Serum folate deficiency based on risk of megaloblastic anaemia, is defined as serum folate concentration <6.8 nmol/L.
Red blood cell (RBC) folate insufficiency (at risk of neural tube defects) is defined as RBC folate concentration <748 nmol/L.
Zinc deficiency is defined as serum zinc concentration <66 μg/dL (for morning blood collection, non-fasting samples).
Estimates calculated using weights that account for survey design and non-response.

Iron deficiency and Iron deficiency anemia among women of reproductive age (aged 15- 49 years)

Table 245 presents inflammation-corrected iron deficiency and iron deficiency anemia for women of reproductive age (aged 15-49 years), stratified by age category, residence, zone, wealth quintile, level of education completed, and use of iron/folic acid supplement in the last 6 months and in the last 7 days prior to the survey.

Iron deficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years), with iron deficiency between zone ($P < 0.001$), wealth quintiles ($P = 0.022$), and use of iron/folic acid supplement in the last 7 days prior to the survey ($P = 0.013$). The percentage of women of reproductive age (aged 15-49 years) with iron deficiency was highest among women in the North East zone (16 percent). It was highest among women in households in the highest wealth quintile (13 percent). It was higher among women who did not use of iron/folic acid supplement in the last 7 days prior to the survey (10 percent) versus those who did (7 percent).

Iron deficiency anemia: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years), with iron deficiency anemia between zone ($P = 0.014$). The percentage of women of reproductive age (aged 15-49 years) with iron deficiency anemia was lowest among women in the South West zone (2 percent).

Table 245: Prevalence of iron deficiency and iron deficiency anemia in women of reproductive age (15-49 years), Nigeria 2021

Background characteristics	Iron deficiency	Iron deficiency anemia		
	N	% [95% CI]	N	% [95% CI]
National	5234	10.0[8.9, 11.3]	5190	4.5[3.8, 5.3]
Age category		P = 0.077		P = 0.235
15-19 years	1108	9.2[7.2, 11.5]	1105	3.6[2.4, 5.2]
20-29 years	1625	11.6[9.6, 13.9]	1608	5.5[4.2, 7.0]
30-39 years	1497	10.1[8.3, 12.3]	1487	4.1[2.9, 5.7]
40-49 years	1004	8.0[6.2, 10.1]	990	4.2[2.8, 5.9]
Residence		P = 0.063		P = 0.154
Urban	2059	11.3[9.6, 13.3]	2050	3.8[2.7, 5.1]
Rural	3175	9.0[7.6, 10.6]	3140	5.0[4.1, 6.0]
Zone		P <0.001***		P = 0.014*
North Central	874	9.1[6.3, 12.5]	868	5.2[3.4, 7.5]
North East	870	15.5[12.8, 18.5]	861	5.5[3.6, 7.9]
North West	915	9.1[6.8, 11.8]	893	4.7[3.1, 6.6]
South East	892	10.4[7.6, 13.8]	891	5.1[3.5, 7.1]
South South	805	12.2[9.1, 15.7]	801	5.3[3.8, 7.2]
South West	878	5.2[3.4, 7.4]	876	1.6[0.8, 2.8]
Wealth quintile		P = 0.022*		P = 0.398
Lowest	950	8.1[6.0, 10.6]	936	4.8[3.3, 6.7]
Second	895	8.3[6.0, 11.0]	879	3.7[2.2, 5.8]
Middle	1064	10.0[8.3, 12.0]	1061	5.6[4.1, 7.4]
Fourth	1181	10.1[7.8, 12.7]	1174	3.7[2.5, 5.1]
Highest	1125	13.2[10.7, 16.0]	1121	4.6[3.2, 6.4]
Level of education completed by caregiver	P = 0.567		P = 0.783	
None	1058	9.5[7.3, 12.0]	1036	4.9[3.5, 6.6]
Primary	855	8.6[6.5, 11.0]	852	4.6[3.1, 6.5]
Secondary	2740	10.2[8.7, 11.9]	2729	4.2[3.3, 5.2]
Post-secondary	436	11.8[7.4, 17.5]	434	3.6[1.2, 7.7]
Use of iron/folic acid supplement in last 7 days		P <0.013*		P = 0.066*
Yes	820	6.9[4.9, 9.3]	818	2.8[1.7, 4.4]
No	4226	10.4[9.1, 11.8]	4193	4.5[3.8, 5.4]
Use of iron/folic acid supplement yesterday		P = 0.447		P = 0.716
0-3 days	540	6.3[3.9, 9.4]	539	2.6[1.3, 4.7]
4-7 days	279	8.0[4.9, 12.0]	278	3.2[1.3, 6.1]

Iron deficiency is defined as serum ferritin concentration <15 μg/L corrected for inflammation.
Iron deficiency anemia defined as serum ferritin concentration <15 μg/L, adjusted for inflammation and adjusted haemoglobin <12 g/dL Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Vitamin A deficiency among women of reproductive age (aged 15-49 years)

Vitamin A deficiency among all women of reproductive age (aged 15-49 years) was assessed based on serum retinol and Modified Relative Dose Response (MRDR) in 20% sub-sample of women of reproductive age (aged 15-49 years).

Table 246 presents vitamin A deficiency based on serum retinol for women of reproductive age (aged 15-49 years) and Modified Relative Dose Response (MRDR) in a sub-sample of women of reproductive age (aged 15-49 years), stratified by age category, residence, zone, wealth quintile, level of education completed, and use of multivitamin supplement in the last 6 months and in the last 7 days prior to the survey. **Figure 72** present the distribution of MRDR values for women of reproductive age (aged 15-49 years), while **Figure 73** presents MRDR against serum retinol values, with vitamin A deficiency defined as serum retinol < 0.7 μmol/L or MRDR ≥ 0.06 for women of reproductive age (aged 15-49 years).

Serum retinol: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with vitamin A deficiency based on serum retinol between residence (P < 0.001), zone (P < 0.001), wealth quintiles (P < 0.001), level of education completed (P = 0.001), and use of multivitamin supplement in the last 6 months prior to the survey (P = 0.040). The percentage of women of reproductive age (aged 15-49 years) with vitamin A deficiency was lowest among women in the 40-49 years age category (9 percent). The prevalence was higher among women residing in rural (15 percent) versus urban areas (7 percent). It was highest among women in the North West zone (22 percent). It was lowest among women in households in the highest wealth quintile (5 percent). It was lowest among women who had completed post-secondary education (5 percent). It was higher among women who did not use multivitamin supplement in the last 6 months prior to the survey (12 percent) versus those who did (8 percent).

MRDR: There was no significant variation in the prevalence of vitamin A deficiency based on MRDR among women of reproductive age (aged 15-49 years) across the background characteristics.

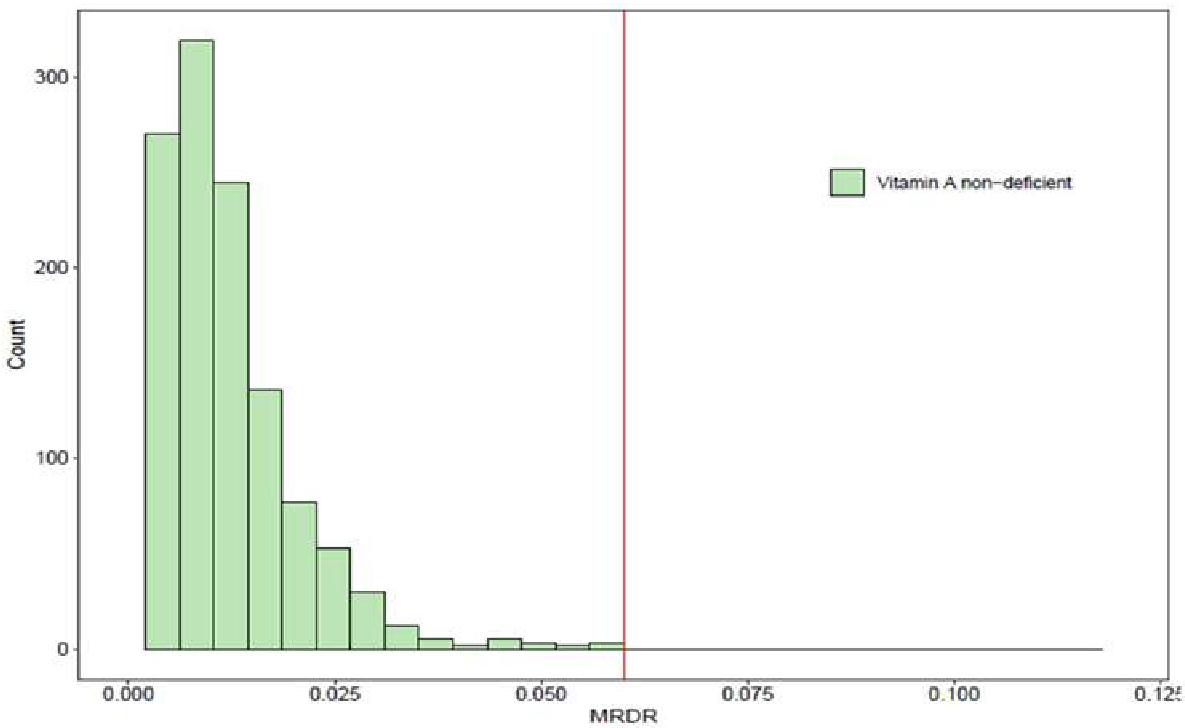


Figure 72. Distribution of MRDR values for women of reproductive age (WRA, aged 15-49 years), Nigeria 2021
Vitamin A deficiency is defined as Modified Relative Dose Response (MRDR) ≥0.060.
Estimates calculated using weights that account for survey design and non-response.

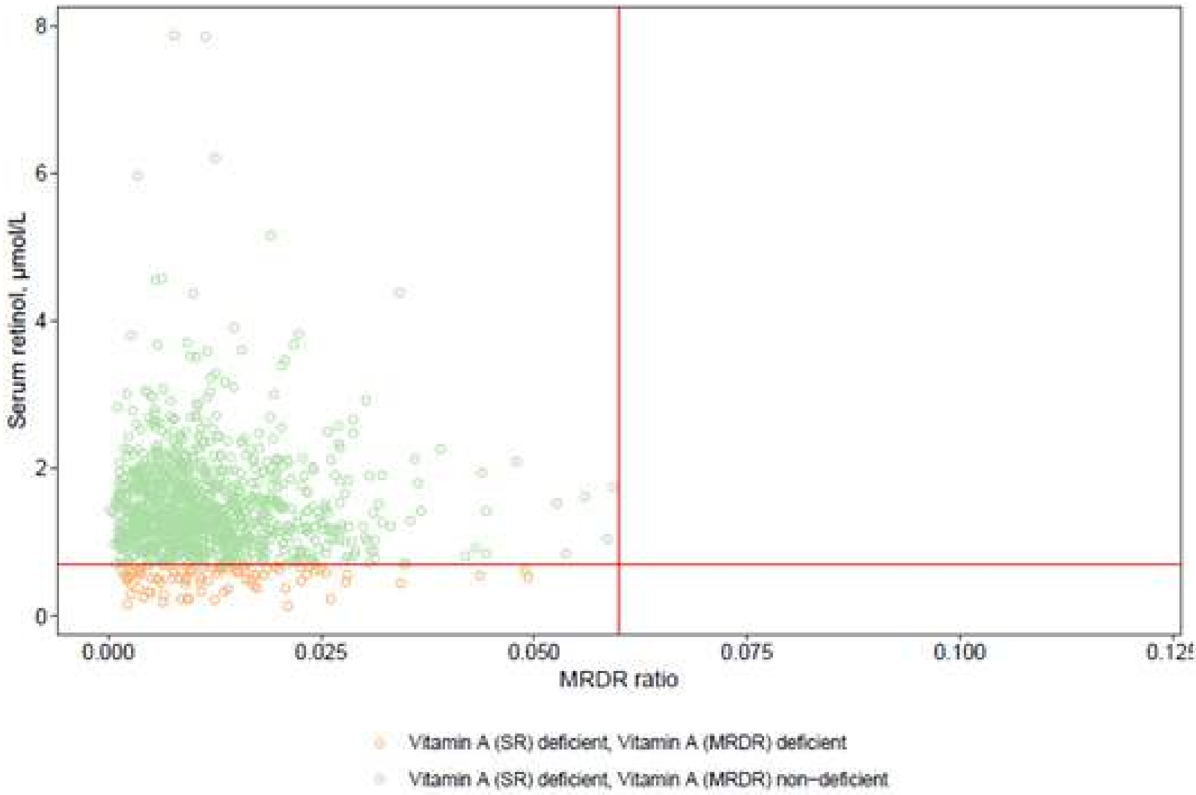


Figure 73. MRDR and serum retinol values, and Vitamin A deficiency, for women of reproductive age (WRA, aged 15-49 years), Nigeria 2021

Vitamin A deficiency defined as Modified Relative Dose Response (MRDR) ≥0.060.
Estimates calculated using weights that account for survey design and non-response.

Table 246. Prevalence of vitamin A deficiency in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Background characteristics	Vitamin A deficiency (Serum retinol)	Vitamin A deficiency (MRDR)		
	N	% [95% CI]	N	% [95% CI]
National	5148	11.6[9.7, 13.6]	1159	0
Age category		P = 0.073		P <0.001***
15-19 years	1092	12.4[9.4, 16.0]	176	0
20-29 years	1594	13.3[10.6, 16.5]	352	0
30-39 years	1474	10.7[8.2, 13.6]	360	0
40-49 years	988	8.6[6.3, 11.4]	271	0
Residence		P <0.001***		P <0.001***
Urban	2012	6.8[5.2, 8.6]	476	0
Rural	3136	15.3[12.4, 18.4]	683	0
Zone		P <0.001***		P <0.001***
North Central	868	6.2[3.8, 9.4]	157	0
North East	854	8.5[6.1, 11.3]	182	0
North West	915	22.2[17.5, 27.4]	181	0
South East	886	3.4[2.0, 5.4]	249	0
South South	792	12.0[5.4, 21.9]	213	0
South West	833	5.2[3.1, 8.1]	177	0
Wealth quintile		P <0.001***		P <0.001***
Lowest	940	19.1[15.1, 23.5]	171	0
Second	879	16.4[12.4, 21.0]	177	0
Middle	1047	11.8[9.0, 15.1]	249	0
Fourth	1163	7.0[5.3, 9.0]	270	0
Highest	1100	5.0[3.5, 6.8]	288	0
Level of education completed		P = 0.001**		P <0.001***
None	1051	15.2[11.9, 18.9]	204	0
Primary	842	12.5[9.1, 16.7]	186	0
Secondary	2684	10.8[8.7, 13.2]	625	0
Post-secondary	428	5.1[2.9, 8.2]	113	0
Not answered	9	12.2[0.2, 54.6]	4	0
Use of multivitamin supplement in last 6 months		P = 0.040*		P <0.001***
Yes	680	8.0[5.0, 12.0]	177	0
No	4293	12.2[10.2, 14.3]	972	0
Use of multivitamin supplement in last 7 days		P = 0.979		P <0.001
0-3 days	436	7.9[4.8, 11.9]	109	0
4-7 days	204	8.0[2.9, 16.4]	58	0

Vitamin A deficiency defined as serum retinol concentration <0.7 μmol/L using BRINDA adjusted serum retinol Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted) CI, Confidence Interval
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Vitamin B1 status among women of reproductive age (aged 15-49 years)

Table 247 presents median basal activity and risk of vitamin B1 deficiency for women of reproductive age (aged 15-49 years), stratified by age category, residence, zone, wealth quintile, level of education completed, and use of multivitamin supplement in the last 6 months and in the last 7 days prior to the survey.

The median ETK basal activity among women of reproductive age (aged 15-49 years) was 1.1.

Low risk of vitamin B1 deficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) at low risk of vitamin B1 deficiency between level of education completed (P = 0.015). The percentage of women of reproductive age (aged 15-49 years) at low risk of vitamin B1 deficiency was lowest among women with no formal education (75 percent).

Moderate risk of vitamin B1 deficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) at moderate risk of vitamin B1 deficiency between level of education completed (P = 0.017). The percentage of women of reproductive age (aged 15-49 years) at moderate risk of vitamin B1 deficiency was highest among women with no formal education (23 percent).

High risk of vitamin B1 deficiency: There was no significant variation in the prevalence of vitamin B1 deficiency among women of reproductive age (aged 15-49 years) across the background characteristics.

Vitamin B2 status among women of reproductive age (aged 15-49 years)

Table 248 presents median basal activity and vitamin B2 deficiency for women of reproductive age (aged 15-49 years), stratified by age category, residence, zone, wealth quintile, level of education completed, and use of multivitamin supplement in the last 6 months and in the last 7 days prior to the survey.

The median EGRAC among women of reproductive age (aged 15-49 years) was 1.7.
There was a statistically significant difference in the prevalence of vitamin B2 deficiency among women of reproductive age (aged 15-49 years) between residence (P = 0.036), and level of education completed (P = 0.022). The percentage of women of reproductive age (aged 15-49 years) with vitamin B2 deficiency was higher among women residing in rural (82 percent) versus urban areas (74 percent).

Table 247. Vitamin B1 status in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Background characteristics	Low risk of B1 deficiency	Moderate risk of B1 deficiency	High risk of B1 deficiency	ETK Basal activity (U/g Hb)				
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	Median [IQRI]
National	875	83.9[80.2, 87.3]	875	14.5[11.5, 18.0]	875	1.5[0.6, 3.2]	875	1.10[1.06, 1.13]
Age category		P = 0.290		P = 0.363		P = 0.719		P = 0.074
15-19 years	187	88.9[83.2, 93.3]	187	10.0[5.9, 15.5]	187	1.1[0.2, 3.3]	187	1.09[1.06, 1.12]
20-29 years	267	82.9[76.1, 88.5]	267	16.0[10.5, 22.8]	267	1.1[0.3, 3.0]	267	1.10[1.07, 1.13]
30-39 years	269	80.5[73.4, 86.4]	269	17.4[11.9, 24.0]	269	2.2[0.4, 6.7]	269	1.10[1.07, 1.14]
40-49 years	152	85.1[75.6, 92.1]	152	13.0[6.3, 22.5]	152	1.9[0.3, 6.0]	152	1.09[1.06, 1.13]
Residence		P = 0.083		P = 0.074		P = 0.780		P = 0.009**
Urban	340	87.9[81.6, 92.7]	340	10.8[6.5, 16.5]	340	1.3[0.2, 4.4]	340	1.09[1.06, 1.12]
Rural	535	81.1[76.4, 85.3]	535	17.2[13.4, 21.6]	535	1.7[0.5, 4.0]	535	1.10[1.07, 1.13]
Zone		P = 0.108		P = 0.181		P = 0.308		P <0.001***
North Central	149	73.2[64.7, 80.7]	149	23.9[16.8, 32.2]	149	2.8[0.4, 9.4]	149	1.11[1.08, 1.15]
North East	123	85.9[76.1, 92.9]	123	13.1[6.4, 22.5]	123	1.1[0.0, 4.9]	123	1.09[1.07, 1.13]
North West	161	83.0[74.5, 89.7]	161	14.2[8.6, 21.3]	161	2.8[0.6, 7.7]	161	1.10[1.07, 1.13]
South East	163	85.1[79.1, 90.0]	163	14.7[9.8, 20.6]	163	0.2[0.0, 1.0]	163	1.10[1.07, 1.12]
South South	147	85.6[76.4, 92.3]	147	14.4[7.7, 23.6]	147	0	147	1.09[1.07, 1.11]
South West	132	93.4[79.0, 99.2]	132	6.6[0.8, 21.0]	132	0	132	1.06[1.03, 1.10]
Wealth quintile		P = 0.116		P = 0.329		P = 0.411		P = 0.007**
Lowest	158	77.8[68.5, 85.5]	158	19.6[12.2, 28.6]	158	2.7[0.7, 6.5]	158	1.10[1.07, 1.14]
Second	139	82.3[72.4, 89.9]	139	15.5[8.2, 25.4]	139	2.2[0.2, 7.9]	139	1.10[1.08, 1.13]
Middle	170	80.1[69.9, 88.2]	170	17.5[9.8, 27.6]	170	2.4[0.4, 7.2]	170	1.10[1.07, 1.13]
Fourth	205	88.8[82.6, 93.5]	205	11.2[6.5, 17.4]	205	0	205	1.09[1.07, 1.12]
Highest	201	88.9[83.0, 93.4]	201	10.4[6.0, 16.2]	201	0.7[0.0, 3.1]	201	1.08[1.05, 1.12]
Level of education completed		P = 0.015*		P = 0.017*		P = 0.426		P = 0.040*
None	170	75.0[66.4, 82.5]	170	22.5[15.2, 31.0]	170	2.5[0.5, 7.3]	170	1.11[1.08, 1.14]
Primary	138	87.4[79.6, 93.1]	138	12.0[6.4, 19.7]	138	0.6[0.0, 2.7]	138	1.10[1.07, 1.13]
Secondary	471	87.3[82.6, 91.2]	471	11.1[7.9, 14.9]	471	1.6[0.4, 4.4]	471	1.09[1.06, 1.12]
Post-secondary	74	83.4[70.0, 92.7]	74	16.4[7.1, 29.8]	74	0.2[0.0, 1.1]	74	1.09[1.06, 1.13]
Not answered(not present in correct copy)	2	0	2	100	2	0	2	1.19[1.19, 1.19]

Table 247. Vitamin B1 status in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021 (continued)

Use of multivitamin supplement in last 6 months		P = 0.255		P = 0.259		P = 0.850		P = 0.002**
Yes	111	88.7[79.6, 94.9]	111	10.0[4.2, 18.8]	111	1.3[0.1, 5.8]	111	1.07[1.04, 1.11]
No	747	83.3[79.2, 86.9]	747	15.1[11.8, 18.8]	747	1.6[0.5, 3.5]	747	1.10[1.07, 1.13]
Use of multivitamin supplement in last 7 days			P = 0.914	P = 0.914				P = 0.236
0-3 days	65	88.7[74.1, 96.9]	65	11.3[3.1, 25.9]	65	0	65	1.08[1.04, 1.12]
4-7 days	39	87.9[73.8, 96.1]	39	12.1[3.9, 26.2]	39	0	39	1.06[1.04, 1.09]

ETK=Erythrocyte Transketolase. Vitamin B1 (Thiamine) status is associated with the following ETK values:
<1.15 low risk of deficiency; 1.15 – 1.25 moderate risk of deficiency; >1.25 – high risk of deficiency. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Table 248. Prevalence of vitamin B2 deficiency in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021

Background characteristics	EGRAC	Vitamin B2 deficiency		
	N	Median [IQR]	N	% [95% CI]
National	982	78.6[74.5, 82.4]	982	1.7[1.4, 2.0]
Age category		P = 0.933		P = 0.640
15-19 years	208	79.6[71.9, 86.1]	208	1.8[1.6, 2.0]
20-29 years	300	78.9[71.3, 85.4]	300	1.7[1.4, 2.1]
30-39 years	298	77.0[70.2, 83.1]	298	1.8[1.4, 2.1]
40-49 years	176	79.1[72.0, 85.1]	176	1.7[1.4, 1.9]
Residence		P = 0.036*		P <0.001***
Urban	396	73.6[68.6, 78.2]	396	1.7[1.4, 1.9]
Rural	586	82.1[75.8, 87.5]	586	1.8[1.5, 2.1]
Zone		P = 0.187		P <0.001***
North Central	164	84.8[76.8, 91.1]	164	1.8[1.6, 2.2]
North East	160	80.6[72.5, 87.2]	160	1.8[1.6, 2.1]
North West	171	76.5[64.3, 86.3]	171	1.7[1.4, 2.1]
South East	176	68.3[59.1, 76.7]	176	1.5[1.3, 1.8]
South South	150	83.7[76.7, 89.4]	150	1.7[1.5, 2.1]
South West	161	75.1[68.0, 81.5]	161	1.6[1.4, 1.8]
Wealth quintile		P = 0.174		P <0.001***
Lowest	178	80.6[67.3, 90.4]	178	1.9[1.5, 2.2]
Second	153	83.9[75.2, 90.7]	153	1.9[1.6, 2.1]
Middle	197	80.8[74.0, 86.5]	197	1.7[1.5, 2.2]
Fourth	226	78.2[71.0, 84.4]	226	1.8[1.4, 2.0]
Highest	226	70.0[62.3, 77.1]	226	1.6[1.3, 1.8]
Level of education completed		P = 0.022*		P <0.001***
None	187	85.3[78.9, 90.5]	187	1.8[1.6, 2.2]
Primary	151	83.7[76.6, 89.4]	151	1.8[1.5, 2.1]
Secondary	534	76.0[69.4, 81.8]	534	1.7[1.4, 2.0]
Post-secondary	86	66.6[50.8, 80.2]	86	1.6[1.3, 1.8]
Not answered	2	1.9[1.9, 1.9]	2	100
Use of multivitamin supplement in last 6 months		P = 0.482		P = 0.057
Yes	127	75.5[66.1, 83.5]	127	1.6[1.4, 1.9]
No	838	79.1[74.4, 83.3]	838	1.8[1.5, 2.0]
Use of multivitamin supplement in last 7 days		P = 0.148		P = 0.242
0-3 days	79	72.9[59.5, 83.9]	79	1.6[1.4, 1.9]
4-7 days	41	86.1[71.7, 95.0]	41	1.7[1.5, 2.0]

Vitamin B2 deficiency is defined as Erythrocyte Glutathione Reductase Activation Coefficient (EGRac) >1.4. Estimates are calculated using weights that account for survey design and non-response
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Vitamin B12 status among women of reproductive age (aged 15-49 years)

Table 249 presents the prevalence of vitamin B12 insufficiency and deficiency in women of reproductive age (aged 15-49 years) stratified by age category, residence, zone, wealth quintile, level of education completed, and use of multivitamin supplement in the last 6 months and in the last 7 days prior to the survey.

Vitamin B12 insufficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with vitamin B12 insufficiency between residence ($P < 0.001$), zone ($P < 0.001$), wealth quintile ($P < 0.001$), level of education completed ($P < 0.001$), and use of multivitamin supplement in the last 6 months prior to the survey ($P < 0.001$). The prevalence of vitamin B12 insufficiency in women of reproductive age (aged 15-49 years) was higher among women residing on rural (14 percent) versus urban areas (3 percent). It was highest among women in the North East zone (21 percent) and among women in households in the lowest wealth quintile (19 percent). It was lowest among women with post-secondary education (2 percent). It was higher among women who did not use multivitamin supplements in the last 6 months prior to the survey (10 percent) versus those who did (5 percent).

Vitamin B12 deficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with vitamin B12 deficiency between residence ($P = 0.001$), zone ($P < 0.001$), wealth quintile ($P < 0.001$), and level of education completed ($P < 0.001$). The prevalence of vitamin B12 deficiency in women of reproductive age (aged 15-49 years) was higher among women residing on rural (2.4 percent) versus urban areas (0.6 percent). It was highest among women in the North East zone (4 percent) and among women in households in the lowest wealth quintile (4 percent). It was lowest among women with post-secondary education (0.2 percent).

Table 249. Prevalence of vitamin B12 deficiency in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Background characteristics	Vitamin B12 insufficiency	Vitamin B12 deficiency		
	N	% [95% CI]	N	% [95% CI]
National	5216	9.5[8.0, 11.2]	5216	1.6[1.1, 2.3]
Age category		P = 0.277		P = 0.918
15-19 years	1105	7.7[5.8, 10.0]	1105	1.7[0.9, 3.1]
20-29 years	1618	10.0[7.8, 12.4]	1618	1.4[0.8, 2.4]
30-39 years	1492	9.8[7.8, 12.1]	1492	1.7[1.0, 2.6]
40-49 years	1001	10.5[7.9, 13.5]	1001	1.8[0.9, 3.1]
Residence		P <0.001***		P = 0.001**
Urban	2050	3.3[2.5, 4.3]	2050	0.6[0.3, 1.2]
Rural	3166	14.3[11.8, 17.1]	3166	2.4[1.6, 3.5]
Zone		P <0.001***		P <0.001***
North Central	871	9.4[6.0, 13.8]	871	1.2[0.5, 2.5]
North East	867	21.0[15.2, 27.6]	867	4.2[2.5, 6.6]
North West	908	13.7[9.9, 18.3]	908	2.2[1.0, 3.9]
South East	892	3.0[1.1, 6.2]	892	0.1[0.0, 0.3]
South South	802	0.7[0.1, 1.9]	802	0.6[0.1, 1.8]
South West	876	0.5[0.1, 1.1]	876	0
Wealth quintile		P <0.001***		P <0.001**
Lowest	947	18.8[14.4, 23.8]	947	3.6[2.1, 5.7]
Second	889	17.4[13.7, 21.6]	889	3.3[1.8, 5.3]
Middle	1064	8.2[6.1, 10.7]	1064	1.0[0.5, 1.8]
Fourth	1176	4.1[2.8, 5.7]	1176	0.5[0.2, 1.2]
Highest	1121	1.3[0.6, 2.4]	1121	0.2[0.0, 1.0]
Level of education completed		P <0.001***		P <0.001***
None	1056	18.6[14.7, 22.9]	1056	4.1[2.7, 6.1]
Primary	852	9.1[6.7, 12.0]	852	1.4[0.7, 2.6]
Secondary	2734	7.1[5.7, 8.8]	2734	0.9[0.5, 1.5]
Post-secondary	433	2.1[1.0, 3.9]	433	0.2[0.0, 0.9]
Not answered	9	0	9	0
Use of multivitamin supplement in last 6 months		P <0.001***		P = 0.148
Yes	694	4.9[3.1, 7.2]	694	0.8[0.2, 2.1]
No	4351	10.2[8.6, 12.0]	4351	1.8[1.2, 2.5]
Use of multivitamin supplement in last 7 days		P = 0.109		P = 0.816
0-3 days	443	3.8[1.9, 6.5]	443	1.0[0.2, 3.0]
4-7 days	211	7.3[4.1, 11.6]	211	0.8[0.2, 2.1]

Vitamin B12 insufficiency (vitamin B12 depletion, at risk of vitamin B12 deficiency) is defined as serum B12 concentration <220 pmol/L.
Vitamin B12 deficiency (at risk of megaloblastic anaemia) is defined as serum B12 concentration <148 pmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Table 250 presents the prevalence of serum folate deficiency depicting risk of elevated homocysteine and risk of megaloblastic anaemia among women of reproductive age (aged 15-49 years) stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months and in the last 7 days prior to the survey.

Serum folate deficiency (risk of elevated homocysteine): There was no significant variation in the percentage of women of reproductive age with serum folate deficiency at risk of elevated homocysteine across the background characteristics.

Serum folate deficiency (risk of megaloblastic anaemia):
There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with serum folate deficiency at risk of megaloblastic anaemia between age category (P = 0.025).

The prevalence of serum folate deficiency (risk of megaloblastic anaemia) was highest among women of reproductive age (aged 15-49 years) in the 40-49-years age category (26 percent)
Table 251 presents the prevalence of folate insufficiency, risk of neural tube defect (RBC folate

<748 nmol/L) and deficiency (RBC folate <624 nmol/) in women of reproductive age (aged 15-49 years) stratified by age category, residence, zone, wealth quintile, level of education completed, and use of iron/folic acid supplement in the last 6 months and in the last 7 days prior to the survey.

Red Blood Cells (RBC) folate insufficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with RBC folate insufficiency between age category (P < 0.001), residence (P = 0.002), zone (P < 0.001), wealth quintile(P < 0.001), level of education completed (P < 0.001), and use of iron/folic acid supplement in the last 6 months prior to the survey (P < 0.001).

The prevalence of RBC folate insufficiency was lowest among women of reproductive age (aged 15- 49 years) in the 40-49-years age category (94 percent). It was higher among women residing in rural (97 percent) versus urban areas (94 percent). It was lowest among women in the South West zone (87 percent). It was highest among women in households in the lowest wealth quintile (99 percent), and lowest among women with no formal education (99 percent). It was higher among women who did not use iron/folic acid supplement in the last 6 months prior to the survey (96 percent) versus those who did (91 percent).

Red Blood Cells (RBC) folate deficiency: There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with RBC folate deficiency between residence (P < 0.001), zone (P < 0.001), wealth quintile (P < 0.001), level of education completed (P < 0.001), and use of iron/folic acid supplement in the last 6 months prior to the survey (P < 0.001).

The prevalence of RBC folate deficiency among women of reproductive age (aged 15-49 years) was higher among women residing in rural (94 percent) versus urban areas (88 percent). It was lowest among women in the South West zone (77 percent), among women in households in the highest wealth quintile (85 percent) and among women with post-secondary education (82 percent). It was higher among women who did not use iron/folic acid supplement in the last 6 months prior to the survey (93 percent) versus those who did (83 percent).

Table 250. Prevalence of serum folate deficiency in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Background characteristics	Serum folate deficiency (risk of elevated homocysteine)	Serum folate deficiency (risk of megaloblastic anaemia)		
	N	% [95% CI]	N	% [95% CI]
National	5225	47.2[45.7, 48.8]	5225	23.1[21.8, 24.4]
Age category		P = 0.363		P = 0.048*
15-19 years	1105	48.1[44.0, 52.2]	1105	21.2[18.2, 24.4]
20-29 years	1622	48.6[45.6, 51.5]	1622	25.3[22.5, 28.3]
30-39 years	1496	44.5[41.3, 47.8]	1496	20.3[17.6, 23.1]
40-49 years	1002	47.7[43.5, 51.9]	1002	25.5[21.7, 29.7]
Residence		P = 0.190		P = 0.096
Urban	2054	46.0[43.4, 48.6]	2054	21.8[19.8, 23.9]
Rural	3171	48.1[46.3, 50.0]	3171	24.0[22.5, 25.7]
Zone		P = 0.865		P = 0.158
North Central	871	45.4[41.7, 49.1]	871	20.8[18.3, 23.5]
North East	869	48.2[45.1, 51.3]	869	24.4[21.1, 27.9]
North West	914	47.1[43.9, 50.2]	914	24.3[21.5, 27.3]
South East	892	48.9[45.5, 52.3]	892	25.9[23.4, 28.5]
South South	802	47.5[43.6, 51.3]	802	21.4[18.0, 25.1]
South West	877	47.2[42.2, 52.1]	877	21.7[19.3, 24.2]
Wealth quintile		P = 0.382		P = 0.719
Lowest	950	50.6[46.7, 54.5]	950	24.9[21.8, 28.0]
Second	892	46.4[42.3, 50.6]	892	23.0[19.7, 26.5]
Middle	1063	47.1[43.2, 50.9]	1063	23.2[20.0, 26.6]
Fourth	1178	47.2[43.8, 50.7]	1178	23.1[20.1, 26.3]
Highest	1123	45.0[41.4, 48.6]	1123	21.5[18.7, 24.5]
Level of education completed		P = 0.807		P =0.132
None	1057	48.5[45.3, 51.8]	1057	25.4[22.4, 28.6]
Primary	855	47.7[42.6, 52.8]	855	22.9[19.3, 26.7]
Secondary	2737	46.8[44.6, 49.0]	2737	22.6[20.7, 24.6]
Post-secondary	435	45.2[38.8, 51.8]	435	18.4[14.4, 22.8]
Not answered	9	43.3[16.4, 73.4]	9	14.8[0.1, 67.4]
Use of iron/folic acid supplement in last 6 months		P = 0.119		P = 0.177
Yes	695	50.9[45.8, 56.0]	695	20.6[17.1, 24.5]
No	4358	46.7[45.1, 48.3]	4358	23.4[22.0, 24.8]
Use of iron/folic acid-supplement in last 7 days		P = 0.192		P = 0.637
0-3 days	444	48.9[42.5, 55.4]	444	20.4[16.5, 24.6]
4-7 days	211	56.0[46.7, 64.9]	211	22.6[14.8, 31.9

Folate deficiency based on risk of elevated homocysteine, is defined as serum folate concentration <14 nmol/L. Folate deficiency based on risk of megaloblastic anaemia, is defined as serum folate concentration <6.8 nmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001

Table 251. Prevalence of Red Blood Cell (RBC) folate insufficiency and deficiency in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Background characteristics	RBC folate insufficiency	RBC folate deficiency		
	N	% [95% CI]	N	% [95% CI]
National	5179	95.4[94.5, 96.3]	5179	91.2[89.7, 92.6]
Age category		P <0.001***		P =0.076
15-19 years	1095	96.9[95.5, 98.0]	1095	92.8[90.3, 94.8]
20-29 years	1601	96.8[95.5, 97.7]	1601	92.3[90.3, 93.9]
30-39 years	1486	94.0[92.0, 95.8]	1486	89.8[86.8, 92.3]
40-49 years	997	93.5[91.5, 95.1]	997	89.8[87.5, 91.8]
Residence		P =0.002**		P <0.001***
Urban	2039	93.6[91.7, 95.2]	2039	87.6[84.8, 90.1]
Rural	3140	96.9[95.8, 97.7]	3140	94.0[92.5, 95.3]
Zone		P <0.001***		P <0.001***
North Central	845	97.9[95.8, 99.2]	845	96.6[94.1, 98.4]
North East	869	99.4[98.2, 99.9]	869	97.6[93.0, 99.5]
North West	911	98.6[97.2, 99.4]	911	96.6[94.3, 98.2]
South East	878	94.2[91.9, 96.1]	878	89.7[86.9, 92.1]
South South	801	91.6[87.9, 94.5]	801	84.2[80.3, 87.7]
South West	875	87.4[83.6, 90.7]	875	77.0[71.3, 82.1]
Wealth quintile		P <0.001***		P <0.001***
Lowest	944	98.9[98.0, 99.5]	944	97.2[95.8, 98.3]
Second	1056	96.9[94.9, 98.3]	883	94.5[92.1, 96.5]
Middle	883	95.4[93.6, 96.8]	1056	90.5[87.7, 92.9]
Fourth	1172	93.9[91.8, 95.6]	1172	90.0[87.3, 92.2]
Highest	1108	92.9[90.5, 94.9]	1108	85.1[81.4, 88.3]
Level of education completed		P <0.001***		P <0.001***
None	1040	98.6[97.4, 99.4]	1040	97.3[95.9, 98.3]
Primary	852	94.7[92.6, 96.4]	852	90.4[87.6, 92.8]
Secondary	2716	94.9[93.6, 95.9]	2716	90.2[88.3, 91.9]
Post-secondary	433	91.7[88.1, 94.6]	433	82.0[75.9, 87.2]
Not answered	9	100	9	100
Use of iron/folic acid supplement in last 6 months		P <0.001***		P <0.001***
Yes	805	90.5[87.6, 92.9]	805	82.6[77.9, 86.7]
No	4194	96.3[95.3, 97.1]	4194	92.8[91.5, 94.1]
Use of iron/ folic acid supplement in last 7 days		P = 0.436		P = 0.082
0-3 days	528	89.9[86.1, 93.0]	528	80.5[74.2, 85.9]
4-7 days	276	91.8[88.0, 94.7]	276	86.6[81.7, 90.6]

RBC folate insufficiency (at risk of neural tube defects) is defined as RBC folate concentration <748 nmol/L RBC folate deficiency, is defined as RBC folate concentration <624 nmol/L.
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted).
CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Zinc deficiency among women of reproductive age (aged 15-49 years)

Table 252 presents zinc deficiency among women of reproductive age (aged 15-49 years), stratified by age category, residence, zone, wealth quintile, level of education completed, and use of multivitamin supplement in the last 6 months and in the last 7 days prior to the survey.

There was a statistically significant difference in the percentage of women of reproductive age (aged 15-49 years) with zinc deficiency between age category (P = 0.046), residence (P = 0.001), zone (P < 0.001), wealth quintile (P < 0.001), level of education completed (P < 0.001), and use of multivitamin supplement in the last 6 months prior to the survey (P = 0.004).

The prevalence of zinc deficiency was lowest among women of reproductive age (aged 15-49 years) in the 15-19-years age category (31 percent). It was higher among women residing in rural (41 percent) versus urban areas (27 percent). It was lowest among women in the South East zone (16 percent). It was highest among women in households in the lowest wealth quintile (49 percent) and among women with no formal education (49 percent). It was higher among women who did not use a multivitamin supplement in the last 6 months prior to the survey (36 percent) versus those who did (27 percent).

Table 252. Prevalence of zinc deficiency in women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Background characteristics	Zinc deficiency	
	N	% [95% CI]
National	5054	35.1[31.2, 39.1]
Age category		P = 0.046*
15-19 years	1079	30.9[26.2, 35.9]
20-29 years	1556	38.2[33.0, 43.5]
30-39 years	1440	35.6[31.4, 40.0]
40-49 years	979	33.8[28.1, 39.9]
Residence		P =0.001**
Urban	1982	27.0[21.8, 32.7]
Rural	3072	41.3[36.0, 46.7]
Zone		P <0.001***
North Central	843	20.3[14.2, 27.5]
North East	845	32.9[23.9, 42.8]
North West	875	60.3[51.4, 68.8]
South East	872	15.5[9.5, 23.0]
South South	775	28.0[19.2, 38.2]
South West	844	23.9[17.4, 31.3]
Wealth quintile		P <0.001***
Lowest	923	49.3[39.9, 58.7]
Second	861	43.1[37.0, 49.4]
Middle	1023	35.1[29.2, 41.3]
Fourth	1139	25.5[21.0, 30.5]
Highest	1090	25.3[20.4, 30.8]
Level of education completed		P <0.001***
None	1021	48.8[41.8, 55.7]
Primary	824	29.9[25.2, 35.0]
Secondary	2651	32.2[27.9, 36.7]
Post-secondary	419	23.7[18.2, 29.9]
Not answered	8	34.2[1.4, 88.6]
Use of multivitamin supplement in last 6 months		P =0.004**
Yes	690	27.0[22.0, 32.6]
No	4278	35.9[31.7, 40.1]
Use of multivitamin supplement in last 7 days		P = 0.659
Yes	439	26.5[20.0, 33.8]
No	211	29.0[20.4, 38.9]

Zinc deficiency defined as serum zinc concentration <66 µl/dL (for morning blood collection, non-fasting). Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Iodine deficiency among women of reproductive age (aged 15-49 years)

Non-lactating women of reproductive age (aged 15-49 years): Median urinary iodine concentration is used an indicator to monitor and evaluate the impact of salt iodization. The goals for intervention programs are that the medial iodine concentration for non-lactating women be in the range of 100-199 µg/L to represent adequate iodine nutrition. Concentrations less than100 µg/L represent any iodine deficiency, concentrations in the range of 200-299 µg/L represent above requirements and concentrations of 300 µg/L and above represent risk of adverse health consequences.

Figure 74 presents the distribution of urinary iodine concentrations among non-lactating women of reproductive age (aged15-49 years). **Table 253** presents the median urinary iodine levels among non-lactating women of reproductive age (aged 15-49 years) stratified by age category, residence, zone, wealth quintile, and level of education completed.

The overall median level of urinary iodine among non-lactating women of reproductive age (aged15- 49 years) was 292.7 µg/L. There was a significant difference in the median urinary iodine concentrations of non-lactating women of reproductive age (aged 15-49 years) between age category ($P < 0.001$), residence ($P < 0.001$), zone ($P < 0.001$), wealth quintile ($P < 0.001$), and level of education completed ($P < 0.001$). The median urinary iodine concentration was highest among women in the 15-19 years age category (337.4 µg/L). The median was higher among women residing in urban (332.0 µg/L) versus rural areas (258.3 µg/L). It was highest among women living in the South West zone (423.1 µg/L), in households in the highest wealth quintile (345.9 µg/L), and who had completed post-secondary education (316.2 µg/L). The results on iodine status in Nigeria suggests that iodine deficiency is not a public health concern. It is more that the intake of iodine may be high.

Lactating women of reproductive age (aged 15-49 years): Median urinary iodine concentration is used an indicator to monitor and evaluate the impact of salt iodization. The goals for intervention programs are that the medial iodine concentration for lactating women be 100 µg/L or more to represent adequate iodine nutrition. Concentrations less than100 µg/L represent an iodine deficiency.

Figure 75 presents the distribution of urinary iodine concentrations among lactating women of reproductive age (aged15-49 years). **Table 254** presents the median urinary iodine levels among lactating women of reproductive age (aged 15-49 years) stratified by age category, residence, zone, wealth quintile, and level of education completed.

The overall median level of urinary iodine among lactating women of reproductive age (aged15-49 years) was 217.6 µg/L. There was a statistically significant difference in the urinary iodine concentrations of lactating women of reproductive age (aged 15-49 years) between age category ($P < 0.001$), residence ($P < 0.001$), zone ($P < 0.001$), wealth quintile ($P < 0.001$), and level of education completed ($P < 0.001$). The median urinary iodine concentration was highest among women in the 15-19 years age category (278.5 µg/L). The median was higher among women residing in urban (260.5 µg/L) versus rural areas (202.3 µg/L). It was highest among women living in the South West zone (372.0 µg/L), in households in the highest wealth quintile (281.8 µg/L), and who had completed post-secondary education (314.1 µg/L).

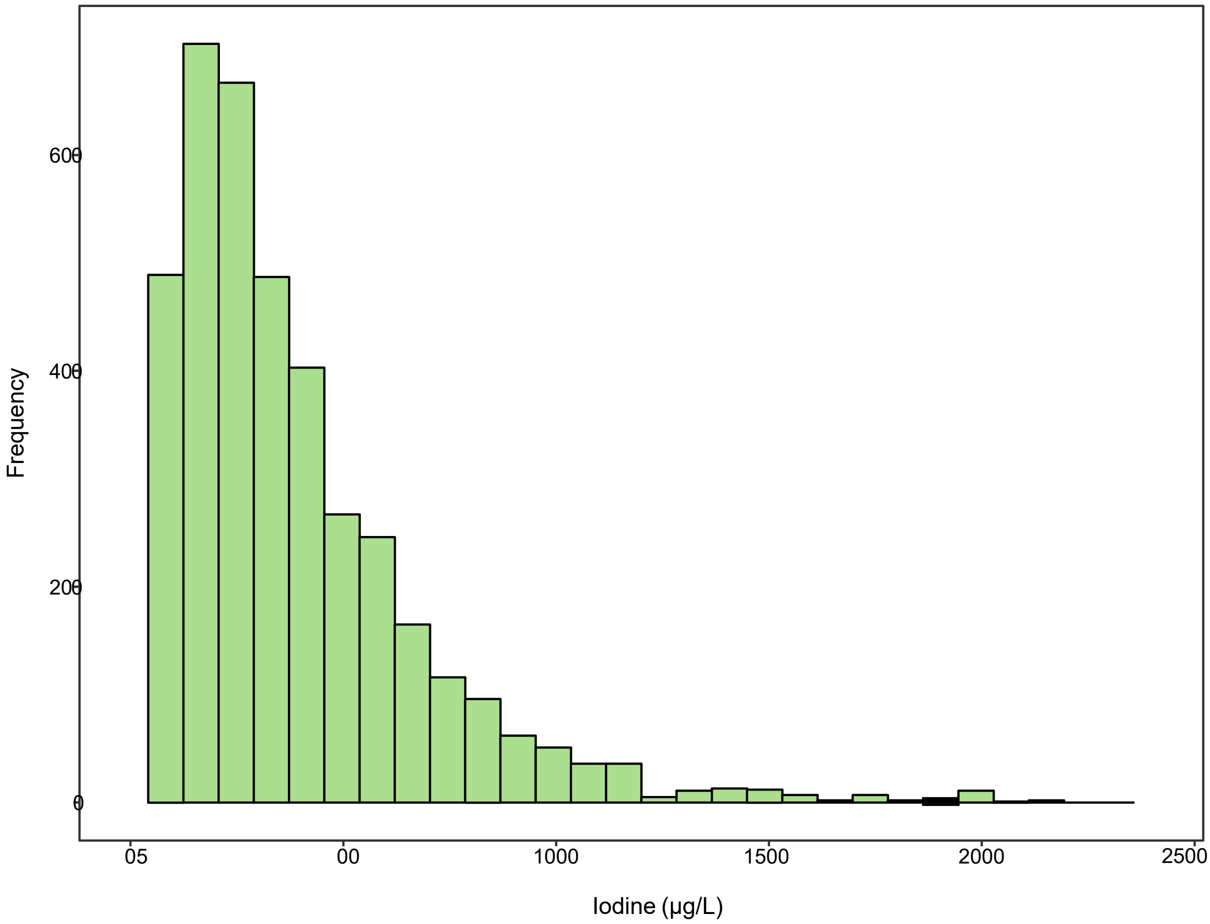


Figure 74. Distribution of urinary iodine concentration in non-lactating women of reproductive age (aged 15-49 years). Nigeria 2021.
Urinary iodine concentration measured in µg/L.
Estimates calculated using weights that account for survey design and non-response.

Table 253. Median urinary iodine levels in women of reproductive age (WRA, aged 15-49 years) who are not lactating, Nigeria 2021.

Background characteristics	Urinary iodine (µg/L)	
	N	Median [IQR]
National	3967	292.7[171.4, 493.7]
Age category		P < 0.001***
15-19 years	991	337.4[206.4, 571.4]
20-29 years	1011	298.5[171.7, 503.1]
30-39 years	1050	276.8[159.1, 474.2]
40-49 years	915	263.3[150.5, 432.1]
Residence		P < 0.001***
Urban	1668	332.0[206.0, 557.1]
Rural	2299	258.3[149.8, 438.4]
Zone		P <0.001***
North Central	662	321.6[168.0, 528.7]
North East	610	281.8[181.0, 432.3]
North West	556	248.1[139.2, 395.9]
South East	718	291.4[180.9, 508.3]
South South	716	242.1[139.9, 422.2]
South West	705	423.1[262.2, 664.3]
Wealth quintile		P < 0.001***
Lowest	598	234.1[143.7, 399.6]
Second	614	260.5[153.5, 420.2]
Middle	850	284.4[174.6, 492.1]
Fourth	943	329.3[188.3, 508.7]
Highest	949	345.9[203.1, 594.5]
Level of education completed		P < 0.001***
None	702	240.0[137.2, 363.4]
Primary	690	287.6[161.5, 467.2]
Secondary	2203	321.7[183.4, 533.8]
Post-secondary	368	316.2[210.2, 664.2]
Not answered	4	161.1[161.1, 161.1]

Iodine deficiency in a population sub-group defined by median urinary iodine concentration: any deficiency <100 µg/L severe deficiency <20 µg/L; moderate deficiency 20-49 µg/L; mild deficiency 50-99 µg/L; adequate iodine nutrition: 100 – 199 µg/L; slight risk of more than adequate intake: 200 – 299 µg/L; risk of adverse health consequences ≥300 µg/L
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted)
IQR, Interquartile range
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

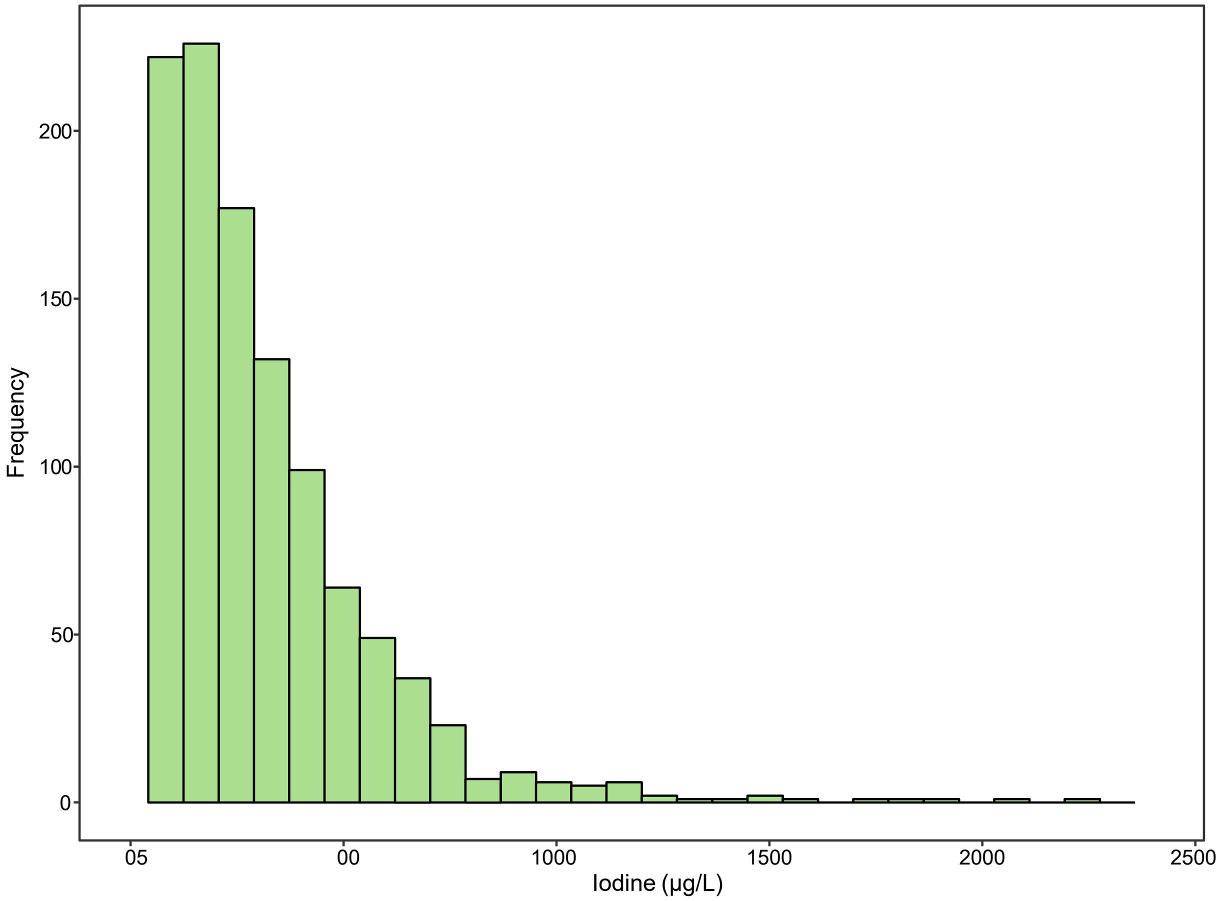


Figure 75. Distribution of urinary iodine concentration in women of reproductive age (WRA, aged 15-49 years) who are lactating, Nigeria 2021.
Urinary iodine concentration measured in µg/L.
Estimates calculated using weights that account for survey design and non-response.

Table 254. Prevalence of iodine deficiency in women of reproductive age (WRA, aged 15-49 years) who are lactating, Nigeria 2021.

Background characteristics	Urinary iodine (µg/L)	
	N	Median [IQR]
National	1119	217.6[120.4, 387.8]
Age category		P < 0.001***
15-19 years	76	278.5[136.2, 575.1]
20-29 years	569	226.0[122.7, 396.9]
30-39 years	408	211.0[117.7, 365.9]
40-49 years	66	189.9[86.4, 366.9]
Residence		P < 0.001***
Urban	311	260.5[142.7, 421.9]
Rural	808	202.3[115.3, 366.7]
Zone		P < 0.001***
North Central	178	241.3[127.2, 404.2]
North East	224	232.2[133.3, 378.6]
North West	324	162.5[107.6, 302.6]
South East	125	293.4[178.5, 537.0]
South South	144	229.1[150.3, 449.7]
South West	124	372.0[228.6, 658.2]
Wealth quintile		P < 0.001***
Lowest	299	194.3[104.9, 367.8]
Second	251	180.0[112.1, 332.5]
Middle	206	260.5[137.1, 387.7]
Fourth	206	241.3[138.0, 424.3]
Highest	152	281.8[169.5, 424.0]
Level of education completed		P < 0.001***
None	330	182.0[104.9, 339.4]
Primary	168	250.9[127.9, 397.9]
Secondary	554	234.1[128.7, 404.2]
Post-secondary	62	314.1[161.1, 499.2]
Not answered	5	286.8[194.3, 386.7]

Iodine deficiency in a population sub-group defined by median urinary iodine concentration: any deficiency <100 µg/L; adequate iodine nutrition: ≥ 100 µg/L
Estimates calculated using weights that account for survey design and non-response. IQR, Interquartile range
N, number of respondents in the sub-group (unweighted)
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Micronutrient status of pregnant women (aged 15-49 years)

Figure 76 presents the overall prevalence of micronutrient deficiencies among pregnant women (aged 15-49 years). The BRINDA adjustment (correction) for inflammation was applied to serum ferritin (iron status). The unadjusted prevalence of iron deficiency in pregnant women (aged 15-49 years) was about 11 percent, while the adjusted prevalence was about 26 percent. The prevalence of vitamin A deficiency in pregnant women (aged 15-49 years) based on serum retinol was 22 percent. The prevalence of vitamin B12 deficiency was 12 percent. The prevalence of folate deficiency based on analysis of whole blood lysate (Red Blood Cell folate) was 85 percent, while serum folate deficiency - risk of elevated homocysteine was 43 percent and serum folate deficiency - risk of megaloblastic anemia was 20 percent.

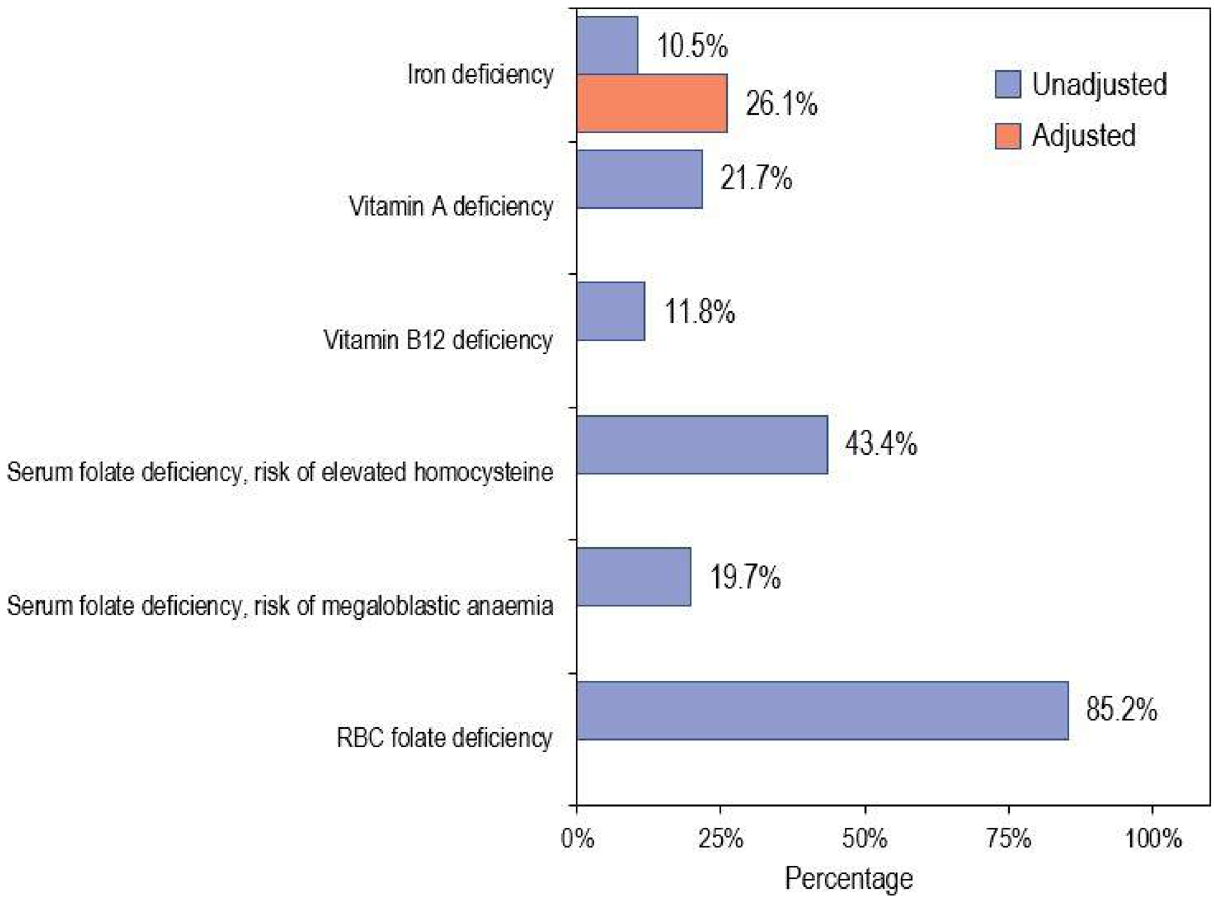


Figure 76. Prevalence of micronutrient deficiencies among women of reproductive age (WRA, aged 15-49 years), Nigeria 2021.

Iron deficiency is defined as serum ferritin <15 µg/L, adjusted for inflammation Vitamin A deficiency is defined as serum retinol <0.70 µmol/L

Vitamin B12 depletion (risk of vitamin B12 deficiency) is defined as serum B12 concentration <220 pmol/L. Folate deficiency based on risk of elevated homocysteine, is defined as serum folate concentration <14 nmol/L Estimates calculated using weights that account for survey design and non-response.

Iron deficiency and Iron deficiency anemia among pregnant women (aged 15-49 years)

Table 255 presents inflammation-corrected iron deficiency and iron deficiency anemia for pregnant women (aged 15-49 years), stratified by age category, residence, wealth quintile, and level of education completed.

There was no significant variation in the percentage of pregnant women (aged 15-49 years) with iron deficiency or with iron deficiency anemia across the background characteristics.

Table 255. Prevalence of iron deficiency in pregnant women (aged 15-49 years), Nigeria 2021.

Background characteristics	Iron deficiency	Iron deficiency anemia		
	N	% [95% CI]	N	% [95% CI]
National	764	26.1[22.3, 30.1]	754	10.5[7.8, 13.5]
Age category		P = 0.631		P = 0.163
15-19 years	66	27.8[16.6, 41.2]	66	9.8[4.1, 18.5]
20-29 years	409	24.5[19.3, 30.2]	406	8.6[4.9, 13.5]
30-39 years	251	29.2[21.2, 38.1]	244	14.6[9.7, 20.6]
40-49 years	38	19.7[7.7, 37.3]	38	5.4[0.9, 15.6]
Residence		P = 0.260		P = 0.631
Urban	308	23.2[18.0, 29.1]	304	7.8[4.8, 11.6]
Rural	456	27.5[22.7, 32.8]	450	11.8[8.3, 16.1]
Wealth quintile		P = 0.130		P = 0.157
Lowest	158	33.4[26.3, 41.0]	155	16.5[9.7, 25.2]
Second	133	23.3[15.1, 33.2]	133	6.9[3.1, 12.8]
Middle	135	18.4[11.2, 27.6]	132	7.8[3.4, 14.6]
Fourth	171	24.6[16.4, 34.3]	171	11.2[4.6, 21.3]
Highest	165	28.2[20.4, 36.9]	161	8.4[4.7, 13.3]
Level of education completed		P = 0.896		P = 0.564
None	164	26.9[18.7, 36.3]	160	12.8[7.7, 19.4]
Primary	114	27.5[18.9, 37.5]	114	8.7[3.7, 16.4]
Secondary	395	25.6[19.2, 32.7]	391	9.4[6.2, 13.5]
Post-secondary	65	21.4[11.3, 34.6]	64	7.2[1.7, 18.4]
Not answered	2	57.8[NA, NA]	2	0

Iron deficiency defined as serum ferritin concentration <15 μg/L, adjusted for inflammation
Iron deficiency anemia defined as serum ferritin concentration <15 μg/L, adjusted for inflammation and adjusted haemoglobin <11 g/dL
Estimates calculated using weights that account for survey design and non-response. N, number of respondents in the sub-group (unweighted)
CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Vitamin A deficiency among pregnant women (aged 15-49 years)

Table 256 presents the prevalence of vitamin A deficiency among pregnant women (aged 15-49 years), stratified by age category, residence, wealth quintile, and level of education completed.

There was no significant variation in the percentage of pregnant women (aged 15-49 years) with vitamin A deficiency across the background characteristics.

Table 256. Prevalence of vitamin A deficiency in pregnant women (aged 15-49 years), Nigeria 2021.

Background characteristics	Vitamin A deficiency (Serum retinol)	
	N	% [95% CI]
National	750	21.7[17.8, 25.9]
Age category		P = 0.438
15-19 years	65	24.5[12.7, 39.7]
20-29 years	406	23.9[18.1, 30.5]
30-39 years	244	18.2[12.3, 25.4]
40-49 years	35	13.9[4.5, 29.4]
Residence		P = 0.064
Urban	302	16.9[11.9, 22.7]
Rural	448	24.1[19.0, 29.7]
Wealth quintile		P = 0.070
Lowest	157	29.2[22.0, 37.2]
Second	128	22.7[14.2, 33.1]
Middle	133	20.1[13.0, 28.7]
Fourth	166	18.0[10.1, 28.2]
Highest	164	12.1[6.9, 19.1]
Level of education completed		P = 0.163
None	162	22.9[15.2, 32.2]
Primary	112	27.2[17.9, 38.1]
Secondary	389	20.1[14.3, 26.9]
Post-secondary	64	5.4[1.2, 14.0]
Not answered	2	42.2[NA, NA]

Vitamin A deficiency defined as serum retinol concentration <0.7 µmol/L using BRINDA adjusted serum retinol Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Vitamin B12 deficiency among pregnant women (aged 15-49 years)

Table 257 presents the prevalence of vitamin B12 insufficiency and deficiency in pregnant women (aged 15-49 years) stratified by age category, residence, wealth quintile, and level of education completed.

Vitamin B12 insufficiency: There was a statistically significant difference in the percentage of pregnant women (aged 15-49 years) with vitamin B12 insufficiency between age category (P = 0.005), residence (P < 0.001), wealth quintiles (P < 0.001), and level of education completed (P < 0.001). The prevalence of vitamin B12 insufficiency was lowest among pregnant women in the 40- 49 years age category (5 percent). It was higher among pregnant women residing in rural (40 percent) versus urban areas (17 percent). It was lowest among pregnant women in households in the highest wealth quintile (10 percent) and among pregnant women who had completed post-secondary education (10 percent).

Vitamin B12 deficiency: There was a statistically significant difference in the percentage of pregnant women (aged 15-49 years) with vitamin B12 deficiency between age category (P = 0.020), residence (P = 0.006), wealth quintiles (P < 0.001), and level of education completed (P < 0.001). The prevalence of vitamin B12 deficiency was lowest among pregnant women in the 40-49 years age category (4 percent). It was higher among pregnant women residing in rural (16 percent) versus urban areas (4 percent). It was lowest among pregnant women in households in the highest wealth quintile (2 percent) and among pregnant women who had completed post-secondary education (2 percent).

Folate deficiency among pregnant women (aged 15-49 years)

Table 258 presents the prevalence of serum folate deficiency depicting risk of elevated homocysteine and risk of megaloblastic anaemia among pregnant women (aged 15-49 years) stratified by age category, residence, wealth quintile, and use of multivitamin supplements in the last 6 months and in the last 7 days prior to the survey.

Serum folate deficiency (risk of elevated homocysteine): There was a statistically significant difference in the percentage of pregnant women with serum folate deficiency at risk of elevated homocysteine between residence (P = 0.047).The prevalence was higher among women in rural (47 percent) versus urban areas (38 percent).

Serum folate deficiency (risk of megaloblastic anaemia): There was a statistically significant difference in the percentage of pregnant women (aged 15-49 years) with serum folate deficiency at risk of megaloblastic anaemia between residence (P = 0.021). The prevalence was higher among women in rural (23 percent) versus urban areas (15 percent).

Table 259 presents the prevalence of RBC folate deficiency among pregnant women (aged 15-49 years) stratified by age category, residence, wealth quintile, and level of education completed.

Red Blood Cells (RBC) folate deficiency: There was a statistically significant difference in the percentage of pregnant women (aged 15-49 years) with RBC folate deficiency between residence (P < 0.001), wealth quintile (P < 0.001), and level of education completed (P = 0.002). The prevalence of RBC folate deficiency was higher among pregnant women residing in rural (89 percent) versus urban areas (77 percent). It was highest among pregnant women in households in the lowest wealth quintile (93 percent) and among pregnant women with no formal education (95 percent).

Table 257. Prevalence of vitamin B12 insufficiency and deficiency in pregnant women (aged 15-49 years), Nigeria 2021.

Background characteristics	Vitamin B12 insufficiency	Vitamin B12 deficiency		
	N	% [95% CI]	N	% [95% CI]
National	798	32.1[27.1, 37.4]	798	11.8[7.8, 16.8]
Age category		P = 0.005**		P = 0.020*
15-19 years	68	45.5[29.0, 62.8]	68	15.4[7.1, 27.2]
20-29 years	430	28.6[22.7, 35.0]	430	8.4[4.4, 14.0]
30-39 years	262	38.1[28.9, 47.8]	262	17.6[10.4, 26.7]
40-49 years	38	5.0[1.3, 12.1]	38	3.8[0.6, 11.8]
Residence		P <0.001***		P = 0.006**
Urban	321	17.2[10.3, 25.9]	321	3.9[1.1, 9.3]
Rural	477	39.6[33.0, 46.5]	477	15.8[10.2, 22.7]
Wealth quintile		P <0.001***		P <0.001***
Lowest	160	51.5[41.1, 61.8]	160	24.1[15.6, 34.3]
Second	139	44.7[35.1, 54.6]	139	17.3[8.6, 29.2]
Middle	143	20.1[13.1, 28.7]	143	2.2[0.5, 5.7]
Fourth	178	20.5[9.3, 35.9]	178	7.1[2.1, 16.3]
Highest	176	9.9[5.7, 15.5]	176	1.5[0.2, 4.9]
Level of education completed		P <0.001***		P <0.001***
None	166	46.5[34.1, 59.2]	166	23.4[12.8, 36.8]
Primary	122	28.7[19.3, 39.5]	122	12.8[6.5, 21.5]
Secondary	417	24.4[18.1, 31.5]	417	4.3[1.8, 8.5]
Post-secondary	69	10.0[4.0, 19.3]	69	2.2[0.4, 6.3]
Not answered	2	0	2	0

Vitamin B12 insufficiency (vitamin B12 depletion, at risk of vitamin B12 deficiency) is defined as serum B12 concentration <220 pmol/L.
Vitamin B12 deficiency (at risk of megaloblastic anaemia) is defined as serum B12 concentration <148 pmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Table 258. Prevalence of serum folate deficiency in pregnant women (aged 15-49 years), Nigeria 2021.

Background characteristics	Serum Folate deficiency, risk of elevated homocysteine	Serum Folate deficiency, risk of megaloblastic anaemia		
	N	% [95% CI]	N	% [95% CI]
National	798	44.3[39.7, 49.0]	798	20.3[16.4, 24.7]
Age category		P = 0.851		P = 0.287
15-19 years	68	46.0[29.5, 63.1]	68	12.3[4.9, 23.6]
20-29 years	430	42.7[36.2, 49.3]	430	21.8[17.0, 27.1]
30-39 years	262	45.6[38.1, 53.1]	262	18.5[12.4, 25.9]
40-49 years	38	51.1[29.7, 72.2]	38	32.6[10.4, 62.2]
Residence		P = 0.047*		P = 0.021*
Urban	321	38.3[31.7, 45.3]	321	14.8[10.7, 19.6]
Rural	477	47.4[41.5, 53.4]	477	23.2[17.8, 29.3]
Wealth quintile		P = 0.518		P = 0.810
Lowest	160	43.9[33.3, 54.8]	160	21.6[14.0, 30.8]
Second	139	47.8[34.9, 60.9]	139	19.4[12.3,28.2]
Middle	143	49.1[39.0, 59.3]	143	23.6[14.2, 35.2]
Fourth	178	38.4[30.6, 46.6]	178	18.7[11.8, 27.3]
Highest	176	39.9[32.2, 48.0]	176	17.4[11.8, 24.2]
Level of education completed		P = 0.590		P = 0.104
None	166	47.8[38.5, 57.3]	166	26.6[17.1, 37.8]
Primary	122	39.2[27.7, 51.5]	122	14.1[8.3, 21.5]
Secondary	417	43.7[37.9, 49.6]	417	18.4[14.0, 23.5]
Post-secondary	69	46.5[34.5, 58.7]	69	16.7[8.6, 27.7]
Not answered	2	100	2	100

Folate deficiency based on risk of elevated homocysteine, is defined as serum folate concentration <14 nmol/L. Folate deficiency based on risk of megaloblastic anaemia, is defined as serum folate concentration <6.8 nmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Table 259. Prevalence of Red Blood Cell (RBC) folate deficiency in pregnant women (aged 15-49 years), Nigeria 2021.

Background characteristics	RBC folate deficiency	
	N	% [95% CI]
National	789	85.2[82.1, 88.1]
Age category		P = 0.188
15-19 years	67	86.2[75.8, 93.5]
20-29 years	425	86.0[81.8, 89.7]
30-39 years	259	85.9[80.3, 90.5]
40-49 years	38	69.6[45.8, 87.8]
Residence		P <0.001***
Urban	319	77.1[71.7, 81.9]
Rural	470	89.4[85.4, 92.6]
Wealth quintile		P <0.001***
Lowest	161	93.3[83.4, 98.3]
Second	134	92.6[85.8, 96.9]
Middle	141	84.7[76.9, 90.8]
Fourth	177	77.7[69.0, 85.1]
Highest	174	70.3[62.8, 77.1]
Level of education completed		P = 0.002**
None	161	94.6[85.7, 98.8]
Primary	123	87.4[80.2, 92.8]
Secondary	412	80.5[75.9, 84.6]
Post-secondary	68	60.6[46.0, 74.0]
Not answered	2	57.8[NA, NA]

Red blood cell (RBC) folate deficiency is defined as RBC folate concentration <624 nmol/L. Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). CI, Confidence Interval.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Iodine deficiency among pregnant women (aged 15-49 years)

Median urinary iodine concentration is used an indicator to monitor and evaluate the impact of salt iodization. The goals for intervention programs are that the medial iodine concentration for pregnant, non-lactating women be in the range of 150-249 µg/L to represent adequate iodine nutrition. Concentrations less than150 µg/L represent any iodine deficiency, concentrations in the range of 250-499 µg/L represent above requirements and concentrations of 500 µg/L and above represent risk of adverse health consequences.

Figure 77 presents the distribution of urinary iodine concentrations among pregnant women (aged 15-49 years). **Table 260** presents the median urinary iodine levels among pregnant women (aged 15-49 years) stratified by age category, residence, wealth quintile, and level of education completed.

The overall median level of urinary iodine among pregnant women was 237.5 µg/L. There was a significant difference in the urinary iodine concentrations of pregnant women (aged 15-49 years) between wealth quintile (P = 0.006). The prevalence of iodine deficiency was lowest among women in the lowest wealth quintile (184.5 µg/L)

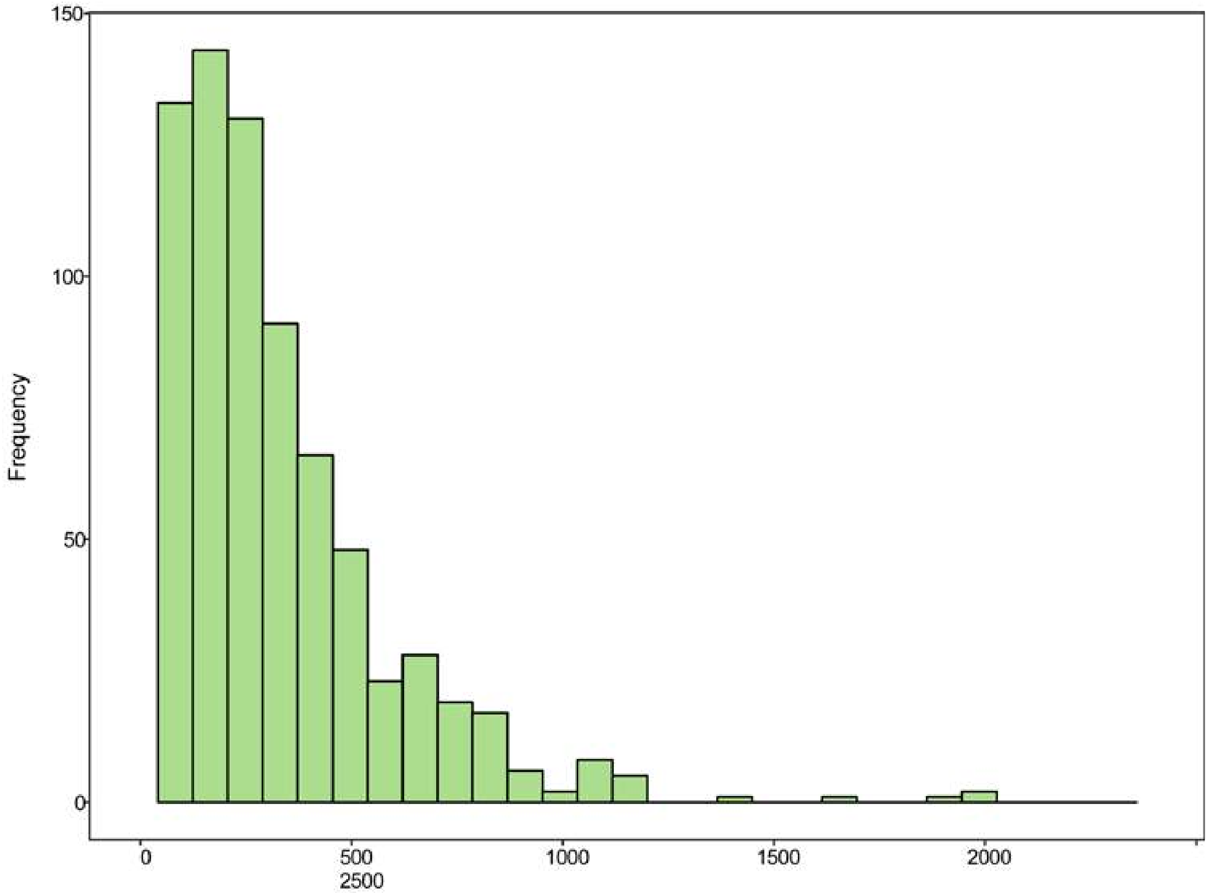


Figure 77. Distribution of iodine status in pregnant women (aged 15-49 years), Nigeria 2021
Urinary iodine concentration measured in µg/L.
Estimates calculated using weights that account for survey design and non-response.

Table 260. Median urinary iodine levels in pregnant women (aged 15-49 years), Nigeria 2021.

Background characteristics	Urinary iodine (µg/L)	
	N	% [95% CI]
National	750	237.5[123.4, 420.1]
Age category		P = 0.396
15-19 years	63	273.9[140.7, 504.4]
20-29 years	407	246.5[130.9, 420.1]
30-39 years	243	204.7[107.7, 380.5]
40-49 years	37	237.5[150.7, 562.4]
Residence		P = 0.133
Urban	295	257.1[139.2, 438.2]
Rural	455	229.0[115.5, 395.7]
Wealth quintile		P = 0.006**
Lowest	150	184.5[72.3, 346.6]
Second	131	218.9[115.5, 374.8]
Middle	141	314.3[150.9, 516.3]
Fourth	162	276.9[136.4, 418.0]
Highest	164	266.1[156.4, 439.3]
Level of education completed		P = 0.068
None	159	204.7[99.9, 368.2]
Primary	116	224.5[131.9, 446.9]
Secondary	391	256.6[131.7, 422.1]
Post-secondary	60	336.3[161.0, 483.4]
Not answered	2	187.6[187.6, 187.6]

Iodine deficiency for a sub-group of a population is defined by median urinary iodine concentration: any iodine deficiency ≤150 µg/L; no deficiency: 150 – 249 µg/L; above requirements: 250-499; risk of adverse health consequence > 500 µg/L.
Estimates calculated using weights that account for survey design and non-response.
N, number of respondents in the sub-group (unweighted). IQR, Interquartile range.
Differences between groups were compared using Chi-square test (* signifies P <0.05, **<0.01, ***<0.001).

Key Drivers of Anaemia

Box 20. Key Findings on the Drivers of Anaemia

Note that for ease of understanding, the first percentage in parenthesis is for the group with deficiency and the second for the group without deficiency.

Children (6-59 months old): Iron (41 percent versus 27percent), zinc (39 percent versus 26 percent), and B12 deficiency (59 percent versus 29 percent) were all associated with a statistically significant increased probability of any anaemia. Children 6-59 months with chronic inflammation (40 percent versus 17 percent), acute inflammation (50 percent versus 22 percent), helminth (38 percent versus 26 percent) and malaria infection (52 percent versus 24 percent) were all associated with a statistically significant increase in any anaemia.

Adolescent girls (10-14 years old): Iron deficiency was the only nutrient associated with a statistically significant increased prevalence of any anaemia (37 percent versus 19 percent); Moderate anaemia was higher among adolescent girls with acute inflammation (15 percent versus 5 percent) and chronic (14 percent versus 4 percent); and higher moderate and severe anaemia among adolescent girls with malaria infection (11 percent versus 4 percent and 2 percent versus 0 percent, respectively.

Women of reproductive age (15-49 years old): The key nutrient deficiencies associated with an increased probability of any anaemia among women of reproductive age were iron (44 percent versus 21 percent), vitamin A (34 percent versus 22 percent), zinc (30 percent versus 20 percent) and folate (24 percent versus 17 percent). Regarding non-nutritional factors associated with anaemia, the prevalence of any anaemia was higher among women of reproductive age with acute and chronic inflammation compared to those without inflammation (32 percent versus 22 percent and 30 percent versus 22 percent, respectively), and with those with malaria than those without malaria (29 percent versus 22 percent).

Pregnant women (15-49 years old): The nutrient deficiencies associated with a statistically significant increased probability of any anaemia were iron (39 percent versus 28 percent) and vitamin A (48 percent versus 27 percent).

Strength of association between any anemia, micronutrient deficiencies and select risk factors: Iron deficiency was associated with anemia in all target groups (2.12 and 1.90 times higher in WRA and Adolescent girls respectively). Among women of reproductive age, vitamin A, zinc and folic acid deficiency were also associated with a higher prevalence of anemia (1.54, 1.47 and 1.38 higher prevalence), while zinc and vitamin B12 deficiency were also all higher children 6-59 months with anemia (1.51 and 2.02 higher), and vitamin A was 1.81 times higher among pregnant women with anemia. Having sickle cell disease was clearly associated with anemia among both WRA and children 6-59 months (4.36 and 3.26 times higher), while having an Hb trait as a genetic blood disorder was also linked to anemia (0.59 and 1.57 times higher respectively).

This chapter presents results on key factors associated with anaemia in children 6-59 months, adolescent girls 10-14 years, and women of reproductive age to inform strategies to prevent and treat anaemia in these populations. The survey produced new insights on the key factors which are responsible for anaemia among preschool children, adolescent girls, women of reproductive age, and pregnant women. This evidence is summarized in the section below based on bivariate analysis and and a log-binomial regression model adjusted for survey design to calculate these PRs and describes the association between several nutrition and health status risk factors and different stages of anaemia (mild, moderate. and severe).

As described in the Chapter on Anaemia, a condition characterized by low levels of hemoglobin, is a serious public health problem associated with significant morbidity and adverse health outcomes. Iron deficiency is often implicated as the primary driver of anaemia, with estimates that it contributes to approximately one-half of all anaemia cases worldwide. However, there are other important nutritional and non-nutritional causes and mediators of anaemia that are relevant to inform public health interventions.

In addition to iron, several other micronutrients are essential for the function of a healthy blood system, and thus, any inadequacy of these may increase the risk of anaemia. Vitamin B12 and folate deficiencies are the most important causes of megaloblastic anaemia. Parasitic infections such as malaria, hookworm, and Salmonellae account for a large proportion of anaemia through inflammation, hemolysis, blood loss, and impaired nutrient absorption.

As previously stated, anaemia for all target groups was measured in the field from a venous blood sample using a HemoCue (Hb-301) instrument. Haemoglobin measurements were adjusted to account for pregnancy, altitude, and cigarette smoking as needed. Data are weighted to account for survey design and non-response. The cut-offs for the respective target groups for diagnosis of anaemia based on haemoglobin levels (grams per liter)are presented in **Table 230**. Below is **Figure 78** showing the overall prevalence of any, mild, moderate, and severe anaemia by target group, extracted from the chapter on anaemia for ease of reference.

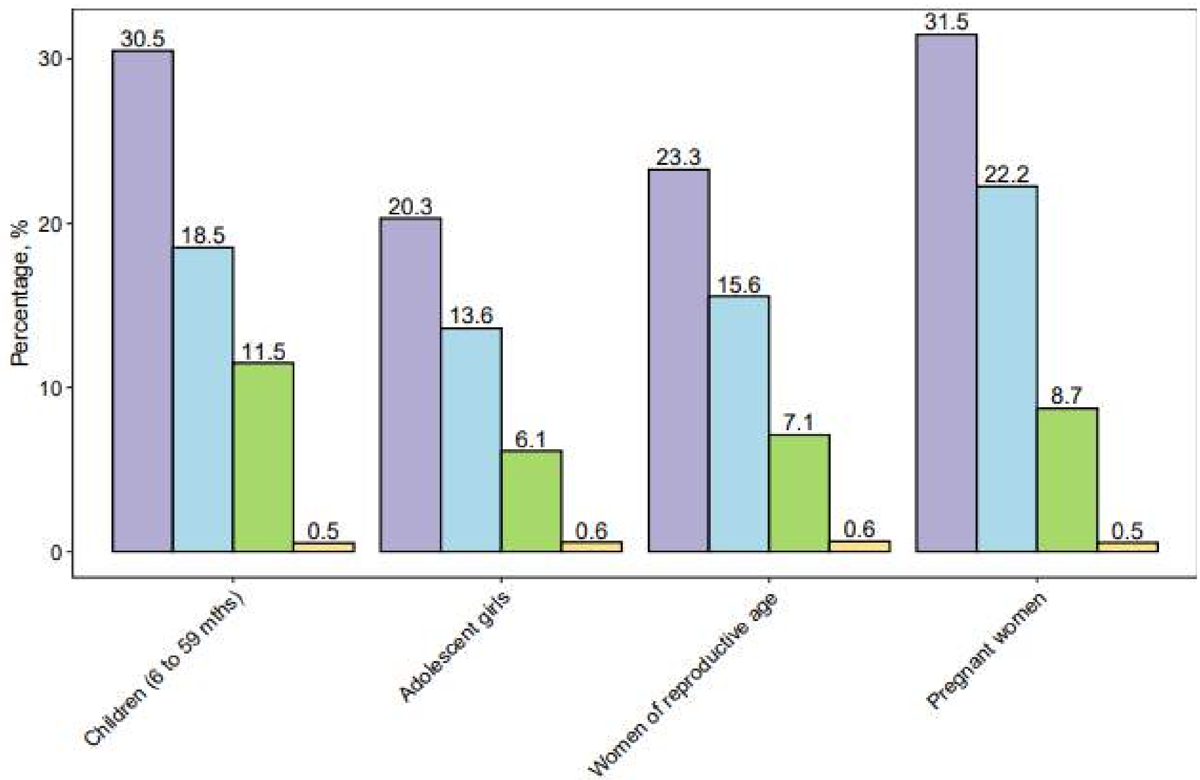


Figure 78. Overall prevalence of any, mild, moderate, and severe anaemia by target group, Nigeria 2021.

Children 6-59 months: Among children 6-59 months the prevalence of any anaemia, moderate anaemia, and severe anaemia was 30.5 percent, 11.5 percent, 0.5 percent, respectively (**Figure 78**). Iron (41 percent versus 27.2 percent), zinc (38.9 percent versus 25.7 percent), and B12 deficiency (59.4 percent versus 29.4 percent) were all associated with a statistically significant increased probability of any anaemia (**Table 261**). The prevalence of anaemia was higher among children under 5 with vitamin A deficiency (33.8 percent versus 28.6 percent), but this was not a statistically significant association.

Children under 5 with chronic inflammation (40 percent versus 17 percent), acute inflammation (50 percent versus 22 percent), helminth (38 percent versus 26 percent) and malaria infection (52 percent versus 24 percent) all were associated with a statistically significantly increase in anaemia ($P < 0.001$) (**Table 261**).

N = 4753 Children aged 6-59 months responded nationally
N = 1214 children with any anemia
N = 759 children with mild anemia
N = 430 children with moderate anemia
N = 25 children with severe anemia

Table 261. Prevalence of anaemia by select risk factors among children (aged 6-59 months), Nigeria 2021.

Risk factors	Any anaemia			Mild anaemia			Moderate anaemia			Severe anaemia		
	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value
Iron Status												
Deficient	778	41.0(35.8, 46.3)	<0.001***	778	23.8(19.8, 28.3)	0.003**	778	16.7(12.9, 21.1)	<0.001***	778	0.4(0.1, 1.1)	0.735
Optimal	3675	27.2(23.8, 30.7)		3675	16.6(14.3, 19.2)		3675	10.0(8.1, 12.2)		3675	0.5(0.3, 0.8)	
Vitamin A Status												
Deficient	1017	33.8(27.9, 40.1)	0.103	1017	20.1(16.7, 23.8)	0.214	1017	13.1(9.3, 17.6)	0.276	1017	0.7(0.2, 1.5)	0.377
Optimal	3372	28.6(25.4, 32.0)		3372	17.5(15.1, 20.1)		3372	10.7(8.7, 13.0)		3372	0.4(0.2, 0.7)	
Zinc Status												
Deficient	267	38.9(33.7, 44.3)	<0.001***	1299	22.3(18.8, 26.1)	<0.001***	1299	15.9(12.0, 20.2)	<0.001***	1299	0.7(0.4, 1.2)	0.189
Optimal	680	25.7(23.1, 28.5)		3155	16.5(14.6, 18.5)		3155	8.9(7.4, 10.7)		3155	0.3(0.1, 0.8)	
Vitamin B12 Status												
Deficient	10	59.4(45.3, 72.6)	<0.001***	80	20.7(10.8, 33.6)	0.688	80	38.7(22.3, 57.2)	<0.001***	80	0	0.571
Optimal	959	29.4(26.3, 32.5)		4522	18.3(16.1, 20.6)		4522	10.6(8.8, 12.6)		4522	0.5(0.3, 0.8)	
Acute Inflammation (CRP)												
Present	1166	49.9(44.6, 55.2)	<0.001***	1166	24.9(20.9, 29.2)	<0.001***	1166	23.7(19.3, 28.6)	<0.001***	1166	1.3(0.6, 2.3)	<0.001***
Absent	3287	21.9(19.2, 24.8)		3287	15.4(12.8, 18.2)		3287	6.4(4.8, 8.2)		3287	0.1(0.1, 0.3)	
Chronic Inflammation (AGP)												
Present	2301	39.8(35.7, 43.9)	<0.001***	2301	22.8(20.2, 25.6)	<0.001***	2301	16.1(13.3, 19.3)	<0.001***	2301	0.8(0.4, 1.3)	<0.001***
Absent	2152	17.4(15.0, 20.0)		2152	12.0(9.8, 14.6)		2152	5.3(3.8, 7.0)		2152	0.1(0.0, 0.2)	
MRDR Status												
Present	12	19.7(0.6, 69.4)	0.926	12	19.7(0.6, 69.4)	0.925	12	0	0.925	12	0	<0.001***
Absent	1157	18.6(15.2, 22.3)		1157	18.6(15.2, 22.3)		1157	0.0(0.0, 0.1)		1157	0	
Malaria												
Present	1062	51.8(46.9, 56.6)	<0.001***	1062	24.1(20.2, 28.3)	0.002**	1062	26.2(21.9, 30.9)	<0.001***	1062	1.4(0.7, 2.5)	<0.001***
Absent	3687	23.7(20.7, 26.9)		3687	16.7(14.3, 19.4)		3687	6.7(5.5, 8.2)		3687	0.2(0.1, 0.4)	
H. Pylori												
Present	1904	29.7(26.2, 33.3)	0.579	1904	16.2(13.5, 19.0)	0.068	1904	12.9(10.5, 15.7)	0.129	1904	0.6(0.2, 1.2)	0.718
Absent	2840	31.0(27.0, 35.1)		2840	19.9(17.1, 22.9)		2840	10.6(8.4, 13.2)		2840	0.5(0.2, 0.8)	
Helminth												
Present	379	37.9(31.0, 45.2)	0.002**	379	22.7(17.0, 29.2)	0.029*	379	15.0(10.6, 20.2)	0.030*	379	0.3(0.0, 0.9)	0.369
Absent	3048	26.3(22.9, 29.8)		3048	16.4(14.3, 18.7)		3048	9.3(7.0, 12.0)		3048	0.6(0.3, 1.0)	
Genotypes												
None	166	43.3(33.0, 54.0)	<0.001***	166	20.9(12.4, 31.4)	0.177	166	22.1(13.7, 32.4)	<0.001***	166	0.3(0.1, 1.1)	<0.001***
AA	3568	29.0(25.8, 32.4)		3568	18.2(15.9, 20.6)		3568	10.5(8.7, 12.6)		3568	0.3(0.2, 0.6)	
AC	73	45.5(30.3, 61.3)		73	31.3(16.2, 49.8)		73	12.9(5.0, 25.3)		73	1.3(0.1, 6.0)	
AS	897	29.1(24.3, 34.2)		897	18.0(14.7, 21.7)		897	10.9(7.5, 14.9)		897	0.2(0.0, 0.6)	
SS	34	94.7(85.4, 98.9)		34	14.5(5.1, 29.5)		34	61.9(40.3, 80.7)		34	18.3(6.0, 37.6)	

Adolescent girls 10-14 years: the prevalence of any anaemia, moderate anaemia, and severe anaemia among adolescent girls 10-14 years was 20.3 percent, 6.1 percent, 0.6 percent, respectively (**Figure 77**). Iron deficiency was the only nutrient associated with a statistically significant increased prevalence of any anaemia (36.5 percent versus 19.2 percent) (**Table 262**).

The prevalence of moderate anaemia was higher among adolescent girls with acute (15 percent versus 5 percent) and chronic (13 percent versus 4 percent) inflammation. There was also a statistically significant higher level of moderate and severe anaemia among adolescent girls with malaria infection (10.6 percent versus 3.9 percent and 1.7 percent versus 0 percent, respectively) (**Table 262**).

N = 983 adolescent girls (aged 10-14 years) who responded nationally
N = 190 adolescent girls with any anemia
N = 128 adolescent girls with mild anemia
N = 59 adolescent girls with moderate anemia
N = 3 adolescent girls with severe anemia

Table 262. Prevalence of anaemia by select risk factors among adolescent girls (aged 10-14 years), Nigeria 2021.

Risk factors	Any anaemia			Mild anaemia			Moderate anaemia			Severe anaemia		
	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value
Iron Status												
Deficient	32	36.5(16.2, 60.9)	0.049*	32	20.7(5.4, 45.8)	0.338	32	9.7(2.3, 24.3)	0.378	32	6.2(0.2, 26.7)	0.001**
Optimal	911	19.2(15.8, 23.0)		911	12.9(10.2, 16.0)		911	5.9(4.1, 8.3)		911	0.3(0.1, 1.1)	
Vitamin A Status												
Deficient	151	21.7(14.4, 30.4)	0.621	151	9.8(5.1, 16.3)	0.197	151	9.9(5.1, 16.6)	0.059	151	2.0(0.3, 6.2)	0.005**
Optimal	779	19.7(15.9, 23.8)		779	14.5(11.3, 18.3)		779	5.0(3.2, 7.4)		779	0.1(0.0, 0.6)	
Zinc Status												
Deficient	267	23.0(16.0, 31.1)	0.400	267	14.1(9.2, 20.1)	0.904	267	7.4(4.1, 11.9)	0.385	267	1.5(0.2, 4.6)	0.034*
Optimal	680	19.4(15.2, 24.1)		680	13.4(10.0, 17.2)		680	5.9(3.6, 8.9)		680	0.2(0.0, 0.7)	
Vitamin B12 Status												
Deficient	10	12.6(0.2, 57.5)	0.601	10	12.6(0.2, 57.5)	0.953	10	0	0.484	10	0	0.839
Optimal	959	20.2(16.7, 24.0)		959	13.4(10.6, 16.5)		959	6.3(4.4, 8.6)		959	0.6(0.1, 1.6)	
RBC Folate												
Deficient	853	20.3(16.7, 24.2)	0.909	853	13.6(10.8, 16.7)	0.925	853	6.1(4.1, 8.5)	0.874	853	0.6(0.1, 1.7)	0.619
Optimal	87	19.6(9.2, 33.9)		87	14.1(5.9, 26.4)		87	5.5(1.1, 14.9)		87	0	
Acute Inflammation (CRP)												
Present	118	41.3(30.1, 53.3)	<0.001***	118	25.0(14.6, 37.8)	0.004**	118	15.4(8.6, 24.3)	<0.001***	118	1.0(0.0, 4.3)	0.624
Absent	825	17.2(13.8, 21.1)		825	11.8(9.3, 14.7)		825	4.9(3.1, 7.3)		825	0.5(0.1, 1.6)	
Chronic Inflammation (AGP)												
Present	182	35.3(27.4, 43.8)	<0.001***	182	21.8(15.0, 29.8)	0.002**	182	13.5(8.1, 20.5)	<0.001***	182	0	0.419
Absent	761	16.4(12.8, 20.4)		761	11.3(8.6, 14.5)		761	4.4(2.7, 6.6)		761	0.7(0.2, 1.9)	
Malaria												
Present	313	27.2(20.4, 34.8)	0.010*	313	14.9(10.5, 20.1)	0.538	313	10.6(6.4, 16.1)	0.003**	313	1.7(0.4, 4.5)	0.020*
Absent	668	16.9(12.9, 21.4)		668	13.0(9.5, 17.1)		668	3.9(2.2, 6.2)		668	0	
H. Pylori												
Present	549	19.3(14.9, 24.2)	0.503	549	12.2(8.7, 16.5)	0.324	549	6.0(4.0, 8.5)	0.775	549	1.0(0.2, 2.8)	0.129
Absent	419	21.6(16.4, 27.4)		419	15.1(11.1, 19.7)		419	6.5(3.7, 10.3)		419	0	

Women of reproductive age 15-49 years: The overall prevalence of any anaemia was 23.3 percent while moderate anaemia was 7.1percent and severe anaemia was 0.6 percent among women of reproductive age (**Figure 77**). Individuals with nutrient deficiencies had strong and statistically significant association with an increased prevalence of any anaemia compared to those with optimal nutrient status. The key nutrient deficiencies associated with an increased probability of any anaemia among WRA were iron (44.4 percent versus 20.9 percent), vitamin A (34.0 percent versus 22 percent), zinc (30.2 percent versus 19.9 percent) and folate (23.9 percent versus 17.2 percent) (**Table 263**). There was a statistically significant higher prevalence of moderate and severe anaemia among WRA with iron deficiency ($P < 0.001$).

Inflammation was also a major contributor to anaemia status. The prevalence of any anaemia was higher among WRA with acute and chronic inflammation compared to WRA without inflammation (32.1 percent versus 22.1 percent and 30.3 percent versus 21.9 percent, respectively). There was also an elevated risk of anaemia among WRA with malaria than those without infection (29.3 percent versus 22.4 percent) (**Table 263**). There was no statistical association between anaemia and H. Pylori or helminth infections among WRA.

N = 5396 women of reproductive age (WRA) who responded nationally
N = 1274 WRA with any anemia
N = 851 WRA with mild anemia
N = 387 WRA with moderate anemia
N = 36 WRA with severe anemia

Table 263. Prevalence of anaemia by select risk factors among women of reproductive age (WRA), Nigeria

Risk factors	Any anaemia			Mild anaemia			Moderate anaemia			Severe anaemia		
	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value
Iron Status												
Deficient	492	44.4(38.9, 50.1)	<0.001***	492	20.6(16.7, 25.0)	0.006**	492	21.6(17.3, 26.3)	<0.001***	492	2.2(1.1, 3.8)	<0.001***
Optimal	4698	20.9(19.1, 22.9)		4698	15.0(13.5, 16.6)		4698	5.5(4.6, 6.5)		4698	0.4(0.2, 0.8)	
Vitamin A Status												
Deficient	468	34.0(28.6, 39.7)	<0.001***	468	22.2(17.5, 27.5)	<0.001***	468	11.1(7.4, 15.6)	0.013*	468	0.7(0.2, 1.6)	0.817
Optimal	4638	22.0(20.3, 23.8)		4638	14.7(13.4, 16.1)		4638	6.7(5.8, 7.7)		4638	0.6(0.4, 1.0)	
Zinc Status												
Deficient	1534	30.2(26.7, 33.8)	<0.001***	1534	19.2(16.4, 22.2)	0.003**	1534	9.8(7.8, 12.1)	<0.001***	1534	1.1(0.6, 2.0)	0.006**
Optimal	3654	19.9(18.1, 21.7)		3654	13.9(12.4, 15.5)		3654	5.6(4.7, 6.6)		3654	0.4(0.2, 0.6)	
Vitamin B12 Status												
Deficient	85	26.0(15.7, 38.5)	0.623	85	13.4(6.0, 24.3)	0.640	85	12.6(6.7, 20.6)	0.039*	85	0	0.624
Optimal	5266	23.4(21.6, 25.2)		5266	15.7(14.3, 17.2)		5266	7.0(6.1, 8.0)		5266	0.6(0.4, 1.0)	
RBC Folate												
Deficient	4790	23.9(22.0, 25.8)	0.013*	4790	16.1(14.7, 17.6)	0.002**	4790	7.2(6.2, 8.2)	0.957	4790	0.6(0.4, 1.0)	0.539
Optimal	541	17.2(13.2, 21.8)		541	9.8(6.9, 13.3)		541	7.0(4.1, 11.1)		541	0.4(0.0, 1.3)	
Acute Inflammation (CRP)												
Present	671	32.1(27.8, 36.7)	<0.001***	671	18.6(15.3, 22.3)	0.062	671	12.2(9.4, 15.5)	<0.001***	671	1.3(0.6, 2.3)	0.019*
Absent	4519	22.1(20.3, 24.0)		4519	15.2(13.7, 16.8)		4519	6.4(5.6, 7.4)		4519	0.5(0.3, 0.9)	
Chronic Inflammation (AGP)												
Present	779	30.3(26.4, 34.5)	<0.001***	779	18.3(14.6, 22.3)	0.097	779	10.6(8.2, 13.3)	<0.001***	779	1.5(0.7, 2.6)	0.005**
Absent	4411	21.9(20.1, 23.8)		4411	15.1(13.6, 16.6)		4411	6.4(5.5, 7.5)		4411	0.4(0.2, 0.8)	
MRDR Status												
Present	4411	22.2(18.5, 26.2)	NA	4411	15.1(13.6, 16.6)	NA	4411	6.4(5.5, 7.5)	NA	4411	0.4(0.2, 0.8)	NA
Absent	1214	29.3(25.2, 33.6)		1214	15.8(12.6, 19.4)		1214	6.4(4.6, 8.5)		1214	0	
Malaria												
Present	699	29.3(25.2, 33.6)	<0.001***	699	19.7(16.4, 23.2)	0.005**	699	8.2(6.0, 10.8)	0.319	699	1.5(0.4, 3.8)	0.069
Absent	4690	22.4(20.7, 24.2)		4690	15.0(13.6, 16.5)		4690	6.9(6.0, 8.0)		4690	0.5(0.3, 0.7)	
H. Pylori												
Present	3616	22.6(20.8, 24.4)	0.240	3616	15.4(14.0, 16.9)	0.753	3616	6.6(5.6, 7.8)	0.146	3616	0.5(0.3, 0.8)	0.404
Absent	1772	24.5(21.5, 27.7)		1772	15.8(13.5, 18.4)		1772	7.9(6.4, 9.6)		1772	0.8(0.3, 1.6)	
Helminth												
Present	274	26.9(20.1, 34.5)	0.251	274	16.7(11.1, 23.4)	0.715	274	9.3(5.8, 14.0)	0.171	274	0.8(0.2, 2.2)	0.282
Absent	3656	22.8(20.7, 24.9)		3656	15.5(13.8, 17.3)		3656	6.8(5.8, 8.0)		3656	0.4(0.2, 0.7)	
Genotypes												
None	150	31.0(21.2, 42.0)	<0.001***	150	17.6(9.8, 27.8)	0.349	150	12.7(7.1, 20.2)	<0.001***	150	0.7(0.0, 3.2)	<0.001***
AA	3987	22.9(21.1, 24.8)		3987	15.0(13.5, 16.5)		3987	7.5(6.4, 8.6)		3987	0.5(0.2, 0.9)	
AC	62	13.5(4.3, 29.0)		62	9.8(2.1, 25.4)		62	3.1(0.4, 9.9)		62	0.7(0.0, 3.2)	
AS	1175	23.0(19.4, 26.9)		1175	17.3(13.8, 21.2)		1175	5.0(3.7, 6.5)		1175	0.7(0.3, 1.3)	
SS	11	100		11	18.9(1.0, 62.1)		11	40.3(1.9, 93.0)		11	40.8(3.3, 90.2)	

Pregnant women (aged 15-49 years): Among pregnant women, the prevalence of any anaemia, moderate anaemia, and severe anaemia was 31.5 percent, 8.7 percent, and 0.5 percent, respectively (**Figure 77**). The nutrient deficiencies associated with a statistically significant increased probability of any anaemia were iron (39.0 percent versus 28.1 percent) and vitamin A (48.4 percent versus 26.7 percent) (**Table 264**). The prevalence of anaemia was higher among pregnant women with vitamin B12 deficiency and folate deficiency, but these were not statistically significant associations.

The prevalence of moderate and severe anaemia was higher among pregnant women with acute inflammation. There was an elevated likelihood of any anaemia among pregnant women with H. pylori and moderate anemia among pregnant women with malaria, but there was no association between anemia and helminth infection.

N = 795 pregnant women who responded nationally
N = 252 pregnant women with any anemia
N = 163 pregnant women with mild anemia
N = 85 pregnant women with moderate anemia
N = 4 pregnant women with severe anemia

Table 264. Prevalence of anaemia by select risk factors among pregnant women, Nigeria 2021.

Risk factors	Any anaemia			Mild anaemia			Moderate anaemia			Severe anaemia		
	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value	N	% [95% CI]	P value
Iron Status												
Deficient	184	39.0(29.8, 48.8)	0.019*	184	26.8(18.5, 36.4)	0.091	184	11.8(7.5, 17.4)	0.101	184	0.4(0.0, 1.7)	0.667
Optimal	570	28.1(22.7, 34.0)		570	19.8(15.2, 24.9)		570	7.7(5.3, 10.7)		570	0.6(0.1, 1.7)	
Vitamin A Status												
Deficient	125	48.4(35.8, 61.3)	<0.001***	125	32.5(20.9, 45.9)	0.013*	125	14.4(8.1, 22.7)	0.032*	125	1.5(0.2, 4.9)	0.110
Optimal	614	26.7(21.8, 32.1)		614	18.9(14.7, 23.7)		614	7.5(5.2, 10.2)		614	0.3(0.1, 1.0)	
Vitamin B12 Status												
Deficient	60	41.1(24.0, 59.8)	0.169	60	24.5(11.8, 41.3)	0.658	60	13.8(5.4, 26.8)	0.198	60	2.7(0.4, 8.9)	0.003**
Optimal	728	29.7(24.7, 35.0)		728	21.3(16.7, 26.4)		728	8.2(6.0, 10.7)		728	0.2(0.0, 0.8)	
RBC Folate												
Deficient	625	31.4(26.0, 37.3)	0.368	625	21.9(17.1, 27.3)	0.727	625	8.9(6.5, 11.8)	0.384	625	0.6(0.2, 1.5)	0.421
Optimal	153	26.9(18.5, 36.5)		153	20.3(13.0, 29.1)		153	6.6(3.1, 11.7)		153	0	
Acute Inflammation (CRP)												
Present	228	36.3(27.6, 45.6)	0.155	228	20.8(14.5, 28.2)	0.808	228	13.4(8.6, 19.6)	0.019*	228	2.0(0.6, 4.8)	0.002**
Absent	526	28.8(22.8, 35.5)		526	21.9(16.3, 28.2)		526	7.0(4.7, 9.9)		526	0	
Chronic Inflammation (AGP)												
Present	80	20.1(11.3, 31.3)	0.060	80	9.6(3.4, 20.0)	0.031*	80	9.6(4.6, 17.2)	0.763	80	0.8(0.0, 3.6)	0.727
Absent	674	32.5(26.5, 38.8)		674	23.3(18.0, 29.1)		674	8.7(6.3, 11.5)		674	0.5(0.1, 1.4)	
Malaria												
Present	110	40.7(28.1, 54.2)	0.125	110	23.6(13.7, 35.9)	0.805	110	17.1(9.6, 27.1)	0.004**	110	0	0.432
Absent	684	30.0(24.5, 35.8)		684	22.0(17.1, 27.5)		684	7.3(5.2, 9.8)		684	0.6(0.2, 1.5)	
H. Pylori												
Present	483	35.4(28.7, 42.5)	0.042*	483	27.1(20.6, 34.3)	0.007**	483	8.0(5.6, 10.9)	0.462	483	0.3(0.0, 1.5)	0.424
Absent	312	25.9(19.8, 32.8)		312	15.4(10.8, 20.9)		312	9.7(6.1, 14.5)		312	0.8(0.2, 2.2)	
Helminth												
Present	31	40.7(20.6, 63.2)	0.395	31	24.1(8.8, 46.2)	0.843	31	16.6(4.0, 39.0)	0.280	31	0	0.705
Absent	521	31.9(26.0, 38.2)		521	22.2(16.7, 28.5)		521	8.9(6.3, 12.1)		521	0.7(0.2, 1.9)	

An overall summary of the results is presented in **Table 265**. Micronutrient deficiencies, infections and inflammation (acute and chronic) and genetic blood disorders were associated with an increased probability of any anaemia in all population groups. Iron deficiency was associated with anemia in all target groups (2.12 and 1.90 times higher in WRA and Adolescent girls respectively).

Among women of reproductive age, vitamin A, zinc and folic acid deficiency were also associated with a higher prevalence of anemia (1.54, 1.47 and 1.38 higher prevalence), while zinc and vitamin B12 deficiency were also all higher among preschool children with anemia (1.51 and 2.02 higher), and vitamin A was 1.81 times higher among pregnant women with anemia.

The prevalence of acute and chronic inflammation and malaria were statistically higher among WRA, preschool children and adolescent girls with anemia. While H pylori emerged as a driver of anemia among pregnant women. Having sickle cell disease was associated with anemia among both WRA and preschool children (4.36 and 3.26 times higher), while having an Hb trait as a genetic blood disorder was also linked to anemia (0.59 and 1.57 times higher respectively).

Table 265. Association between any anemia, micronutrient deficiencies and select risk factors:

Any Anemia	WRA			Preschool children			Pregnant women			Adolescent girls		
Predictors	PR	CI	p	PR	CI	p	PR	CI	p	PR	CI	p
Iron (Deficient)	2.12	1.83 - 2.46	<0.001	1.51	1.29, 1.76	<0.001	1.39	1.06, 1.81	0.016	1.9	1.07, 3.39	0.03
Vitamin A (Deficient)	1.54	1.31 - 1.82	<0.001	1.18	0.97, 1.44	0.096	1.81	1.37, 2.41	<0.001	1.1	0.75, 1.62	0.618
Zinc (Deficient)	1.47	1.27 - 1.69	<0.001	1.51	1.31, 1.74	<0.001				1.19	0.80, 1.77	0.397
B12 (Deficient)	1.11	0.73 - 1.70	0.617	2.02	1.62, 2.53	<0.001	1.38	0.90, 2.13	0.137	0.62	0.10, 4.05	0.62
Folic acid (Deficient)	1.38	1.06 - 1.80	0.016				1.17	0.82, 1.66	0.378	1.04	0.56, 1.92	0.91
CRP (Present)	1.45	1.25 - 1.68	<0.001	2.28	2.00, 2.60	<0.001	1.26	0.92, 1.72	0.151	2.4	1.71, 3.36	<0.001
AGP (Present)	1.38	1.20 - 1.59	<0.001	2.29	1.98, 2.64	<0.001	0.62	0.36, 1.06	0.078	2.16	1.57, 2.95	<0.001
Malaria (Present)	1.31	1.13 - 1.52	<0.001	2.18	1.88, 2.54	<0.001	1.36	0.93, 1.98	0.109	1.61	1.12, 2.31	0.01
H. pylori (Present)	0.92	0.80 - 1.06	0.237	0.96	0.82, 1.11	0.578	1.36	1.01, 1.85	0.044	0.89	0.64, 1.25	0.503
Helminth (Present)	1.18	0.89 - 1.56	0.241	1.44	1.16, 1.79	0.001	1.28	0.75, 2.18	0.369			
Genotype (vs. AA)												
Hb trait (AC)	0.59	0.26, 1.37	0.217	1.57	1.15, 2.14	0.004						
Sickle cell trait (AS)	1.00	0.84, 1.19	0.976	1.00	0.85, 1.18	0.982						
Sickle cell disease (SS)	4.36	4.02, 4.72	<0.001	3.26	2.86, 3.72	<0.001						

Overall iron deficiency, inflammation and malaria seemed to be associated with an increased probability of anemia across all age groups, while VA deficiency was an important driver for pregnant women and women of reproductive age and zinc deficiency was a determinant of anemia among WRA and preschool children. While these results provide important insights, additional multivariate analyses are needed to understand the extent of the relative contribution of each risk factor to better inform the design of anaemia reduction efforts to maximize public health impact.

Factors associated with multiple forms of malnutrition

The term malnutrition covers two broad groups of conditions: undernutrition, which includes stunting (low length/height-for-age), wasting (low weight-for-length/height), and underweight (low weight-for-age); and overweight (weight-for-length/height) and obesity (weight-for-length/height). Stunting reflects linear growth retardation caused by long-term, insufficient nutrient intake and repeated infections. Wasting results from acute food shortage and illness, causing recent weight loss or failure to gain weight. Underweight is a composite indicator that can indicate wasting, stunting, or both. Overweight and its severe form, obesity, are measures of overnutrition, which result from an energy imbalance between calories consumed and calories expended. Thinness among adolescent girls (aged 10-14 years) is defined as a BMI-for-age Z-scores (BAZ) <-2SD and among WRA it is defined as a body mass index (BMI) of <18.5 kg/m2.

The underlying causes of malnutrition could be numerous. These could be due to immediate causes related to the individual, such as inadequate dietary intake, reflected in the food security status of the household/individual, prevalence of diseases due to inadequate care, unhealthy household environment, and lack of health services. There could be underlying causes at the household or community level such as income, poverty, dwellings, assets, or due to basic socio-economic conditions a person is living in.

We assessed the prevalence of food insecurity and examined the relationship between some of the underlying causes of malnutrition to identify other key factors at individual and HH levels (e.g., education, SES) that are associated with micronutrient status in WRA and children (aged 6–59 months), and the micronutrient status in adolescent girls. Therefore, this chapter presents results on key factors associated with multiple forms of malnutrition among women of reproductive age (15-49 years), adolescent girls (10-14 years), and children (6-59 months).

To explore the relationship between malnutrition indicators and associated risk factors, we conducted a bivariate analysis of the prevalence of relevant malnutrition indicators for a population group with several risk factors such as the food security status of the individual, various micro-nutrient deficiency indicators, such as zinc and vitamin A deficiencies, presence of inflammations and infections, diseases such as malaria and genetic blood disorders.

Food security status of an individual was determined using the Food Insecurity Experience Scale (FIES) methodology with an assumption that the food security status of an individual, for whom biomarkers and malnutrition indicators are examined, is the same as all the other members of his/her household with whom FIES questions were canvassed. For this analysis, all individuals are classified into three levels of food security: moderately food Insecure, severely food insecure, and food secure. Results are summarised below.

Table 266 shows the prevalence of Stunting, Wasting, Underweight, Overweight and Obesity by food security status and select micro-nutrient deficiency indicators among children (aged 6-59 months). that the results indicate that prevalence of all the five malnutrition indicators is almost same across all the three categories of food insecurity. However, these results are insignificant. An important result is that the prevalence of stunting, wasting, underweight, overweight and obesity are significantly higher among children with iron, vitamin A, zinc and vitamin B12 deficiencies. Both, acute and chronic inflammations are also significantly related to all malnutrition indicators.

Table 266. Association between food security, malnutrition, and micronutrient deficiencies and select risk factors among children (aged 6-59 months), Nigeria 2021.

Risk factors	Stunting			Wasting			Underweight			Overweight			Obesity		
	PR	CI	P	PR	CI	P	PR	CI	P	PR	CI	P	PR	CI	P
Food Security Status															
Severely Food Insecure	0.98	0.81–1.18	0.88	0.88	0.64–1.22	1.02	1.02	0.84–1.22	0.52	0.52	0.21–1.33	0.44	0.44	0.12–1.55	0.198
Moderately Food Insecure	0.97	0.84–1.11	1.03	1.03	0.79–1.35	1.06	1.06	0.90–1.25	1.11	1.11	0.66–1.87	0.82	0.82	0.37–1.85	0.635
Iron Status															
Deficient	1.32	1.14–1.53	<0.001	1.12	0.81–1.55	0.491	1.28	1.04–1.57	0.019	1.93	1.11–3.36	0.02	2.21	0.88–5.57	0.093
Vitamin A Status															
Deficient	1.38	1.21–1.57	<0.001	1.11	0.86–1.42	0.42	1.29	1.12–1.47	<0.001	1.09	0.57–2.09	0.8	1.66	0.65–4.29	0.291
Zinc Status															
Deficient	1.36	1.20–1.55	<0.001	0.99	0.76–1.28	0.943	1.31	1.13–1.52	<0.001	1.05	0.59–1.89	0.864	1.32	0.50–3.47	0.57
Vitamin B12 Status															
Deficient	1.33	0.97–1.82	0.078	1.72	0.96–3.06	0.067	1.89	1.41–2.55	<0.001	0.47	0.11–1.96	0.3	0.00	0.00–0.00	<0.001
Acute Inflammation (CRP)															
Present	1.17	1.04–1.31	0.011	1.3	1.02–1.66	0.033	1.23	1.06–1.43	0.006	1.00	0.54–1.85	0.994	1.22	0.49–3.02	0.671
Chronic Inflammation (AGP)															
Present	1.74	1.52–1.98	<0.001	1.49	1.22–1.82	<0.001	1.71	1.44–2.02	<0.001	1.79	1.03–3.13	0.04	2.27	0.99–5.23	0.054
MRDR															
Present	1.37	1.19–1.58	<0.001	0.00	0.00–0.00	<0.001	0.00	0.00–0.00	<0.001	0.00	0.00–0.00	<0.001	0.00	0.00–0.00	<0.001
Malaria															
Present	1.91	0.41–8.89	0.407	0.61	0.45–0.82	0.001	1.2	1.01–1.43	0.038	1.17	0.64–2.16	0.61	1.48	0.59–3.71	0.405
H. Pylori															
Present	0.97	0.84–1.12	0.674	0.65	0.50–0.86	0.002	0.82	0.72–0.94	0.004	1.03	0.62–1.71	0.923	1.29	0.59–2.80	0.518
Helminth															
Present	1.27	1.06–1.52	0.01	1.01	0.65–1.56	0.969	1.05	0.78–1.42	0.738	1.57	0.68–3.64	0.289	2.37	0.67–8.41	0.182
Genotypes															
AC	0.7	0.43–1.15	0.156	0.89	0.21–3.67	0.868	0.96	0.51–1.81	0.892	0.00	0.00–0.00	<0.001	0.00	0.00–0.00	<0.001
AS	0.97	0.82–1.15	0.734	1.05	0.84–1.32	0.682	0.99	0.79–1.25	0.95	1.34	0.72–2.47	0.353	1.68	0.69–4.07	0.251
SS	0.65	0.20–2.10	0.474	1.11	0.40–3.10	0.844	0.51	0.18–1.44	0.202	0.53	0.07–4.07	0.54	1.15	0.14–9.21	0.895
Missing	1.24	1.01–1.54	0.044	1.5	1.12–2.00	0.006	1.46	1.17–1.81	0.001	1.32	0.64–2.73	0.449	1.90	0.70–5.13	0.205

Table 267 shows the prevalence of stunting, thinness, overweight, and obesity by food security status and select micronutrient deficiency indicators among adolescent girls (aged 10-14 years). The results show that though the prevalence of stunting and thinness is higher among moderately and severely food insecure girls, the results are not significant. Vitamin A deficiency is related to prevalence of stunting, overweight, and obesity. Zinc deficiency, on the other hand, is strongly related to stunting among girls. There are no statistically significant results between malnutrtion indicators and iron deficiency, vitamin B12 or RBC folate deficiency indicators. Inflammations and infections also do not show any significant relationship with malnutrition indicators for adolescent girls.

Table 267. Association between food security, malnutrition, and micronutrient deficiencies and select risk factors among adolescent girls (aged 10-14 years), Nigeria 2021.

Risk factors	Stunting			Thinness			Overweight			Obesity		
	PR	CI	P	PR	CI	P	PR	CI	P	PR	CI	P
Food Security Status												
Severely Food Insecure	1.09	0.70 – 1.69	0.702	0.77	0.43 – 1.39	0.388	0.68	0.26 – 1.78	0.437	0.24	0.05 – 1.18	0.079
Moderately Food Insecure	1.19	0.79 – 1.8	0.397	1.07	0.65 – 1.75	0.801	0.67	0.31 – 1.45	0.308	1.18	0.24 – 5.80	0.837
Iron Status												
Deficient	0.48	0.17 – 1.36	0.164	0.9	0.30 – 2.69	0.853	1.17	0.16 – 8.53	0.873	2.2	0.42 – 11.55	0.348
Vitamin A Status												
Deficient	2.44	1.83 – 3.25	<0.001	1.4	0.85 – 2.31	0.185	0.13	0.04 – 0.4	<0.001	0.73	0.14 – 3.94	0.715
Zinc Status												
Deficient	1.42	1.03 – 1.97	0.035	1.33	0.88 – 2.00	0.176	0.51	0.22 – 1.20	0.122	1.9	0.51 – 7.10	0.337
Vitamin B12 Status												
Deficient	2.13	0.87 – 5.23	0.097	1.38	0.37 – 5.20	0.631	0	0.00 – 0.00	<0.001	0	0.00 – 0.00	0.001
RBC Folate												
Deficient	0.94	0.50 – 1.78	0.845	1.00	0.48 – 2.13	0.99	1.32	0.34 – 5.05	0.689	0.57	0.07 – 4.63	0.598
Acute Inflammation (CRP)												
Present	1.34	0.85 – 2.10	0.205	1.01	0.60 – 1.70	0.963	1.39	0.51 – 3.82	0.521	2.41	0.49 – 11.91	0.281
Chronic Inflammation (AGP)												
Present	1.14	0.79 – 1.64	0.474	1.13	0.67 – 1.89	0.651	0.82	0.31 – 2.22	0.701	4.34	1.13 – 16.64	0.032
Malaria												
Present	1.25	0.89 – 1.74	0.196	0.94	0.58 – 1.53	0.812	0.5	0.22 – 1.12	0.09	0.6	0.13 – 2.70	0.504
H. Pylori												
Present	0.74	0.50 – 1.10	0.132	0.63	0.41 – 0.99	0.044	0.79	0.40 – 1.56	0.5	0.65	0.17 – 2.49	0.526

Table 268 presents the prevalence of thinness, overweight, and obesity by food security status and select micro-nutrient deficiency indicators for women of reproductive age 15-49 years. The results show that the prevalence of thinness is higher among both, moderately and severely food-insecure women and is significant too. Prevalence of obesity and overweight are higher among food-secure women; however, the results are insignificant. Vitamin A, zinc, and RBC folate deficiencies are strongly associated with all indicators of malnutrition in women of reproductive age (thinness, overweight, obesity) except vitamin A deficiency in overweight women. Acute and chronic inflammations are strongly associated with overweight and obese women. The prevalence of overweight and obese women is significantly lower among those who reported to have suffered from Malaria. There was no statistical association between malnutrition and H. Pylori or Helminth infections among WRA.

Table 268. Association between food security, malnutrition, and micronutrient deficiencies and select risk factors among women of reproductive age (WRA), Nigeria 2021.

Risk factors	Thinness			Overweight			Obesity		
	PR	CI	P	PR	CI	P	PR	CI	P
Food Security Status									
Severely Food Insecure	995	1.14(0.93 – 1.41)	0.209	1.15	0.93 – 1.43	0.203	1.02	0.75 – 1.39	0.887
Moderately Food Insecure	1311	1.06(0.90 – 1.25)	0.468	0.98	0.80 – 1.20	0.861	1.18	0.89 – 1.56	0.244
Iron Status									
Deficient	486	1.05(0.81 – 1.38)	0.703	1.16	0.89 – 1.52	0.28	1.40	1.06 – 1.86	0.017
Vitamin A Status									
Deficient	468	1.44(1.14 – 1.82)	0.002	0.74	0.52 – 1.06	0.1	0.52	0.30 – 0.87	0.014
Zinc Status									
Deficient	1625	1.59(1.31 – 1.93)	<0.001	0.75	0.60 – 0.93	0.01	0.58	0.44 – 0.77	<0.001
Vitamin B12 Status									
Deficient	86	1.01(0.53 – 1.92)	0.983	0.31	0.13 – 0.74	0.008	1.00	0.36 – 2.79	0.999
RBC Folate									
Deficient	4789	1.37(0.96 – 1.94)	0.081	0.76	0.60 – 0.96	0.02	0.62	0.45 – 0.85	0.003
Acute Inflammation (CRP)									
Present	666	0.72(0.51 – 1.01)	0.054	1.23	1.01 – 1.51	0.039	3.51	2.91 – 4.22	<0.001
Chronic Inflammation (AGP)									
Present	780	1.1(0.88 – 1.38)	0.41	0.99	0.77 – 1.26	0.927	1.72	1.35 – 2.21	<0.001
Malaria									
Present	690	1.22(0.94 – 1.58)	0.136	0.56	0.40 – 0.79	0.001	0.38	0.24 – 0.60	<0.001
H. Pylori									
Present	3582	0.82(0.66 – 1.01)	0.064	1.03	0.85 – 1.26	0.759	1.18	0.93 – 1.49	0.164
Helminth									
Present	275	1.23(0.91 – 1.67)	0.183	0.90	0.60 – 1.35	0.601	1.00	0.56 – 1.78	0.996
Genotypes									
AC	62	0.72(0.29 – 1.80)	0.487	1.47	0.86 – 2.51	0.161	0.86	0.28 – 2.63	0.788
AS	1185	1.14(0.92 – 1.41)	0.233	0.95	0.78 – 1.17	0.623	0.87	0.68 – 1.13	0.294
SS	11	5.32(3.61 – 7.83)	<0.001	0.00	0.00 – 0.00	<0.001	0.00	0.00 – 0.00	<0.001
Missing	156	0.97(0.56 – 1.69)	0.914	0.91	0.55 – 1.50	0.71	1.02	0.51 – 2.02	0.956

Recommendations for Nutrition Policy in Nigeria

Thematic Area	Major Finding	Implication	Call to action
Nutrient Intake inadequacy	The contribution of animal-sourced protein is low and at least >30% of women did not meet protein intake requirements.	Overall diet (of women and children) is likely limited in essential amino acids critical for growth and development.	Food system innovations are needed to incentivize the production and consumption of animal-based protein foods. Specifically, a scale out of relevant policies such as policy recommendations on the Transformation and Future of Aquatic Food Systems in Nigeria is needed urgently.
	Above 50% inadequacy in women's intake of Calcium, Vitamin C, B1, B2, Folate, and Vitamin B12 . Inadequacy of between 25% - 50% in intake of Iron, Zinc, Vitamin A	Food-related micronutrient inadequacy is still a problem and is more severe among women (especially in pregnant and lactating women)	Existing policy strategies such as the Agricultural Sector Food Security and Nutrition Strategy need to be strengthened to fulfill all its strategic objectives which include "to reduce undernutrition, including, micronutrient deficiency disorders" Food-based and food system policies such as supplementation and fortification that are proven to improve micronutrient intake need to be scaled up and sustained. There is need to develop sub-national food-based recommendations through modelling
	Severe inadequacy of >50% in the children's intake of Calcium, Vitamin B2, Folate, and Vitamin B12 with lesser severity in the intake of Iron, Zinc, Vitamin A, and B1		
IYCF	Frequency of meals was generally within recommendations for most children but dietary diversity was lower resulting in 41% attaining minimum acceptable diet	Nutrient adequacy of food consumption is currently sub-optimal	There is need for an urgent adaptation and scale-up of health-related priority actions for Nigeria's food systems transformation. This includes the integration of food-based dietary guidelines and standardized nutrition education messages into service delivery at all levels This will improve nutrition education toward achieving dietary diversity for children There is need for barrier analysis research on diet diversity for infants, young children, and women of reproductive age..
	While consumption of unhealthy foods among infants and young children was higher in urban areas, as food systems shift this will only grow in rural areas. It is an opportunity to stagnate the growth of these dietary patterns in rural areas	Dietary patterns are likely becoming unhealthy among children living in urban areas	Food environment policies that can drive and protect healthy consumption patterns are needed
Biofortification	Only three percent consumed yellow cassava, five percent consumed orange-fleshed sweet potato and 13 percent consumed orange maize. Consumption was highest in the North East compared to all other zones in the country.	Nutritious foods capable of reducing the burden of micronutrient deficiencies, especially Vitamin A deficiency are not reaching the targeted population substantially. There are still opportunities for scaling up especially in areas where industrial manufactured foods have a low reach and the analogous crops are still main staples.	Provide enabling environment suitable for scaling up the production and consumption of biofortified crops especially in areas experiencing high micronutrient deficiency.

Fortification	Consumption of fortifiable and fortified foods was higher for items that are usually utilized as ingredients in households (vegetable oil, sugar, salt, and bouillon) when compared to the flours that are consumed in higher quantity (wheat flour maize flour, and semolina flour).	Flours and staples that could deliver more nutrients to the overall nutrient intake of the population are less utilized in quantity compared to food vehicles that serve as ingredients.	Strengthen existing policies and create innovative policies that improve mandatory large-scale food fortification, especially for staples.
	Despite high utilization of Coverage of fortification is low for flours, especially in Northern zones	Coverage of fortification is low among zones in the northern part of the country	Context-specific innovations are needed in low-fortification coverage areas
Diet Quality	Mean Minimum dietary diversity score of women in Nigeria is 3.6 out of a possible score of 10. Only a fifth of non-pregnant and a third of pregnant women achieved minimum dietary diversity (consumed at least 5 from 10 food groups).	Dietary diversity is still low for sustaining micronutrient adequacy in women	Based on recommendations of consultations by several food system dialogues, food system transformation pathways that suit the Nigerian context are recommended for urgent adaptation to incentivize the increased production and consumption of nutrient-dense foods in addition to known staples. Specifically, there should be an expansion in nutrition education programmes to encourage the general population to consume nutrient rich and diverse diets, fortified/bio fortified foods, and reduce food waste at the household level. It is also recommended that quantitative food-based dietary guidelines be developed for informed nutrition education. For both WRA and children, there is need to identify ways to improve dietary adequacy through modelling (such as linear program modelling) to identify food-based recommendations that could improve nutrient adequacy and fill nutrient gaps through already consumed, available foods and food groups
Anthropometry	The data indicate that stunting affects 1 in 3 children aged 6-59 months nationally but some zones are more affected than others.	Although country-level estimates are useful for international comparisons and benchmarking, they mask disparities in malnutrition at the lower administrative levels at which most health and nutrition policy planning and implementation occur.	Geospatial estimates of malnutrition provided by the survey provide a baseline for measuring progress and should be used for prioritization and targeting interventions to those populations with the greatest need, in order to reduce disparities and accelerate progress.
	The prevalence of obesity is in double digits among women of reproductive age in certain zones.	The data reveal obesity as a critical and emerging issues in Nigeria	There is a need to develop comprehensive plans that tackle both undernutrition and overnutrition across different age groups and geopolitical zones. Further research is needed to identify the drivers of overnutrition so the actions can be tailored.
Coverage of nutrition interventions to improve nutrition status	The results reveal low coverage of key nutrition interventions and an even lower co-coverage of these interventions.	Improved implementation and coverage of essential nutrition interventions and services is needed across different population groups to enhance overall nutritional status and maternal-child health.	A better understanding of implementation science is needed to address implementation bottlenecks in order to strengthen programmatic coverage, quality and impact of nutrition interventions.

Malaria, Helicobacter pylori (H. pylori), helminths, elevated plasma glucose, and elevated glycated haemoglobin (Hba1c)	Morbidities are an important public health issues in Nigeria, with H. pylori infection being widespread.	These findings underscore the importance of targeted interventions and healthcare strategies to address the high prevalence of these health conditions among specific populations.	There is a need to investigate the high prevalence of H. pylori observed as well as public health communication programs that include prediabetes testing in risk populations.
Anemia & Iron deficiency anaemia	The prevalence of anemia and iron deficiency anemia are lower than expected	The data are evidence of steady progress on an issue long thought intractable	Efforts to further reduce anemia are warranted. Documentation of what works, for whom, where, when, why and how is needed to extend transferable principles to other intervention programs.
Iodine	The levels of urinary iodine observed in pregnant and non-pregnant women of reproductive age are fine or above recommended intakes.	Suspected high intake of iodine needs to be explored and addressed, and the impact of other interventions supplying iodine (as for example MMS) to be assessed for unintended negative consequences.	There is a need to conduct a smaller longitudinal study to document use and intake of iodine fortified products and micronutrient supplements as the findings will have implications for the levels of iodine in fortification programs and fortifiable food vehicles, as well as the introduction of other interventions.
Micronutrient status	The National Food Consumption and Micronutrient Survey 2021 is the most comprehensive micronutrient survey in Africa, and presents a comprehensive picture of specific micronutrient deficiencies of public health importance, the co-existence of micronutrient deficiencies, and emerging issues of public health importance.	The data reveal a high prevalence of folate deficiency among adolescent girls, and pregnant and non-pregnant women of reproductive age.	There is a need for agri-food system interventions and innovations to address the deficiencies observed, especially for folate and zinc.
Key drivers of anaemia	Micronutrient deficiencies, infections and inflammation (acute and chronic), and genetic blood disorders were associated with an increased probability of any anaemia in all population groups. Iron deficiency was associated with anemia in all target groups but in a lower proportion than 50%.	The results provide important insights into the key drivers of anaemia.	There is need to understand the extent of the relative contribution of each risk factor to better inform the design of anaemia reduction efforts to maximize public health impact.

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Annexes

Annex 1. Household listing form

Form ID No | | | | | | | | |

(Leave Blank)

Nigeria National Food Consumption and Micronutrient Survey (NFCMS)

Household Listing Form

IDENTIFICATION		NAME	CODE
ID-1	ZONE		
ID-2	STATE		
ID-3	LGA		
ID-4	Locality		
ID-5	EA		
ID-6	EA Serial No		
ID-7	Sector (Urban = 1; Rural = 2)		
ID-8	Building Number		

ID-9.GPS Coordinates?

LATITUDE (N)	LONGITUDE (E)

ID-10. Address of Building:…….………………………………………………………………………………………………

………

ID-11. Use of Household Unit ☐

Residential only = 1	Institutional = 6
Commercial only = 2	Hotel/Restaurant = 7
Religious only = 3	Vacant = 8
Residential/commercial = 4	Uncompleted = 9
Residential/Religious = 5	Others = 10

ID-12S/No of Residential HU:_______

ID-13S/No of households: _______

ID-14. Name of Head of Household: ……………………………………………………………

ID-15. Phone number(s): ………………………………………… ……………………………………

Purpose(s) of survey:

We are conducting a national survey to assess the micronutrient status and dietary intake of women(15-49 years old), including pregnant and lactating women, and children(6–59 months old), as well as the micronutrient status of non-pregnant Adolescent girls girls (aged 10–14 years) and to identify key factors associated with poor nutrition in these populations. The information generated will provide a foundation for the formulation of evidence informed policies and programs. In the short to medium term, the information will provide a baseline from which to monitor changes over time.

We would very much appreciate your participation in this survey. This information will help the government to plan health and nutrition services. The results from this survey will be kept strictly confidential and will not be shared with anyone other than members of our survey team

Do you have any questions for me?	1 = Yes ☐ 0 = No	**Give objective answer any question that is relevant to the survey**
May I begin the interview now?	1 = Yes 0 = No ☐	**Thank the respondent and record reason for no consent**

Interviewer's Visits

No of Visit	1	2	3	Final Visit
Date Interviewer's name Result*				Day: ____________ Month ____________ Year: ____________
Next Visit: Date	____/____/20____	____/____/20____	____/____/20____	
Next Visit: Time	__ ____:_____	__ ____:_____	__ ____:_____	Total No of visits to HH _______
Time Interview Started	____:_____	____:_____	____:_____	____:_____
Time Interview Ended				

***Result codes**

1. Completed
2. No household member at home or no competent respondent at home at time of visit
3. Entire household absent for extended period of time

4. Postponed
5. Refused
6. Dwelling vacant or address not a dwelling
7. Dwelling destroyed
8. Dwelling not found
9. Other (specify)

Data Collection, Editing, and Entry Record

	Data collection	Field editing	Office editing	Data entry
Name	___ –	___ –	___ —	___ –
Date	___ –	___ –	___ —	___ –

Respondent: Head of household or any knowledgeable adult member of the household

HR-0	HR-1	HR-2	HR-3		HR-4		HR-5	HR-6	HR-7	HR-8		HR-9	HR-10		
Line Number	USUAL RESIDENTS AND VISITORS	Relationship to Head of Household	SEX		RESIDENCE		AGE	CHILDREN UNDER 5 YEARS					WOMEN OF REPRODUCTIVE AGE		
	Please give me the names of the persons who usually live in the HH and guests of the HH who stayed here last night,		Is [NAME} male or female?		Does [NAME] usually live here? *(at least 6 months of year)*		How old is [NAME]? Enter completed years at last birthday	If under 5 years	Date of Birth What is the date of birth of (name)?	Certificate of Birth Ask if **[NAME]** has a birth certificate or any written documentation		Source of Birth Certificate or any written documentation	If female 14-49 years Ask if [name] is currently pregnant		
	Start with the head of the household		M	F	Yes	No	Age < than 1 year = 0	Enter Age in Months	DD/MM/YYYY	Yes	No	Enter code of the source	Yes	No	Dk
01		01	1	2	1	2				1	2		1	2	9
02			1	2	1	2				1	2		1	2	9
03			1	2	1	2				1	2		1	2	9
04			1	2	1	2				1	2		1	2	9
05			1	2	1	2				1	2		1	2	9
06			1	2	1	2				1	2		1	2	9
07			1	2	1	2				1	2		1	2	9
08			1	2	1	2				1	2		1	2	9

HR.2:
Relationship to Head

Head........................01	Parent-in-law...................07
Spouse 02	Brother/Sister 08
Own child................03	Others relatives..............09
Child-in-law 04	Adopted/foster/stepchild 10
Grand Child 05	

HR9:
Source of Birth Certificate

Birth certificate.........................1
Child health card......................2
Holy Card 3
Local event calendar...............4
Recall 5
Index method..........................6

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

Annex 2. Household Questionnaire

Nigeria National Food Consumption

and Micronutrient Survey (NFCMS)

Household Socio-Economic Questionnaire

(To be administered by Field Enumerators)

IDENTIFICATION		NAME	CODE
ID-1	ZONE		
ID-2	STATE		
ID-3	LGA		
ID-4	Locality		
ID-5	EA		
ID-6	EA Serial No		
ID-7	Sector(Urban = 1; Rural = 2)		
ID-8	Building Number		

ID-9.GPS Coordinates?

LATITUDE (N)	LONGITUDE (E)

ID-10. Address of Building:……………………………………………………………………………………

……………………………………………………………………………………

ID-11. Use of Household Unit ☐

Residential only = 1
Commercial only = 2
Religious only = 3
Residential/commercial = 4
Residential/Religious = 5
Institutional = 6
Hotel/Restaurant = 7
Vacant = 8
Uncompleted = 9
Others = 10

ID-12. S/No of Residential HU:________

ID-13. S/No of HH: _________

ID-14. Name of Head of Household: ____

ID-15. Phone number(s): ___________________________ ___________________________

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

Consent Statement:		
I have read this form and/or someone has read it to me. I was encouraged to ask questions and given time to ask questions. Any questions that I had, have been answered satisfactorily. I agree to take part in the household interview. I know that after choosing to be in the interview, I may withdraw at any time. My taking part is voluntary. I have been offered a copy of this consent form.		
Do you agree to do the household interview?	1 = Yes☐ 0 = No☐	**'YES' means that you agree to do the interview.** **'NO' means that you will NOT do the interview.**

Head of household signature or mark______________________________ Date: ____/____/20____

Name of head of household **[PRINTED]**

____

Household ID number: _______________________

[FOR ILLITERATE PARTICIPANTS]

Signature of witness____ Date: ____/____/20____

Printed name of witness____

Signature of person obtaining consent_______________________________ Date: ____/____/20____

Name of person obtaining consent: **[PRINTED]** ________________________

Survey staff ID number _______________________________________

HH SEC Questionnaire

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If the witness is from the survey staff, state his/her role in the survey, his/her staff ID number and describe the reason why an impartial witness could not be identified:

____

____

Do you have any questions for me?	1 = Yes☐ 0 = No	**Give objective answer any question that is relevant to the survey**
May I begin the interview now?	1 = Yes 0 = No☐	**Thank the respondent and record reason for no consent**

Interviewer's Visits				
No of Visit		1	2	3
Date(dd/mm./yy)		____/____/20____	____/____/20____	____/____/20____
Interviewer's name				
RESULT(codes 1-8)				
Next Visit:	Date Time	____/____/20____ ____:____	____/____/20____ ____:____	____/____/20____ ____:____
Time Interview Started		____:____	____:____	____:____
Time Interview Ended		____:____	____:____	____:____

Result codes

10. Completed
11. Incomplete
12. Refused
13. Incapacitated
14. Not found

HH SEC Questionnaire

Form ID No					
	Zone	State	EA	HH	Indiv

15. Ineligible
16. Away for a long period
17. Other (specify)

Data Collection, Editing, and Entry Record				
	Data collection	Field editing	Office editing	Data entry
Name	________ –	________ –	________ ________	________ –
Date	________ –	________ –	________ —	________ –

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

RESPONDENT IDENTIFICATION CONFIRMATION

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
RIC-1	**Confirm respondent** What is your name? **[NAME LINKED TO LINE LISTING?]**	Yes …………………………… No ………………………………	1 2 ---□	**Update/correct in the Roster**
RIC-2	**Confirm respondent** **[GENDER LINKED TO LINE LISTING?]**	Yes …………………………… No ………………………………	1 2 ---□	**Update/correct in the Roster**
RIC-3	**Confirm respondent** How old are you? **[AGE LINKED TO LINE LISTING?]**	Yes …………………………… No ………………………………	1 2 ---□	**Update/correct in the Roster**
RIC-4	**Confirm completion of household questionnaire:** Did anyone in your household answers questions about your household during a previous visit?	Yes …………………………… No ………………………………	1 2 ---□	**Identify initial respondent**
RIC-5	**Confirm completion of household questionnaire:** If yes, was that you or someone else?	Myself………………………… Someone else………………	1 2	
RIC-6	**Confirm respondent** **[SIGN CONSENT FORM?]**	Yes …………………………… No ………………………………	1 2 ---□	**Ensure respondent sign to continue**
RIC-7	Line number of the respondent in the HH Roster	□□		

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

GENERAL HOUSEHOLD INFORMATION

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
GHI-1	What is the ethnic group of [NAME of household head]?	Hausa………………………… Yoruba………………………… Igbo………………………… Ijaw………………………… Kanuri ………………………… Fulani ………………………… Ibibio………………………… Tiv………………………… Others(Specify) ___________	01 02 03 04 05 06 07 08 98	
GHI-2	What is the religion of [NAME of household head]?	Christian…………………………………… Muslim…………………………………… Traditional…………………………………… No Religion …………………………………… Others(Specify) ___________________ Don't know ………………………………	1 2 3 4 8 9	
GHI-3	What is the highest level of school [NAME of household head] has <u>completed</u>?	None…………………………………… Primary …………………………………… Secondary …………………………………… Technical / vocational certificate………… Higher / university/ college…………………… Others(Specify) ___________________ Don't know ………………………………	1 2 3 4 5 8 9	
GHI-4	What kind of work does [NAME of household head] **mainly** do for income? **(SELECT ONE ANSWER ONLY)**	Not working and didn't work in last 12 months Professional, Technical and Related Workers Administrative and Managerial Workers	01 02 03 04 05	

		Office and Administrative Support Workers Sales and Related Workers…………………… Service Workers………………………………... Installations, Maintenance and Repair Workers Agricultural, Animal Husbandry and Forestry Workers, Fishermen and Hunters………… Production, Construction and Extractions Workers…………………………………………… Transportation and Material Moving Workers Others(Specify) ____________________ Don't know ………......…………...................	06 07 08 09 10 96 99	

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
GHI-5	What is the **main** source of drinking water for members of your household? **DO NOT READ LIST** **PROBE FOR ONE RESPONSE**	**Piped water** Piped water into dwelling................................. Piped water into compound, yard or plot.......... Piped to neighbor... Public tap or standpipe................................... Borehole or tube well...................................... **Dug well** Protected well... Unprotected well.. **Water from Spring** Protected spring.. Unprotected spring.. **Rainwater** Rainwater collection...................................... **Delivered or kiosk water** Truck-tanker... Cart with small tank/drum............................... Water kiosk.. **Packaged water** Bottled water.. Sachet water.. **Surface water** River/ stream, pond/ lake/ dam/canal/irrigation channel) Other, (specify) _______________	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 98	

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

GHI-6	**Ask if GHI-5 = 01-05 , 14, 15** What is the **main** source of water used by your household for other purposes such as cooking and hand-washing? **DO NOT READ LIST** **PROBE FOR ONE RESPONSE**	**Piped water** Piped water into dwelling................................ Piped water into compound, yard or plot.......... Piped to neighbor... Public tap or standpipe................................... Borehole or tube well.................................... **Dug well** Protected well... Unprotected well... **Water from Spring** Protected spring... Unprotected spring.. **Rainwater** Rainwater collection...................................... **Delivered or kiosk water** Truck-tanker.. Cart with small tank/drum.............................. Water kiosk... **Packaged water** Bottled water.. Sachet water.. **Surface water** River/ stream, pond/ lake/ dam/canal/irrigation channel) Other, (specify) ____________________	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 98	
GHI-7	**Ask if GHI-6 = 01 or 02**	In own dwelling………………..……………..………	1 2	

	Where is the water source located	In own yard/plot…………………….…………… Elsewhere……………………...……… ……..	3	
GHI-8	**Ask if GHI-7 = 3** How long does it take to go to your main drinking water source water source, get water, and come back?	**[99 = don't know]** ________minutes		
Q/N	**QUESTION**	**RESPONSE**	**CODE**	**INSTRUCTION**
GHI-9	In the last month, has there been any time when your household did not have sufficient quantities of drinking water when needed?	Yes, at least once... No, always sufficient.................................... Don't know...	1 2 9	
GHI-10	In the past month, for how many days was water from this source unavailable when needed	**00 = no interruption** **99 = don't know** [_______] days		
GHI-11	Do you or any other member of this household do anything to the water to make it safer to drink?	Yes …………..…………………………….… ….. No …………………………………………... ….. Don't Know... .	1 2 □ 9 □	 **Skip to GHI-13** **Skip to GHI-13**

Form ID No	Zone	State	EA	HH	Indiv

GHI-12	WHAT DO YOU USUALLY DO TO MAKE THE WATER SAFER TO DRINK? ***PROBE:*** Anything else? **RECORD ALL METHODS MENTIONED.**	BOIL .... ADD BLEACH / CHLORINE .... STRAIN IT THROUGH A CLOTH .... USE WATER FILTER (CERAMIC, SAND, COMPOSITE, ETC.) .... SOLAR DISINFECTION LET IT STAND AND SETTLE .... OTHER (***specify***) ____________________ DON'T KNOW:	A B C D E F X Z	
GHI-13	What kind of toilet facility do members of your household usually use? **(DO NOT READ LIST. PROBE FOR ONE RESPONSE)**	**Flush/pour flush toilet** Flush toilet connected to piped sewer system Flush toilet connected to septic tank Flush toilet connected to pit latrine Flush toilet connected to somewhere else Flush toilet connected to don't know where **Pit Latrine** Ventilated improved pit latrine....................... Pit latrine with slab....................................... Pit latrine without slab/open pit....................... Composting Toilet... Bucket toilet.. Hanging toilet/hanging latrine......................... No facility/use bush or field............................. Other, (Specify) ____________________	01 02 03 04 05 06 07 08 09 10 11 12 98	

GHI-14	Do you share your toilet facility with other households?	Yes …………………………………………….. No ……………………………………………..	1 2	
GHI-15	Where is the toilet facility located?	In own dwelling………………………………… In own yard/plot………………………………… Elsewhere………………………………………	1 2 3	
GHI-16	Has your (pit latrine or septic tank) ever been emptied? **Ask if GHI-11 = 02, 03, 06, 07, 08 or 09**	Yes emptied……………………………………….. No, never emptied…………………………… Don't know…………………………………………….	1 2 □ 9 □	 **Skip to GHI-19** **Skip to GHI-19**
GHI-17	The last time (pit latrine or septic tank) was emptied, was it emptied by a service provider? **Ask if GHI-14 = 1**	Yes, by a service provider …………………… No, never emptied…………………………… Don't know……………………………………………	1 2 □ 9 □	 **Skip to GHI-19** **Skip to GHI-19**
GHI-18	Where were the contents of the (pit latrine or septic tank) emptied to? **Ask if GHI-14 = 1**	To a treatment plant………………………………… Buried in a covered…………………………………… Uncovered pit/bush/field/open ground………. Surface water (river/dam/lake/pond/ stream/canal/irrigation channel)………………… Others, (specify) ________________ Don't know……………………………………………	1 2 3 4 8 9	

GHI-19	We would like to learn about the places where members of this household wash their hands. Can you please show me where members of your household most often wash their hands? *Record result and observation.*	**OBSERVED** Fixed facility observed (sink / tap) in dwelling .... in yard /plot .... Mobile object observed (bucket / jug / kettle) .... **NOT OBSERVED** No handwashing place in dwelling / yard / plot .... No permission to see .... Other reason (*specify*)............................	1 2 3 4 5 6	 Skip to GHI-23 Skip to GHI-22 Skip to GHI-23
GHI-20	*Observe presence of water at the place for handwashing.* *Verify by checking the tap/pump, or basin, bucket, water container or similar objects for presence of water.*	WATER IS AVAILABLE WATER IS NOT AVAILABLE	1 2	
GHI-21	*Observe presence of soap or detergent at the place for handwashing?*	YES, SOAP/DETERGENT AVAILABLE NO, SOAP/DETERGENT NOT AVAILABLE	1 2	Skip to GHI-25 Skip to GHI-23
GHI-22	Where do you or other members of your household most often wash your hands?	Fixed facility (Sink / Tap) In dwelling In yard / plot Mobile object (Bucket / Jug / Kettle) No handwashing place in dwelling / yard / plot Other (*specify*)	 1 2 3 4 6	
GHI-23	Do you have any soap or detergent in your house for washing hands?	Yes .... No	1 2	Skip to GHI-26
GHI-24	Can you please show it to me?	Yes, shown	1 2	Skip to GHI-26

		No, not shown ………………………………		
GHI-25	**RECORD YOUR OBSERVATION.** **Record all that apply.**	Bar or Liquid soap ………… ………………….. Detergent (Powder / Liquid / Paste) …………..	A B	
GHI-26	What is the **main** way in which this household disposes refuse? **(Select one answer only)**	Burning………………………………………… ………. Refuse heap………………………………………… Bush………………………………………… ………. Pay someone to dispose…………………………… Government disposal services…………………… Others, (specify) ____________________ Don't know…………………………………………	1 2 3 4 5 8 9	

HH SEC Questionnaire		Form ID No					
			Zone	State	EA	HH	Indiv

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
GHI-27	What type of fuel does your household **mainly** use for cooking? **(Select one answer only)** **Read options?**	Electricity... Gas... Kerosene/ paraffin... Solar... Coal/lignite.. Charcoal.. Wood... Animal dung cakes... Grass/shrubs/ straw.. Do not cook... Others, (specify) ____________	01 02 03 04 05 06 07 08 09 10 98	
GHI-28	**Observe the main material of the floor of the dwelling** **Record observation**	Natural floor (earth/sand/mud, dung)................. Rudimentary floor (wood planks, palm/bamboo).. Finished floor (polished wood, vinyl, ceramic tiles, cement/concrete, carpet, rug.................... Others, (specify) ____________	1 2 3 8	
GHI-29	**Observe the main material of the roof of the dwelling** **Record observation**	Natural floor (earth/sand/mud, dung)............ Rudimentary floor (wood planks, palm/bamboo).. Finished floor (polished wood, vinyl, ceramic tiles, cement/concrete, carpet, rug................... Others, (specify) ____________	1 2 3 8	

HH SEC Questionnaire

Form ID No	Zone	State	EA	HH	Indiv

GHI-30	**Observe the main material of the exterior walls of the dwelling** **Record observation**	Natural walls (no walls, cane/palm/trunks, dirt)..... Rudimentary walls (bamboo with mud, stone with mud, uncovered adobe, plywood, cardboard, reused wood).. Finished walls (cement, stone with lime/cement, bricks, cement blocks, covered adobe, wood planks/shingles).. .... Others, (specify) _______________________	1 2 3 8	
GHI-31	How many rooms in this household are used for sleeping?	________ Rooms		
GHI-32	Does this household have electricity?	Yes …………..…………………………..…….. No …………………………………………...….. Don't Know...	1 2 9	
GHI-33	How many of the following animals do this household own? **IF NONE, RECORD '00'. IF 95 OR MORE, RECORD '95'. IF UNKNOWN, RECORD '99'.**	**Animal** / **Number owned** Chickens or other poultry? Goats? Sheep? Milk cows or bulls Pigs? Donkeys/ Mules? Horses? Camels?		
GHI-34	Does your household mostly consume, mostly sell, or both sell and consume these animals?**THIS WILL LOOP FOR ALL ANIMALS>0 IN GHI-24 ABOVE**	Mostly consume... Mostly sell... Both consume and sell....................................	1 2 3 9	
		Don't Know... ..		

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
GHI-35	Does this household own any livestock, herds, other farm animals, or poultry (even if these animals are not here right now)?	Yes …………………………………………….. No ……………………………………………… Don't Know……………………………………	1 2 9	
GHI-36	Does your household currently raise any of these animals (rabbit, guinea pigs, grass cutters, snails or other small animals) for your household's own consumption?	Yes …………………………………………….. No ……………………………………………… Don't Know……………………………………	1 2 9	
GHI-37	Does anyone in this household currently raise fish for your household's own consumption?	Yes …………………………………………….. No ……………………………………………… Don't Know……………………………………	1 2 9	
GHI-38	Does anyone in this household currently catch / harvest fish from the wild for your household's own consumption?	Yes …………………………………………….. No ……………………………………………… Don't Know……………………………………	1 2 9	
GHI-39	Does your household currently have a garden where you grow vegetables?	Yes …………………………………………….. No ……………………………………………… Don't Know……………………………………	1 2 9	

HH SEC Questionnaire

Form ID No										
	Zone	State		EA			HH		Indiv	

GHI-40	(If yes to vegetable garden) What does your household do with what you produce?	Mostly consume...................................... Mostly sell.. Both consume and sell.............................. Don't Know...	1 2 3 9	
GHI-41	(If no to vegetable garden) do you have access to any land where you could grow vegetables?	Yes .... No .... Don't Know...	1 2 9	
GHI-42	Does your household currently have any trees or bushes that produce fruits?	Yes .... No .... Don't Know...	1 2 9	
GHI-43	(If yes to fruits) what does your household do with what you produce?	Mostly consume...................................... Mostly sell.. Both consume and sell.............................. Don't Know...	1 2 3 9	
GHI-44	Does any member of this household have an account in a bank or other financial institution?	Yes .... No .... Don't Know...	1 2 9	

GHI-45	Does your household have a functional:		**Yes**	**No**		
		Radio	1	2		
		Television	1	2		
		Cable TV	1	2		

		Refrigerator	1	2		
		Generator	1	2		
		Air conditional	1	2		
		Computer	1	2		
		CD/DVD Player	1	2		
		Electric iron	1	2		
		Electric Fan	1	2		
		Washing Machine	1	2		
		Bed with Mattress	1	2		
		Chair	1	2		
		Table	1	2		
		Cupboard/Cabinet	1	2		

Q/N	QUESTION	RESPONSE			CODE	INSTRUCTION
GHI-46	Does any member of this household have a functional:		Yes	No		
		Watch	1	2		
		Mobile Phone	1	2		
		Bicycle	1	2		
		Motorcycle	1	2		
		Tricycle or Keke	1	2		
		Animal Drawn Cart	1	2		
		Car, Bus or Truck	1	2		
		Boat with Motor	1	2		
		Canoe or Boat without motor	1	2		
GHI-47	How long does it take in minutes to walk from your home to the nearest bus stop?	________minutes				Households in urban locations only
GHI-48	How long does it take in minutes to walk from your home to the nearest road that is motorable at	________minutes				Households in rural locations only

	all times of the year and in all weather conditions?			
GHI-49	How long does it take in minutes to go from your home to the nearest healthcare facility, which could be a hospital, a health clinic, a medical doctor, or a health post?	________minutes		
GHI-50	How do you travel to this healthcare facility from your home? ***IF MORE THAN ONE WAY OF TRAVEL IS MENTIONED, CIRCLE THE ONE HIGHEST ON THE LIST.***	**Motorized** Car/truck………………………………………… Public bus……………………………………… Motorcycle…………………………………….. Tricycle/Keke NAPEP……………………….. Boat with motor……………………………….. **Not motorized** Animal drawn cart…………………………….. Bicycle…………………………………………… Boat without motor………………………….. Walking…………………………………………… Others, (specify) ____________________	01 02 03 04 05 06 07 08 09 98	
GHI-51	How long does it take in minutes to go from your home to the nearest food market?	________minutes		
GHI-52	How do you travel to this food market from your home? ***IF MORE THAN ONE WAY OF TRAVEL IS MENTIONED, CIRCLE THE ONE HIGHEST ON THE LIST.***	**Motorized** Car/truck………………………………………… Public bus………………………………………	01 02 03 04 05	

		Motorcycle…………………………………….. Tricycle/Keke NAPEP……………………….. Boat with motor……………………………….. **Not motorized** Animal drawn cart…………………………….. Bicycle……………………………………………. Boat without motor………………………….. Walking…………………………………………. Others, (specify) ____________	06 07 08 09 98	
GHI-53	How often is this food market open?	Daily……………………………..………………. 2-5 days per week……………..…………….. 1 day per week…………………..……………. Others, (specify) ____________	1 2 3 8	

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

HOUSEHOLD FOOD INSECURITY EXPERIENCE SCALE

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
HFI-1	During the last 12 months, was there a time when you or others in your household worried about not having enough food to eat because of a lack of money or other resources?	Yes …………………………….. No ……………………..……....…. Don't Know...........................	1 2 9	
HFI-2	Still thinking about the last 12 months, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	Yes …………………………….. No ……………………..……....…. Don't Know...........................	1 2 9	
HFI-3	Was there a time when you or others in your household ate only a few kinds of food because of a lack of money or other resources?	Yes …………………………….. No ……………………..……....…. Don't Know...........................	1 2 9	
HFI-4	Was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	Yes …………………………….. No ……………………..……....…. Don't Know...........................	1 2 9	
HFI-5	Still thinking about the last 12 months, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	Yes …………………………….. No ……………………..……....…. Don't Know...........................	1 2 9	

HFI-6	Was there a time when your household ran out of food because of a lack of money or other resources?	Yes ……………………….…….. No ………………..……...….. Don't Know………………………	1 2 9	
HFI-7	Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	Yes ……………………….…….. No ………………..……...….. Don't Know………………………	1 2 9	
HFI-8	Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	Yes ……………………….…….. No ………………..……...….. Don't Know………………………	1 2 9	

HOUSEHOLD COPING STRATEGIES

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
HCS-1	In the past seven days were there times when your household did not have enough food or money to buy food?	Yes ……………………………...………. No ………………...................…..….....….. Don't Know……………………………………	1 2 9	

HH SEC Questionnaire

Form ID No

Zone	State	EA	HH	Indiv

HCS-2	If Yes, how many days in the past seven days did your household use the following coping strategies when you did not have enough food or money to buy food? Number of days out of the past seven. **[Write number. If not used, write '00']**	Rely on less preferred and less expensive foods…………………………	1	
		Borrow food, or rely on help from a friend or relative…………………………..… ..	2	
			3	
		Limit portion size at mealtimes?	4	
		Restrict consumption by adults in order for small children to eat ………………...	5	
		Reduce number of meals eaten in a day?		

END of HOUSEHOLD/RESPONDENT QUESTIONNAIRE

NB:

1. **Response code in figures [e.g. 1, 2, 9, 01, 02 ... 99] only one response option is allowed**
2. **Response code in alphabets [e.g. A, B, C, D ..... X] multiple response options are allowed**
3. **Panel Headings are in BLUE Colour**
4. **Instructions to enumerators are in BLUE Fonts**
5. **Code for "Others, (specify)"**
   a. **= 8 if it is a single-digit code**
   b. **= 88 if it is a double-digit code**
6. **Code for "Don't know"**
   a. **= 9 if it is a single-digit code**
   b. **= 99 if it is a double-digit code**

Annex 3. Diet Questionnaire (for first visit)

Nigeria National Food Consumption and Micronutrient Survey (NFCMS)

DIET INTAKE Questionnaire FOR WOMEN

FIRST HOME VISIT – "Dietary Intake Survey Form"

Preliminary Session
I would like to start by asking you some questions to confirm that I am speaking to the intended person

Q/N	QUESTION	RESPONSE	CODE	SKIP PATTERN
RIC-8	What is your name? Select 'Yes' if the name given is the same or similar to [NAME]. Select 'No' if the name given is different.	Yes No	1 2	If yes, go to **RIC-2.**
I	Is [NAME] available for an interview now?	Yes No	1 2	If yes, go to **RIC-2.**
Ii	Is it possible to reschedule and interview with [NAME]	Yes No	1 2	If yes, go to iv.
Iii	Why is it not possible to interview [NAME]?	Text______________		End interview
Iv	Are you able to get a date for the rescheduled interview?	Yes No	1 2	
V	When would [NAME] be available for an interview?	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		
Vi	Select the time of the day	Morning Afternoon Evening	1 2 3	
RIC-9	How old are you? Check if the reported age is close to the age provided during the line-listing. [NAME] was reported to be [AGE] years old	__________		If the age is correct, go to **RIC-3.**
	The age is different by more than 2 years, probe further to establish is this is the correct respondent.			

Age Verification

RIC-10	Can I see an identification card such as (National ID, Voter's card, Driver's License, Birth certificate, or International passport)?	Yes No		If yes, go to **RIC-4** If no, go to **RIC-5**

	This is asked to confirm the date of birth			
RIC-11	Record date of birth as documented	__ __ __ __ __ __ __ D D – M M - Y Y Y Y		Skip to question **RIC-8**
RIC-12	Do you know your FULL date of birth?	Yes No		If no, go to b
A	What is your date of birth?	__ __ __ __ __ __ __ D D – M M - Y Y Y Y		
B	Do you know the year you were born?	Yes No		If no, go to RIC-7
C	What year you were born?	_ _ _ _		
D	Do you know the month you were born?	Yes No		
E	What month you were born?	January February March April May June July August September October November December	1 2 3 4 5 6 7 8 9 10 11 12	
RIC-13	Based on your date of birth, you are [AGE] years old. Is it correct? You mentioned earlier in this interview that you were [AGE] years old	Yes No	1 2	If no, go back to RIC-5
RIC-14	Can you recall an event that happened when you were born?	Enter short text.		

Confirm previous visit

RIC-15	Did anyone in your household answer questions about your household during a previous visit?	Yes No	1 2	Please can you arrange a household visit as soon as possible. Inform your supervisor.

Consent

If 18 years old or older

Give the respondent the dietary survey information sheet and the consent form. Read out the information provided then ask the respondent if she has questions. Answer any questions asked. Ask the respondent or a witness to fill in and sign the consent form.

Please confirm that you, or a witness, signed the informed consent form for the dietary survey.

Yes Go to next question

No The current respondent does not agree to be interviewed, therefore the interview must be ended.

If 15-17 years old, establish if emancipated

Please note that [NAME] is[AGE] years old, therefore establish if she is emancipated.

	Do you live with your parents?	Yes No	1 2	If yes, not emancipated If no, ask if married
	Are you married?	Yes No	1 2	If yes, emancipated If no, as if HH head
	Are you the head of your household?	Yes No	1 2	If yes, emancipated If no, not emancipated

If emancipated

Give the respondent the dietary survey information sheet and the consent form. Read out the information provided then ask the respondent if she has questions. Answer any questions asked. Ask the respondent or a witness to fill in and sign the consent form.

Please confirm that you, or a witness, signed the informed consent form for the dietary survey.

Yes Go to next question

No The current respondent does not agree to be interviewed, therefore the interview must be ended.

If not emancipated:

Give the guardian and girl the dietary survey information sheet. Give and the guardian the consent form and the girl the assent form. Read out the information provided then ask them if they have questions. Answer any questions asked. Ask the guardian or a witness to fill in and sign the consent form. Ask the girl or a witness to fill in and sign the assent form.

Please confirm that you, or a witness, signed the assent form and a guardian, or a witness, signed the consent form for the dietary survey.

Yes Go to next question

No The current respondent does not agree to be interviewed, therefore the interview must be ended.

	May I begin the interview now?	Yes No	1 2	If yes, go to next section
	Why do you prefer not to continue the interview?	____________________	1 2	
	Is it possible to schedule an interview with [NAME]?	Yes No	1 2	If yes, schedule interview If no, end interview

	When would [NAME] be available for an interview?	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		
	Select the time of the day	Morning Afternoon Evening	1 2 3	

Respondent Socio-Demographics
Let me ask you a few general questions about you.

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
RSD-1	What is your ethnic group? Do NOT read the responses out loud	Hausa Yoruba Igbo Ijaw Kanuri Fulani Ibibio Tiv Etc Etc Etc Other (Specify)	1 2 3 4 5 6 7 8 88	
RSD-2	What is your religion? Do NOT read the responses out loud	Christian Muslim Traditional No Religion Other (Specify)	1 2 3 4 88 99	
RSD-3	What is the highest level of school you completed?	None Primary Junior secondary Senior secondary Technical / vocational certificate Higher / university/ college Other (Specify)	1 2 3 4 5 6 88 99	
RSD-4	Have you done any paid or unpaid work outside your home in the last seven days?	Yes No No response Don't Know	1 2 77 99	**Skip to next Section**
RSD-5	In the last seven days, what kind of work did you do?	Artisan (such as hair dressor, tailor, soap maker) Farmer Business/trader Civil servant Education/teacher Security personnel (such as police, army)		

		Health worker Other (Specify)		
RSD-6	Was this paid or unpaid?	Paid Unpaid Both No response Don't Know	1 2 3 77 99	

Pregnancy and Lactation

We need to interview a few pregnant women so we will ask a few questions about pregnancy, this information will remain confidential.

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
PAL-1	Are you pregnant?	Yes No No response Don't know	1 2 77 99	**Skip to PLP5**
PAL-2	How many months pregnant are you? Fill in the number of months as a value between 0 and 10. Or fill in 77 if no response. Or 99 if don't know/cant remember.	__________ No response Don't know/Can't remember	 77 99	
PAL-3	Do you know the expected delivery month?	Yes No No response Don't know	1 2 77	**Skip to PLP5**
PAL-4	What is the expected delivery month?	January February March April May June July August September October November December	1 2 3 4 5 6 7 8 9 10 11 12	
PAL-5	Are you currently breastfeeding?	Yes No No Response	1 2 9	**Skip to next section**
PAL-6	If currently breastfeeding, did you breastfeed a child yesterday during the day or night?	Yes No No Response	1 2 99	

PAL-7	How old is the youngest child you are breastfeeding? Indicate age in years and months. Enter 77 if no response or 99 if don't know.	____________years Enter a value between 0 and 4. ____________months Enter a value beweten 0 and 11.		

Biofortified Food Consumption

Now I would like to ask about how often you consumes specific foods

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
BFW-1	In the last 30 days, did you eat yellow cassava or any food products made from it?	Yes No Don't Know	1 2 99	 **Skip to BFW-3**
BFW-2	In the last 30 days, how many days did you eat yellow cassava or any food products made from it? Fill in the number of days reported as value between 1 and 30, or fill in 99 if unknown	DAYS [_____] Don't Know	 99	
BFW-3	In the last 30 days, did you eat orange-fleshed sweet potato or any food products made from it?	Yes No Don't Know	1 2 99	 **Skip to BFW-5**
BFW-4	In the last 30 days, how many days did you eat orange-fleshed sweet potato or any food products made from it? Fill in the number of days reported as value between 1 and 30, or fill in 99 if unknown	DAYS [_____] Don't Know	 99	
BFW-5	In the last 30 days, did you eat orange maize or any food products made from it?	Yes No Don't Know	1 2 99	 **Skip to Next Section**
BFW-6	In the last 30 days, how many days did you eat orange maize or any food products made from it? Fill in the number of days reported as value between 1 and 30, or fill in 99 if unknown	DAYS [_____] Don't Know	 99	

Fortification Coverage

Now I'm going to ask you few questions about some food items (vegetable oil, wheat flour, semolina, sugar,salt and boullion). If you have any of these at home, could you please bring them out here so I can see them?

Q/N	QUESTION	RESPONSE		CODE	INSTRUCTION
FCW-1	Does your household use any of the following to prepare foods at home?	Vegetable oil	Yes No	1 2 }	**If yes, go to the relevant option**
		Wheat flour	Yes No		
		Maize flour	Yes No		
		Semolina flour	Yes No		
		Sugar	Yes No		
		Salt	Yes No		
		Bouillon	Yes No		

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
FCW-2	What is the main type of vegetable oil that your household uses? Select ONE response	Groundnut oil Oil blend Palm olein/palm oil Soybean oil Sunflower oil Other (Specify) Don't know/Can't remember	1 2 3 4 5 88	
FCW-3	The last time your household got vegetable oil, how did you get it? Select ONE response.	Purchased Home made Received from relative/friend/food aid Other (Specify) ____________ Don't know/ Can't remember	1 2 } 3 88 99	**Skip to FCW-4**
FCW-4	The last time your household got vegetable oil, what was the brand? Select ONE response	King's 100% vegetable oil Laziz - Pure vegetable oil Power oil - Pure vegetable oil Sunola - Soybean oil Winner-100% pure soya oil Golden Penny-pure soya oil Bulk/open source with no brand name	1 2 3 4 5 6 7	

		Other (Specify) Don't know/ Can't remember	88 99	
	What is the main type of wheat flour that your household uses Select ONE response	All-purpose flour Bread flour Cake flour Refined wheat flour Self-rising flour Whole wheat Other (Specify) Don't know/Can't remember	1 2 3 4 5 6 88	
FCW-5	The last time your household got wheat flour, how did you get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember	1 2 } 3 88 99	**Skip to FCW-7**
FCW-6	The last time your household got wheat flour, what was the brand? Select ONE response	Golden Penny Dangote Bakewell Bua flour Honeywell Eagle flour Open bulk source with no brand name Other (Specify) Don't know/ Can't remember	1 2 3 4 8 9 88 99	
	What is the main type of maize flour that your household uses? Select ONE response	White maize flour Yellow maize flour Other (Specify) Don't know/ Can't remember	1 2 88 99	
FCW-7	The last time your household got maize flour, how did you get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember	1 2 } 3 88 99	**Skip to FCW-10**
FCW-8	The last time your household got maize flour, what was the brand? Select ONE response	Not branded Ultimate - Maize flour Jifatu - Maize flour meal	1 2 3	

		Ammani Foods - Maize Flour Munro - Corn Flour Other (Specify) Don't know/ Can't remember	4 5 6 88 99	
	What is the main type of semolina that your household uses? Select ONE response	Wheat based Wheat-Maize Other (Specify) Don't know/Can't remember	1 2 3 88	
FCW-9	The last time your household got semolina, how did you get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember	1 2 } 3 88 99	**Skip to FCW-14**
FCW-10	The last time your household got semolina, what was the brand? Select ONE response	Not branded Golden Penny Semovita Dangote semolina Honeywell Semolina Other (Specify) Don't know/ Can't remember	1 2 3 4 88 99	
FCW-11	What is the main type of sugar that your household uses? Select ONE response	White granulated White cube Brown granulated Brown cube Don't know/ Can't remember Other (Specify)	1 2 3 4 88	
FCW-12	The last time your household got sugar, how did you get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember	1 2 } 3 88 99	**Skip to FCW-17**
FCW-13	The last time your household got sugar, what was the brand? Select ONE response	Family - Refined granulated Sugar Dangote - Refined Granulated White Sugar Bua - Premium Refined Sugar Golden Penny - Premium quality white granulated sugar Family - Sugar Cubes Open bulk source with no brand name Other (Specify) Don't know/ Can't remember	1 2 3 4 5 6 88 99	

FCW-14	What is the main type of salt that your household uses? Select ONE response	Table salt-fine Sea salt-fine Salt-low sodium Sea salt-coarse Edible/cooking salt-Coarse Edible salt for industrial use Other (Specify) Don't know/ Can't remember	1 2 3 4 88	
FCW-15	The last time your household got salt, how did you get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember	1 2 } 3 88 99	**Skip to Next Section**
FCW-16	The last time your household got salt, what was the brand? Select ONE response	Dangote - Refined and iodized salt Royal Salt - Edible iodized Salt Mr. Chef - Pure refined and iodized salt Dangote - Fine edible salt iodized Uncle Palm - Iodized salt Open bulk source with no brand name Other (Specify) Don't know/ Can't remember	1 2 3 4 5 6 88 99	
	What is the main type of boullion that your household uses? Select ONE response	Cube Granule Powder Liquid Other (Specify) Don't know/ Can't remember		
	The last time your household got bouillon, how did you get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember	1 2 } 3 88 99	
	The last time your household got boullion, what was the brand? Select ONE response	Maggi Knorr Royco Onga Mr Cheff Ajinomoto Other (Specify) Don't know/ Can't remember		

Annex 3. Questionnaire for Children

FIRST HOME VISIT – "Dietary Intake Survey Form"

Respondent Identification Confirmation
I would like to start by asking you some questions to confirm we are speaking about the correct child.

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
RIC-1	What is the child's name? Select 'Yes' if the name given is the same or similar to [CHILD NAME]. Select 'No' if the name given is different	Yes No	1 2	
I	Is [CHILD NAME]'s primary caregiver available for an interview now?	Yes No	1 2	If yes, go to **RIC-2.**
Ii	Is it possible to reschedule and interview with [CHILD NAME]	Yes No	1 2	If yes, go to iv.
Iii	Why is it not possible to interview [CHILD NAME]'s caregiver?	Text_______________		End interview
Iv	Are you able to get a date for the rescheduled interview?	Yes No	1 2	
V	When would [CHILD NAME] be available for an interview?	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		
Vi	Select the time of the day	Morning Afternoon Evening	1 2 3	
RIC-2	Is [CHILD NAME] a boy or girl?	Boy Girl	1 2	If
	[CHILD NAME] was recorded as being [female/male] during the line listing. If gender is different than what was previously recorded, probe further to establish if this is the correct respondent.			
RIC-3	How old is [CHILD NAME] Enter age in years and months.	___________years Enter a value between 0 and 4. ___________months Enter a value beweten 0 and 11.		
	Check if the reported age is close to the age provided during the line-listing.			

	[CHILD NAME] was reported to be [AGE] months old. The calculated age is [AGE] months old.			
	The age is different by more than 2 months, probe further to establish is this is the correct respondent.			

Age Verification

~~RIC-4~~	~~Do you have a vaccination card or a birth certificate for [CHILD NAME]?~~ ~~*This is asked to confirm the date of birth. Ask to see document.*~~	~~Yes~~ ~~No~~		~~If not available, go to **RIC-9**~~
~~RIC-5~~	~~Record date of birth as documented~~	~~__ __ __ __ __ __ __ __~~ ~~D D – M M - Y Y Y Y~~		~~Go to next section~~
RIC-6	Do you have a vaccination card for [CHILD NAME]? *This is asked to confirm the date of birth. Ask to see document.*	Yes No		If not available, go to **RIC-9**
RIC-7	May I see where [CHILD NAME] vaccinations are written down?	Yes No		
RIC-8	Record date of birth as documented	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		Go to next section
RIC-9	Do you see any records of Vitamin A administration?	Yes No		Only if they have vaccination card
RIC-10	Record date of last vitamin A dose given	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y None recorded		Only if they have vaccination card
RIC-11	Do you have a birth certificate for [CHILD NAME]? *This is asked to confirm the date of birth*	Yes No		If not available, go to **RIC-11**
RIC-12	Record date of birth as documented	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		
RIC-16	Do you know the FULL date of birth of [CHILD NAME] ?	Yes No		If no, go to b
A	What is [CHILD NAME]'s date of birth?	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		Go to next session

B	Do you know the year [CHILD NAME] was born?	Yes No		If no, go to RIC-7
C	What year you was [CHILD NAME] born?	_ _ _ _		
D	Do you know the month [CHILD NAME] were born?	Yes No		
E	What month was [CHILD NAME] born?	January February March April May June July August September October November December	1 2 3 4 5 6 7 8 9 10 11 12	
RIC-17	Based on your date of birth, you [CHILD NAME] is [AGE] years old. Is it correct? You mentioned earlier in this interview that [CHILD NAME] was [YEARS] years and [MONTHS] months old	Yes No	1 2	If no, go back to RIC-5
RIC-13	Can you recall an event that happened when [CHILD NAME] was born? Enter short text.			
RIC-14	Did anyone in [CHILD NAME]'s household answers questions about his/her household during a previous visit?	Yes No	1 2	

Informed Consent

Give the guardian the dietary survey information sheet. Read out the information provided then ask them if they have questions. Answer any questions asked. Ask the guardian or a witness to fill in and sign the consent form.

Please confirm that you, or a witness, signed the informed consent form for the dietary survey.

Yes Go to next question

No The current respondent does not agree to be interviewed, therefore the interview must be ended.

	May I begin the interview now?	Yes No	1 2	If yes, go to next section
	Why do you prefer not to continue the interview?	______________________ _	1 2	

	Is it possible to schedule an interview with [CHILD NAME]'s primary caregiver?	Yes No	1 2	If yes, schedule interview If no, end interview
	When would [CHILD NAME]'s primary caregiver be available for an interview?	__ __ __ __ __ __ __ __ D D – M M - Y Y Y Y		
	Select the time of the day	Morning Afternoon Evening	1 2 3	

Child Caregiver Characteristics
Now I would like to ask a few questions about you because you are a caregiver, not the child.

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
CCC-1	Are you the person mostly responsible for feeding [CHILD NAME]?	Yes No	1 2	
CCC-2	Were you with [CHILD NAME] most of the day yesterday?	Yes No	1 2	If yes, skip to CCC-4
CCC-3	Is there another person available now who can help tell us what [CHILD NAME] ate yesterday?	Yes No	1 2	
CCC-4	What is your relationship to [NAME OF CHILD]?	Mother Father Other family member Other (Specify)	1 2 3 8	
CCC-5	Note the sex of the respondent	Male Female	1 2	
CCC-6	How old are you? Enter age in years, enter 99 if age is unknown.	[ ][ ]	99	If the age is <16 y, show message "You need to get someone who is 16 years or older to proceed".
RSD-7	What is your name?	______________________		
RSD-8	What is your ethnic group? Do NOT read the responses out loud	Hausa Yoruba Igbo Ijaw Kanuri Fulani Ibibio Tiv	1 2 3 4 5 6 7 8	

		Etc. Other (Specify)	88	
RSD-9	What is your religion? Do NOT read the responses out loud	Christian Muslim Traditional No Religion Other (Specify) No response	1 2 3 4 88 99	
RSD-1	What is the highest level of school you <u>completed</u>? *Select ONE response*	None Primary Junior Secondary Senior Secondary Technical / vocational certificate Higher / university/ college Other (Specify)	1 2 3 4 5 88 99	

Infant and Young Child Feeding
Now I would like to ask you a few questions about breastfeeding and bottle feeding of [CHILD NAME].

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
IYC-1	Has [CHILD NAME] ever been breastfed?	Yes No Don't Know	1 2 99	 **Skip to IYC3**
IYC-2	Was [CHILD NAME] breastfed yesterday during the day or at night?	Yes No	1 2 99	
IYC-3	Did [CHILD NAME] drink anything from a bottle with a nipple yesterday during the day or night?	Yes No Don't Know	1 2 99	**Skip to next section**
IYC-4	What was fed to [CHILD NAME] from a bottle with a nipple yesterday during the day or night? Select MORE THAN ONE response if relevant	Breast Milk Formula milk/other milks Water with sugar Juice (Herbal/fruits) Pap Other (Specify) Other text	0,1 0,1 0,1 0,1 0,1 0,1 text	

Biofortified Food Consumption
Now I would like to ask you a few questions about food that [CHILD NAME] may eat.

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
BFC-1	In the last 30 days, did [CHILD NAME] eat yellow cassava or any food products made from it?	Yes No Don't Know	1 2 8	**Skip to BFC-3**
BFC-2	In the last 30 days, on how many days did [CHILD NAME] eat yellow cassava or any food products made from it?	DAYS [______] Don't Know	 99	
BFC-3	In the last 30 days, did [CHILD NAME] eat orange-fleshed sweet potato or any food products made from it?	Yes No Don't Know	1 2 99	**Skip to BFC-5**
BFC-4	In the last 30 days, on how many days did [CHILD NAME] eat orange-fleshed sweet potato or any food products made from it?	DAYS [______] Don't Know	 99	
BFC-5	In the last 30 days, did [CHILD NAME] eat orange maize or any food products made from it?	Yes No Don't Know	1 2 8	**Skip to Next Section**
BFC-6	In the last 30 days, on how many days did [CHILD NAME] eat orange maize or any food products made from it?	DAYS [______] Don't Know	 99	

Fortification Coverage

Now I'm going to ask you few questions about some foods (vegetable oil, wheat flour, semolina flour, sugar salt and bullion). If there are any of these foods in [CHILD NAME]'s household, could you please bring them out here so I can see them?

Q/N	QUESTION	RESPONSE		CODE	INSTRUCTION
FCW-17	Does [CHILD NAME]'s household use any of the following to prepare foods at home?	Vegetable oil	Yes No	1 2	**If yes, go to the relevant option**
		Wheat flour	Yes No		
		Maize flour	Yes No		
		Semolina flour	Yes No		
		Sugar	Yes No		
		Salt	Yes No		

		Bouillon	Yes No		
Vegetable oil					
FCW-18	What is the main type of vegetable oil that [CHILD NAME]'s household uses? Select ONE response	Groundnut oil Oil blend Palm olein/palm oil Soybean oil Sunflower oil Other (Specify) Don't know/Can't remember			
FCW-19	The last time the [CHILD NAME] household got vegetable oil, how did they get it? Select ONE response	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/Can't remember			**Skip to FCW-4**
FCW-20	The last time the household of [CHILD NAME] got vegetable oil, what was the brand? Select only one answer	King's 100% vegetable oil Laziz - Pure vegetable oil Power oil - Pure vegetable oil Sunola - Soybean oil Winner-100% pure soya oil Golden Penny-pure soya oil Bulk/open source with no brand name Other (Specify) Don't know/ Can't remember			
FCW-21	What is the main type of wheat flour that [CHILD NAME]'s household uses? Select only one answer				
FCW-22	The last time the [CHILD NAME] household got wheat flour, how did they get it? Select only one answer	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember			**Skip to FCW-7**
FCW-23	The last time the household of [CHILD NAME] got wheat flour, what was the brand? Select only one answer				

maize flour				
FCW-24	What is the main type of maize flour that [CHILD NAME]'s household uses? Select only one answer			
FCW-25	The last time the [CHILD NAME] household got maize flour, how did they get it? Select only one answer	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember		**Skip to FCW-10**
FCW-26	The last time the household of [CHILD NAME] got maize flour, what was the brand? Select only one answer			
semolina				
FCW-27	What is the main type of semolina flour that [CHILD NAME]'s household uses on most days? Select only one answer			
FCW-28	The last time the [CHILD NAME] household got semolina flour, how did they get it? Select only one answer	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember		**Skip to FCW-14**
FCW-29	The last time the household of [CHILD NAME] got semolina flour, what was the brand? Select only one answer			
Sugar				
FCW-30	What is the main type of sugar that [CHILD NAME]'s household uses on most days? Select only one answer			
FCW-31	The last time the [CHILD NAME] household got sugar, how did they get it? Select only one answer	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember		**Skip to FCW-17**

FCW-32	The last time the household of [CHILD NAME] got sugar, what was the brand? Select only one answer			
Salt				
FCW-33	What is the main type of salt that [CHILD NAME]'s household uses on most days? Select only one answer			
FCW-34	The last time the [CHILD NAME] household got salt, how did they get it? Select only one answer	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember		**Skip to Next Section**
FCW-35	The last time the household of [CHILD NAME] got salt, what was the brand? Select only one answer			
	What is the **main** type of bullion that [CHILD NAME]'s household uses? Select ONE response			
	The last time [CHILD NAME]'s household got bullion, how did they get it?	Purchased Home made Received from relative/friend/food aid Other (Specify) Don't know/ Can't remember		
	The last time the household of [CHILD NAME) got bullion, what was the brand? Select ONE response			

Annex 4. Biomarker Questionnaire (Q)[1]

Q1. Children (6-59 months old)

RESPONDENT IDENTIFICATION CONFIRMATION

For infants and young children				
RIC-18	Confirm respondent. What is the child's name? **[NAME LINKED TO LINE LISTING]**	Yes ……………………………… No ………………………………	1 2 ---☐	**Update/correct in the Roster**
RIC-19	Confirm respondent. Is (CHILD NAME) a boy or girl? **[GENDER LINKED TO LINE LISTING]**	Yes ……………………………… No ………………………………	1 2 ---☐	**Update/correct in the Roster**
RIC-20	Confirm respondent How old is (CHILD NAME) **[AGE LINKED TO LINE LISTING]**	Yes ……………………………… No ………………………………	1 2 ---☐	**Update/correct in the Roster**
RIC-21	**Confirm completion of household questionnaire:** Did anyone in your household answers questions about your household during a previous visit?	Yes ……………………………… No ………………………………	1 2 ---☐	
RIC-22	**Confirm completion of household questionnaire:** If yes, was that you or someone else?	Myself…………………… Someone else…………………	1 2	
RIC-23	Confirm consent is signed **[SIGN PHYSICAL CONSENT FORM]** **Request for Assent** Confirm assent	Yes ……………………………… No ………………………………	1 2 ---☐	**Ensure respondent signs to continue**
RIC-24	Line number of the respondent in the HH Roster	☐☐		

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[1] Paper version before digitization on CommCare App

<table>
<tr><td colspan="6">QUESTIONS RELATED INTERVENTION COVERAGE & HEALTH STATUS (CHILDREN 6-59 MONTHS OLD) (If grp = 4)</td></tr>
<tr><td>chs1</td><td>Do you have a card or other document where (NAME)'s vaccinations are written down?</td><td colspan="3">01= Yes
00= No</td><td></td></tr>
<tr><td>chs2</td><td>May I see the card or other document where (NAME)'s vaccinations are written down?</td><td colspan="3">01= Yes
00= No</td><td>if chs1 = 1</td></tr>
<tr><td>chs3</td><td>Document down most recent date of vitamin A given</td><td colspan="3">Day/month/year</td><td></td></tr>
<tr><td>chs4</td><td>In the last six months, has a health worker or community volunteer spoken with you about how to feed [NAME CHILD]?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td rowspan="7">chs5</td><td rowspan="7">If yes, the health worker or community volunteer speak with about any of these topics?
(READ EACH ITEM AND RECORD RESPONSE)</td><td></td><td>No =0</td><td>Yes =1</td><td>Dk= 98</td><td rowspan="7">Ask if chs4 = 1</td></tr>
<tr><td>Breastfeeding</td><td></td><td></td><td></td></tr>
<tr><td>When to start feeding foods other than breastmilk (e.g., after 6 months)</td><td></td><td></td><td></td></tr>
<tr><td>Giving a variety of types of foods</td><td></td><td></td><td></td></tr>
<tr><td>Giving animal source foods specifically (eggs, milk, meats or fish)</td><td></td><td></td><td></td></tr>
<tr><td>How often to feed the child</td><td></td><td></td><td></td></tr>
<tr><td>Not feeding sugary drinks (e.g., fizzy drinks)</td><td></td><td></td><td></td></tr>
<tr><td>chs6</td><td>Within the last six months, was (NAME) given a vitamin A dose like (this/any of these)?
SHOW COMMON CAPSULES</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td>chs7</td><td>Source of verification</td><td colspan="3">Mother's recall 01
Health card 02
Vaccination card 03
Other (Specify) ___ 98</td><td>Ask if chs6 = 1</td></tr>
<tr><td>chs8</td><td>In the last six months, did you receive a supply of sprinkles with iron or any micronutrient powder like (SHOW IMAGE WITH PACKAGING) to give to [NAME]?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td>chs9</td><td>Was (NAME) given any drug for intestinal worms in the last six months?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td>chs1</td><td>In the last 7 days, has (NAME) eaten earth, clay, mud, or soil from any source (e.g., walls of mud houses, the yard, purchased at the market)?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td>chs1</td><td>Has (NAME) had diarrhea in the last two weeks?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td>chs1</td><td>Was there any blood in the stools?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
<tr><td>chs1</td><td>Did (NAME) have diarrhea yesterday?</td><td colspan="3">01= Yes
00= No
98= Don't Know</td><td></td></tr>
</table>

chs1	Was he/she given any of the following to drink at any time since he/she started having the diarrhea: A fluid made from a special packet called [LOCAL NAME FOR ORS PACKET]? A pre-packaged ORS liquid? A government-recommended homemade fluid? (Show image)	01= Yes 00= No 98= Don't Know	Ask if chs13 = 1
chs1	What (else) was given to treat the diarrhea?	Pill or Syrup Antibiotic ……………………………….1 Antimotility……………………………… ………………..2 Zinc……………………………………… …………………3 Other (Not antibiotic, antimotility, or zinc)...4 Unknown Pill or Syrup…........................5 Injection Antibiotic ……………………………6 Non-Antibiotic………………………………… …..7 Unknown Injection ……………………………….8 Intravenous……………………………… …………...9 Home Remedy/Herbal Medicine ……..10 Others Specify ……………………………………98	Ask if chs13 = 1
chs1	Has (NAME) been ill with a fever at any time in the last 2 weeks?	01= Yes 00= No 98= Don't Know	
chs1	Has (NAME) had an illness with a cough at any time in the last 2 weeks?	01= Yes 00= No 98= Don't Know	
chs1	Has (NAME) had fast, short, rapid breaths or difficulty breathing at any time in the last 2 weeks?	01= Yes 00= No 98= Don't Know	
chs1	Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?	01= Yes 00= No 98= Don't Know	Ask if chs18= 1
chs2	In the last 12 months, was (NAME) given any ready-to-use therapeutic feeds/plumpy'nut like (SHOW COMMON PACKAGING) because the child was malnourished?	01= Yes 00= No 98= Don't Know	
chs2	Did [CHILD] consume it yesterday?	1= Yes 0= No 98 = Don't Know	Ask if chs20 = 1

Anthropometry Questionnaire

Question Number	**Questions**	**Options**	**Skip**
name_respondent	Please confirm that CHILD is [ ] years old and is [ ] Gender.	01= This respondent age and gender is the same 02= The respondent age and gender is different	

		03= ONLY the respondent's AGE is different 04= ONLY the respondent's GENDER is different	
month_label_notification	Confirm correct age in month	01= Yes 02= No	
new_age	Enter respondent's age		If **name_respondent !**=1
new_age	Enter respondent's age in month		If **name_respondent !**=1
preg_notification	Please note that the respondent was reported to be pregnant during the listing. Is she currently pregnant?	01= Yes 02= No	
confirm_stand	Please kindly confirm that respondent is able to stand during the measurement during height measurement.	01= The CHILD can stand 02= The CHILD is disabled and is unable to stand 03= The CHILD is ill and therefore cannot stand.	If respondent is <=24months
fw1	Enter the Accurate weight #1 of the respondent (in kg).		
cg1	Enter the Accurate weight #1 of CAREGIVER ONLY (in kg).		
cgC6-59m1	Enter the Accurate weight #1 of the CAREGIVER and CHILD (in kg).		
C6-59m1	Enter the Accurate weight #1 of CHILD		
height_note	Please confirm that you are able to remove or push aside any barrettes, braids, or hairstyles that might interfere with the measurement of respondent_name	01= There is no problem with barrettes, braids, or hairstyles. 02= I am able to remove or adjust barrettes, braids, or hairstyles 03= I am NOT able to remove or adjust barrettes, braids, or hairstyles	
height_note	Is respondent overdressed	01= Yes 02= No	
h1	Enter the accurate height/length 1 of the respondent in cm		
fw2	Enter the accurate weight #2 of respondent		
cg2	Enter the accurate weight #2 of the CAREGIVER only		
cgC6-59m2	Enter the accurate weight #2 of the CAREGIVER and CHILD		
C6-59m2	Enter the accurate weight #2 of CHILD		
h2	Enter the accurate height/length 2 of the respondent in cm		
fw3	Enter the accurate weight #3 of respondent		
cg3	Enter the accurate weight #3 of the CAREGIVER only		

cgC6-59m3	Enter the accurate weight #3 of the CAREGIVER and CHILD		
C6-59m3	Enter the accurate weight #3 of CHILD		
h3	Enter the accurate height/length 3 of the respondent in cm		
height_scale_id_confirm	Confirm height Scale ID	01= I can confirm that my height Scale ID is still the same. 02= I have another Height equipment	
new_scale_height_id	New height Scale ID		If weight_scale_id_confirm = 2
weight_scale_id_confirm	Confirm weight Scale ID	01= I can confirm that my weight Scale ID is still the same. 02= I have another weight equipment	
new_scale_weight_id	New weight Scale ID		If weight_scale_id_confirm = 2

Annex 4. Adolescent girls girls (10-14 years old) and WRA (15-49 years old)

RESPONDENT IDENTIFICATION CONFIRMATION

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
RIC-25	**Confirm respondent** What is your name? **[NAME LINKED TO LINE LISTING?]**	Yes ………………………….…… No ……………………..…………..	1 2 ---□	**Update/correct in the Roster**
RIC-26	**Confirm respondent** **[GENDER LINKED TO LINE LISTING?]**	Yes ………………………….…… No ……………………..…………..	1 2 ---□	**Update/correct in the Roster**
RIC-27	**Confirm respondent** How old are you? **[AGE LINKED TO LINE LISTING?]**	Yes ………………………….…… No ……………………..…………..	1 2 ---□	**Update/correct in the Roster**
RIC-28	**Confirm completion of household questionnaire:** Did anyone in your household answers questions about your household during a previous visit?	Yes ………………………….…… No ……………………..…………..	1 2 ---□	**Identify initial respondent**
RIC-29	**Confirm completion of household questionnaire:** If yes, was that you or someone else?	Myself..……………..…… … Someone else………..……	1 2	
RIC-30	**Confirm respondent** **[SIGN CONSENT FORM?]** SIGN ASSENT FORM/ GIVE ASSENT	Yes ………………………….…… No ……………………..…………..	1 2 ---□	**Ensure respondent sign to continue**
RIC-31	Line number of the respondent in the HH Roster	|__|__|		

ANAEMIA RISK (WRA AND ADOLESCENT GIRLS GIRL)			
Now I would like to ask you some questions about your health. We will first ask about the last six months.			
wrf1.	Have you been diagnosed with anaemia in the past six months?	01= Yes 00= No 98= Don't Know	
wrf2.	Did you take any drugs for intestinal worms in the past six months?	01= Yes 00= No 98 = Don't Know	
Now I would like to ask you about your health in the last 2 weeks.			
wah1.	Have you been ill with diarrhoea in the past 2 weeks? *DEFINED AS THREE OR MORE LOOSE OR WATERY STOOLS IN A 24-HOUR PERIOD*	01= Yes 00= No 98 = Don't Know	
wah2.	Have you been ill with a cough or breathing problems in the past 2 weeks?	01= Yes 00= No 98 = Don't Know	
wah3.	When you had an illness with a cough, did you breathe faster than usual with short, rapid breaths or have difficulty breathing?	01= Yes 00= No 98 = Don't Know	
wah4.	Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?	Chest only ….. 01 Blocked or runny nose only. ….................02 Both ….. 03 Other (specify)___________________77 Don't know 98	
wah5.	Have you been ill with a fever in the past two weeks?	01= Yes 00= No 98 = Don't Know	
wah6.	Have you been ill with malaria in the past two weeks?	01= Yes 00= No 98 = Don't Know	
wah7.	Have you had any hospitalization and /or clinic visits due to illness in the last two weeks?	01= Yes 00= No 98 = Don't Know	
wah8.	Do you smoke? (do not include the powder and chew type)	00= No 01= Yes	
Now we would like to ask you some questions about other topics			
wtt1.	In the last seven days, have you eaten earth, clay, mud or soil from any source (e.g, walls of mud houses, the yard, purchased at the market)?	00= No 01= Yes	
wtt2.	During the last six months, did you take any multivitamin tablets for yourself? *(SHOW TABLETS)* *ASK TO SEE THE TABLETS*	01= Yes 00= No 98 = Don't Know	
wtt3.	How many days did you take any of these products in the last week (7 days)	Number of days……… [ ][ ] (IF NONE, ENTER 00) (IF DON'T KNOW, ENTER 98)	
wtt4.	During the last six months, did you take any iron tablets, iron-folic acid tablets for yourself? *(SHOW TABLETS)* *ASK TO SEE THE TABLETS*	01= Yes 00= No 98 = Don't Know	
wtt5.	How many days did you take any iron tablets, iron-folic acid tablets in the last week (7 days)	Number of days……… [ ][ ] (IF NONE, ENTER 00) (IF DON'T KNOW, ENTER 98)	

Annex 4. Pregnant women (15-49 years old)

RESPONDENT IDENTIFICATION CONFIRMATION

Q/N	QUESTION	RESPONSE	CODE	INSTRUCTION
RIC-32	**Confirm respondent** What is your name? **[NAME LINKED TO LINE LISTING?]**	Yes ………………………..…… No ……………………..…………..	1 2 ---☐	**Update/correct in the Roster**
RIC-33	**Confirm respondent** **[GENDER LINKED TO LINE LISTING?]**	Yes ………………………..…… No ……………………..…………..	1 2 ---☐	**Update/correct in the Roster**
RIC-34	**Confirm respondent** How old are you? **[AGE LINKED TO LINE LISTING?]**	Yes ………………………..…… No ……………………..…………..	1 2 ---☐	**Update/correct in the Roster**
RIC-35	**Confirm completion of household questionnaire:** Did anyone in your household answers questions about your household during a previous visit?	Yes ………………………..…… No ……………………..…………..	1 2 ---☐	**Identify initial respondent**
RIC-36	**Confirm completion of household questionnaire:** If yes, was that you or someone else?	Myself...……………..…… … Someone else…………..……	1 2	
RIC-37	**Confirm respondent** **[SIGN CONSENT FORM?]**	Yes ………………………..…… No ……………………..…………..	1 2 ---☐	**Ensure respondent sign to continue**
RIC-38	Line number of the respondent in the HH Roster	☐☐		

ANAEMIA RISK			
Now I would like to ask you about your health in the last two weeks.			
wah9.	Have you been ill with diarrhoea in the past two weeks? *DEFINED AS THREE OR MORE LOOSE OR WATERY STOOLS IN A 24-HOUR PERIOD*	01= Yes 00= No 98 = Don't Know	
wah10.	Have you been ill with a cough or breathing problems in the past two weeks?	01= Yes 00= No 98 = Don't Know	
wah11.	When you had an illness with a cough, did you breathe faster than usual with short, rapid breaths or have difficulty breathing?	01= Yes 00= No 98 = Don't Know	
wah12.	Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?	Chest only............................01 Blocked or runny nose only......... 02 Both ….. 03 Other (specify) _______________ 77 Don't know ………………..……….98	
wah13.	Have you been ill with a fever in the past two weeks?	01= Yes 00= No 98 = Don't Know	
wah14.	Have you been ill with malaria in the past two weeks?	01= Yes 00= No 98 = Don't Know	
wah15.	Have you had any hospitalization and /or clinic visits due to illness in the last two weeks?	01= Yes 00= No 98 = Don't Know	
wah16.	Do you smoke? (do not include the powder and chew type)	00= No 01= Yes	
INTERVENTION COVERAGE FOR PREGNANT WOMEN			
wpw1.	Have you seen any health worker for antenatal care during this pregnancy so far?	01 = Yes 00 = No	
wpw2.	How many months pregnant were you when you first received antenatal care for this pregnancy?	[_____] Months Don't know	
wpw3.	How many times have you received antenatal care so far?	[_____] times Don't know	
wpw4.	During this pregnancy, have you received or purchased any tablets, syrups, or tonics containing iron? SHOW COMMON VARIETIES – IFA	1 = Yes 0 = No 98 Don't Know	
wpw5.	Did you receive for free or purchase these tablets or syrup?	1 = Receive for free 2 = Purchase Don't know	
wpw6.	How many iron-folic acid IFA tablets did you receive during your pregnancy	[____] Tablets [Enter 0-180] Don't know	
wpw7.	How many days in the last 7 days (one week) did you consume a tablet or syrup containing iron?	[____] Days [Enter 0-7] Don't know	
wpw8.	Did you consume a tablet or syrup containing iron and/folic acid yesterday?	1 = Yes 0 = No 98= Don't know	
wpw9.	So far, during this pregnancy, has a health worker or community volunteer spoken with you about what foods to eat during pregnancy?	1 = Yes 0 = No 98= Don't know	
wpw10.	So far, during this pregnancy, has a health worker or community volunteer spoken with you about breastfeeding your newborn?	1 = Yes 0 = No 98 = Don't know	

Annex 5: Scope of the micronutrient component

Target group, data & indicators for the biomarker questionnaire, anthropometry and laboratory measurements

A. TARGET GROUP DEFINITION

Data were collected from four target groups that are defined as follows:

1. children, of either sex, aged 6-59 months
2. non-pregnant Adolescent girls girls, aged 10-14 years
3. non-pregnant Women of Reproductive Age (WRA), aged 15-49 years
4. pregnant women, aged 15-49 years

B. DATA & INDICATORS

Tables 1 (a), (b), and (c) and summarize:

a) the biomarker questionnaire variables generated by the target group
b) the anthropometry data and respective indicators generated by the target group, and
c) the laboratory measurements by location and by survey target groups

Table 1a: Biomarker questionnaire - Data from the biomarker questionnaire (by the target group)

Respondents	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Intervention coverage	Vitamin A supplementation Nutrition counselling & specific key messages Micronutrient powder/ any sprinkles with iron Deworming Therapeutic feeds	Deworming Iron or iron/folic acid tablets Multivitamins	Deworming Iron or iron/folic acid tablets Multivitamins	Antenatal care Iron and/or folic acid supplementation Nutrition counselling
Health status	Diarrhoea Blood in stool Cough Fever Difficulty breathing	Diarrhoea Cough Fever Malaria Hospitalization	Diarrhoea Cough Fever Malaria Hospitalization	Diarrhoea Cough Fever Malaria Hospitalization
Anaemia risk-factors	Pica	Anemia diagnosis Smoking Pica	Anemia diagnosis Smoking Pica	Smoking

Table 1b: Anthropometry – Data and respective indicators from Anthropometry (by target group)

Respondents	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of Reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Anthropometry data collected	Age, length/height, weight	Age, height, and weight	Age, height, and weight	Height
Anthropometry indicators reported	Stunting Underweight Wasting Overweight *** Severe stunting Severe underweight Severe wasting Obesity	Thinness Normal weight Overweight Obesity	Thinness Normal weight Overweight Obesity	---

Table 1c: Laboratory measurements - Data anticipated from the six labs supporting the survey

Respondents	Children (aged 6-59 months)	Adolescent girls (aged 10-14 years)	Women of reproductive age (aged 15-49 years)	Pregnant women (aged 15-49 years)
Measurements 1. Field lab	Malaria Haemoglobin Helicobacter pylori (H. pylori) Helminth	Malaria Haemoglobin H. pylori	Malaria Haemoglobin H. pylori Plasma glucose Helminth	Malaria Haemoglobin H. pylori Helminth
Measurements **2. Synlab Nigeria**	Haemoglobin genotype	---	Haemoglobin genotype HbA1c	---
Measurements 3. Germany lab	Ferritin Serum Transferrin Receptor (sTfR) Retinol Binding Protein for vitamin A deficiency (RBP) C-reactive protein (CRP) Alpha 1-acid glycoprotein (AGP)	Ferritin sTfR RBP CRP AGP	Ferritin sTfR RBP CRP AGP	Ferritin sTfR RBP CRP AGP
Measurements 4. UK Lab	---	---	Vitamin B1 (sub- sample: 20%) Vitamin B2 (sub-sample: 20%)	---
Measurements **5. USA Lab**	Serum retinol MRDR (sub-sample: 20%)	Serum retinol	Serum retinol MRDR (20%)	Serum retinol
Measurements 6. China Lab	Vitamin B12 Zinc	Vitamin B12 Red Blood Cell (RBC) folate Serum folate Zinc	Vitamin B12 (RBC) folate Serum folate Zinc Urinary iodine	Vitamin B12 (RBC) folate Serum folate Urinary iodine

Annex 6. Anthropometry Data Quality Report

Data quality assessment report template with results from WHO Anthro Survey Analyzer

Analysis date: 17 March 2022 09:56:35

Link: https://worldhealthorg.shinyapps.io/anthro/

This report is a template that includes key data quality checks that can help to identify issues with the data and considerations when interpreting results. Other outputs relevant to your analyses can be saved directly from the tool interactive dashboards and added to the report.

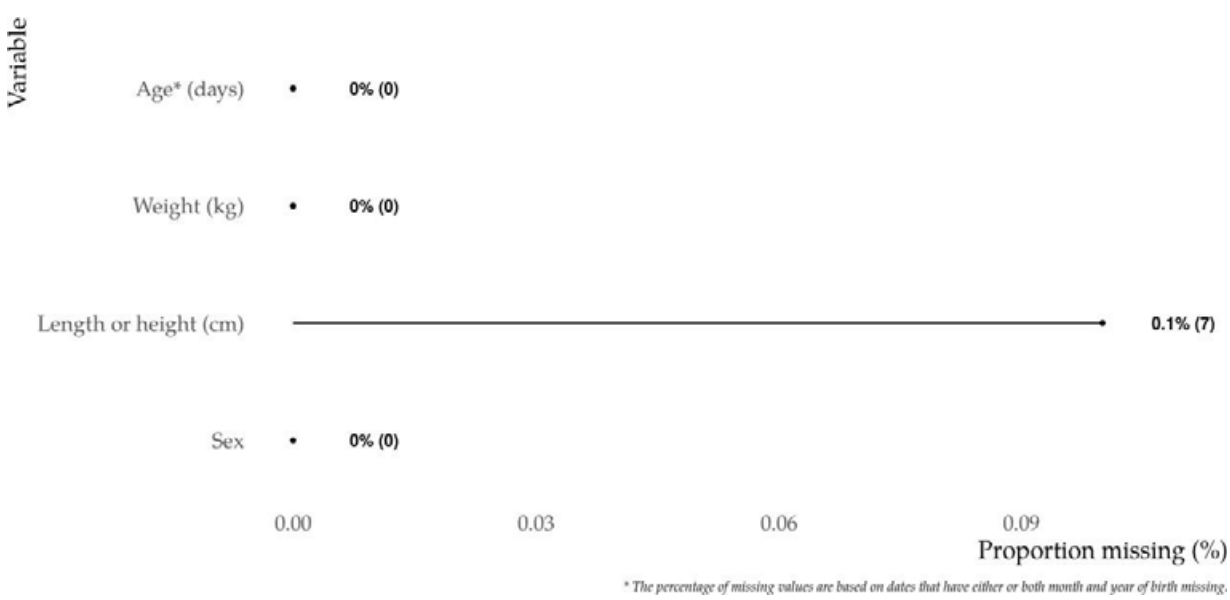
For guidance on interpreting the results, the user should refer to the document "Recommendations for improving the quality of anthropometric data and its analysis and reporting" by the Working Group on Anthropometric Data Quality for the WHO-UNICEF Technical Expert Advisory Group on Nutrition Monitoring (TEAM). The document is available at www.who.int/nutrition/team, under "Technical reports and papers."

Missing data

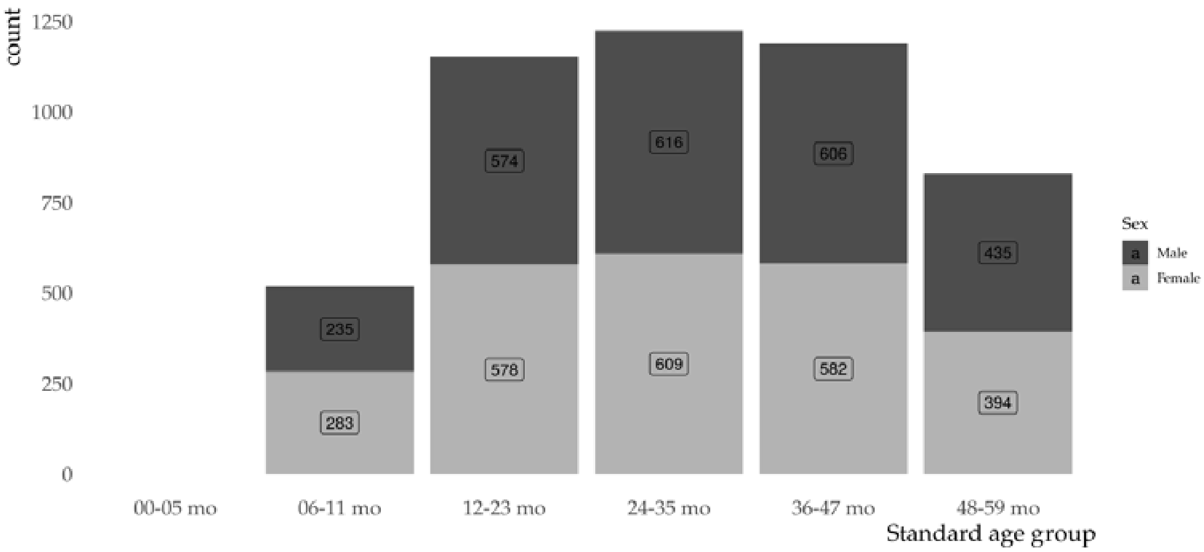
Percentage (number of cases) of children missing information on variables used in the analysis

The total number of children: 4912.

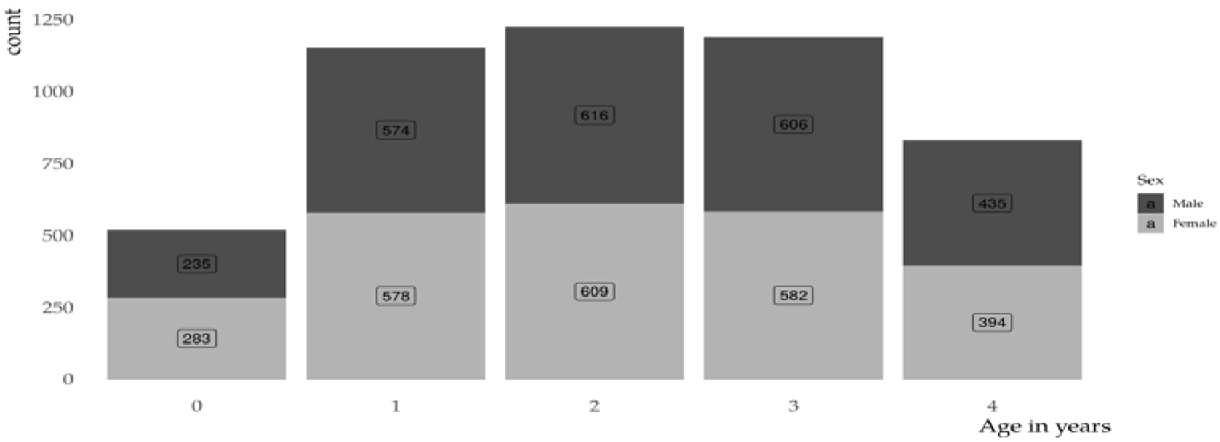
The total number of children: 4912.



Data Distribution
Distribution by standard age grouping and sex



Distribution by age in years and sex



The number of cases and proportions of mismatches between length/height measurement position and recommended position, by age group.

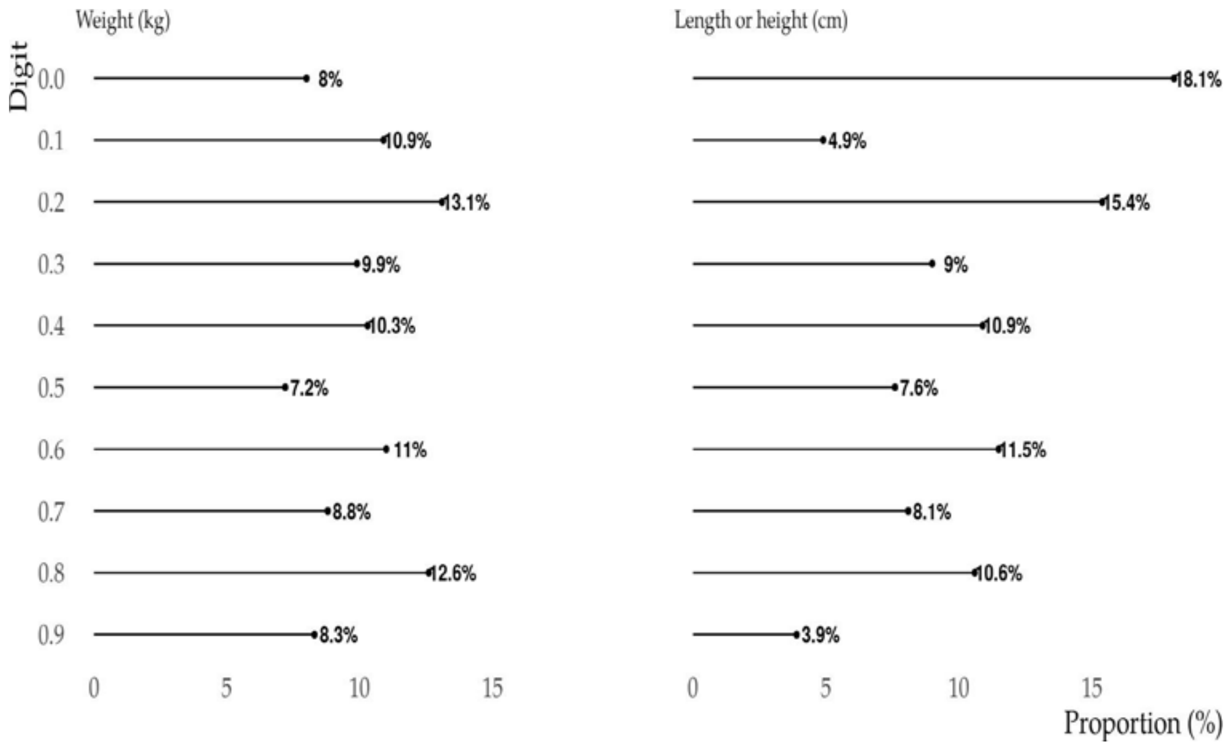
Age group	Expected position	Total	Observed mismatch*	% mismatch*
0 to 11 months	lying	511	6	1.2%
0 to 8 months	lying	208	0	0.0%
12 to 23 months	lying	1152	176	15.3%
24 to 35 months	standing	1225	119	9.7%
36 to 47 months	standing	1188	15	1.3%
48 to 59 months	standing	829	7	0.8%
Total		4905	323	6.6%

Number of children with missing information on measurement position: 7

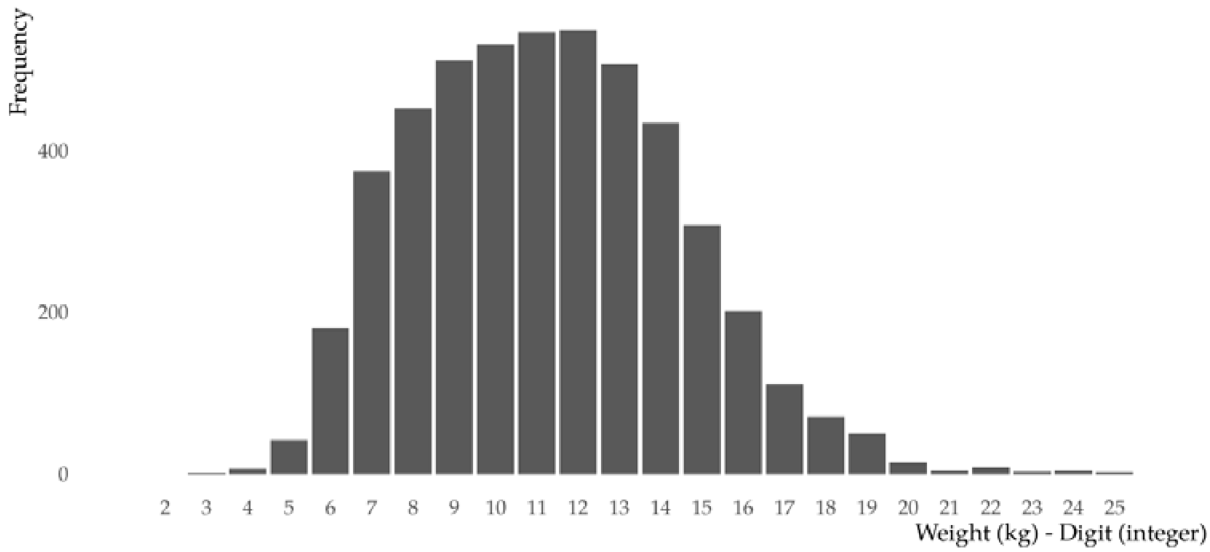
A mismatch means children under 24 months were measured standing (height) or children 24 months or older were measured lying down (recumbent length).

Digit preference charts

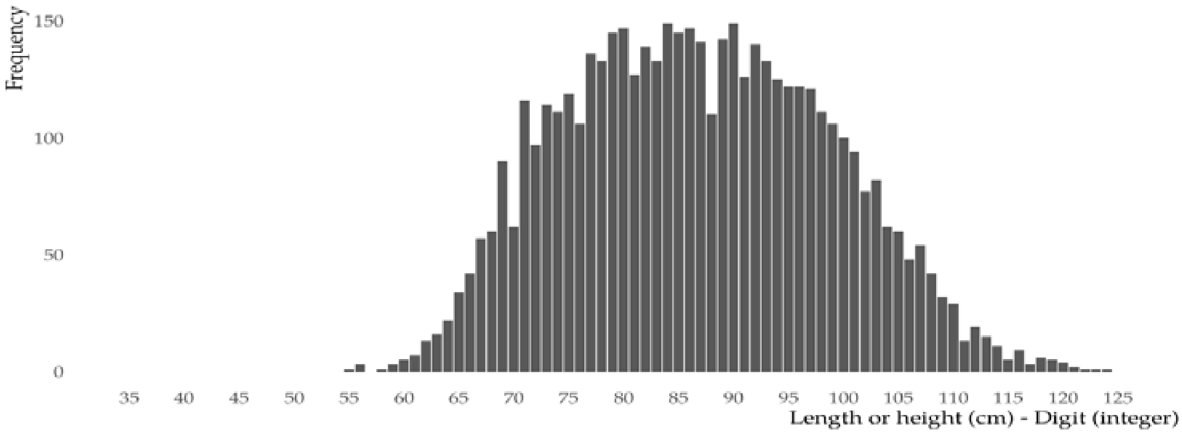
Decimal digit preference for weight and length/height



Whole number digit preference for weight

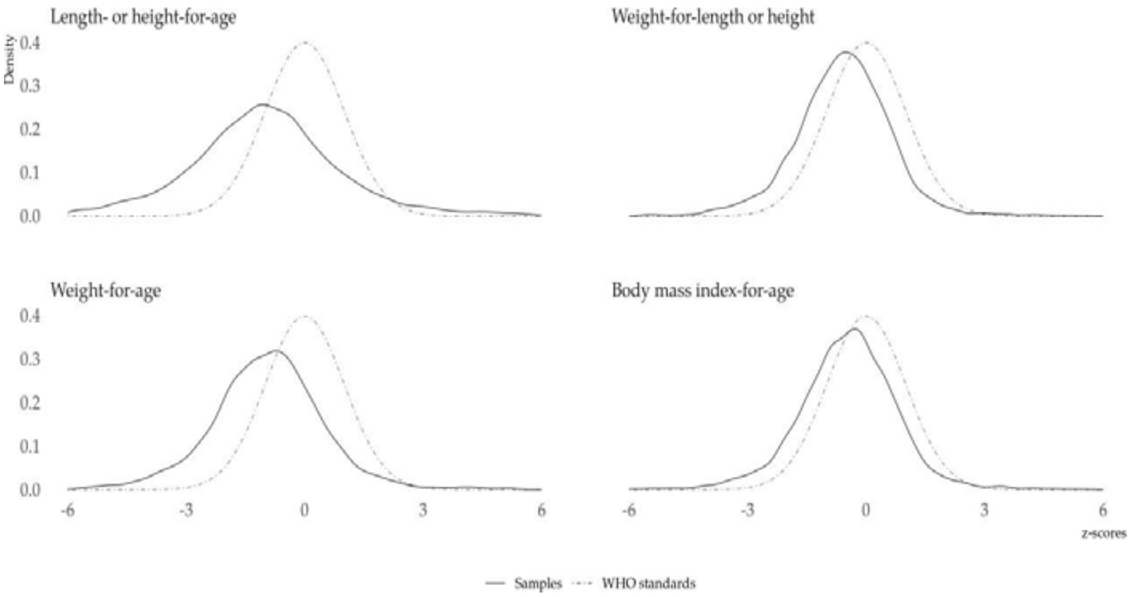


Whole number digit preference for length/height

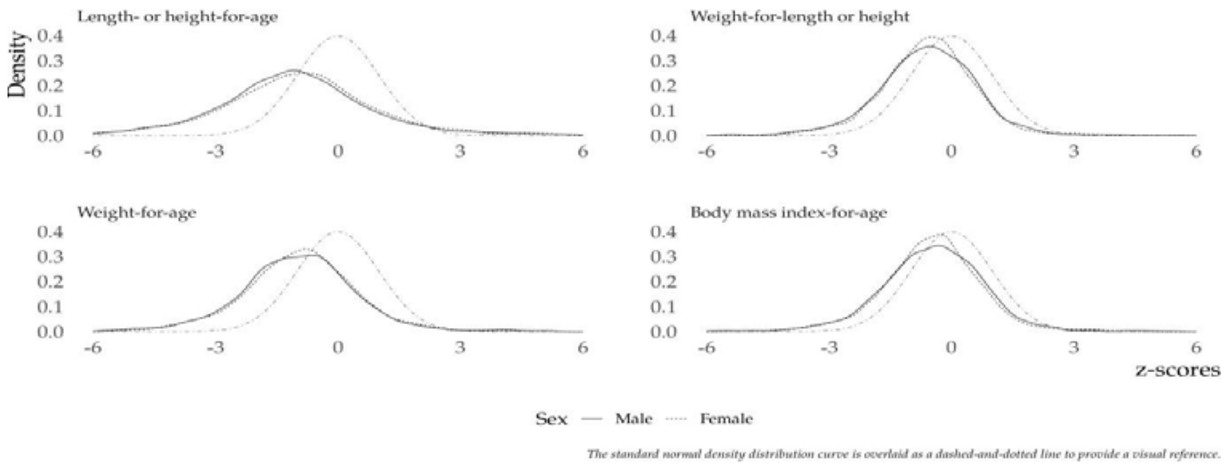


Z-score distribution of indicators

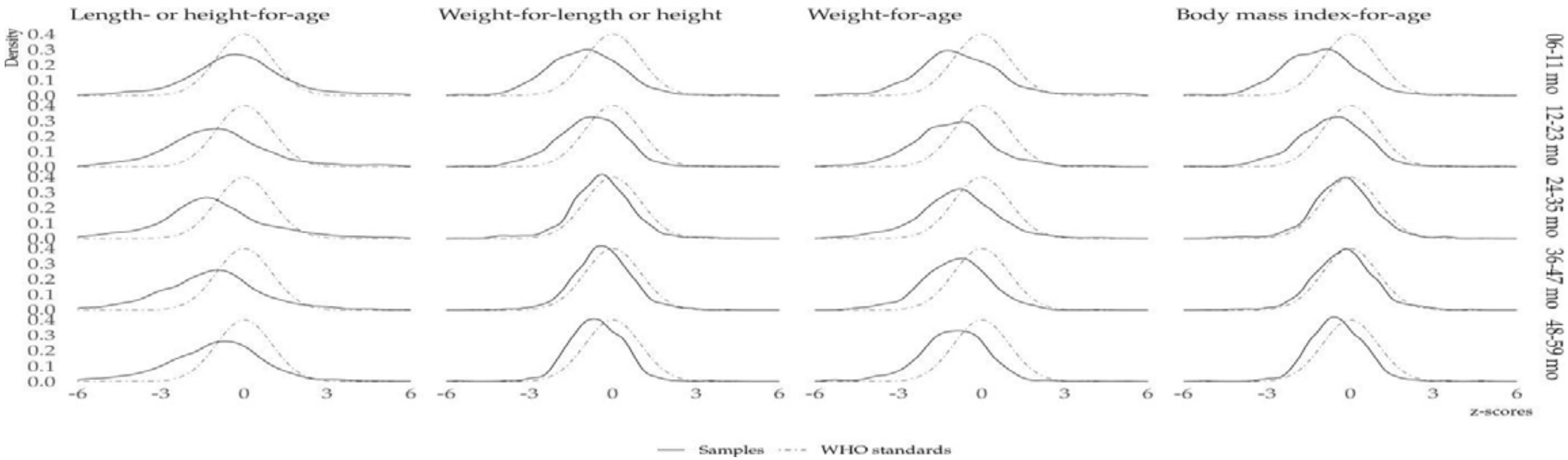
Z-score distribution by index



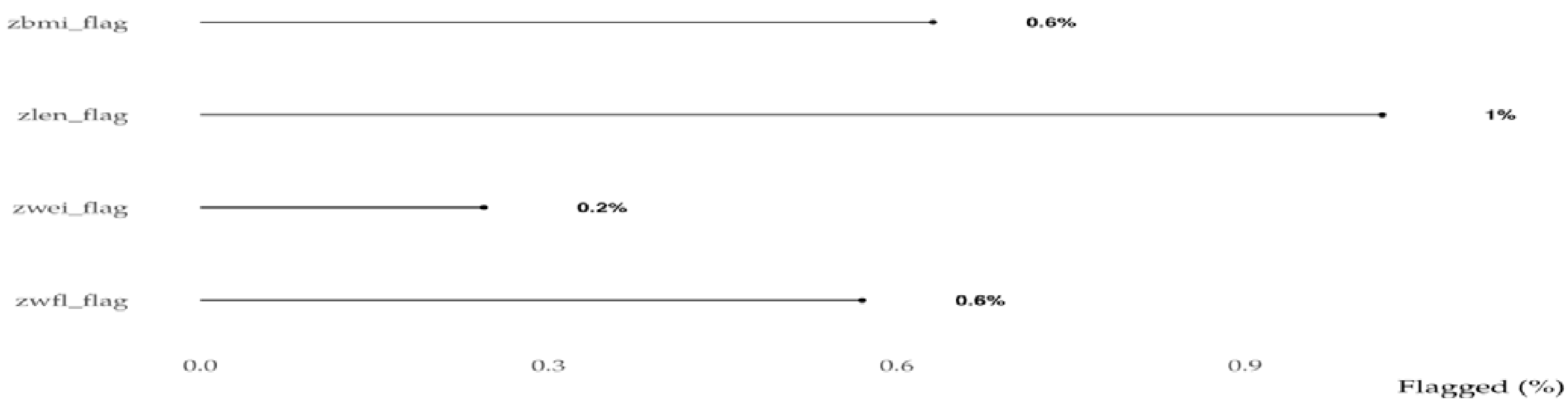
Z-score distribution by index and sex



Z-score distribution by index and age group



Percentage of flagged z-scores based on WHO flagging system by index



Z-score summary table

Z-score distribution of unweighted summary statistics by index

Group	Unweighted N	Mean (zlen)	Standard deviation (zlen)	Skewness (zlen)	Kurtosis (zlen)	Mean (zwei)	Standard deviation (zwei)	Skewness (zwei)	Kurtosis (zwei)
All	4912	-0.98	1.85	0.33	3.89	-0.95	1.39	0.08	4.11
Age group: 6 to 11 months	518	-0.24	1.81	0.27	4.18	-0.83	1.49	0.36	4.16
Age group: 12 to 23 months	1152	-0.95	1.89	0.55	4.12	-1.03	1.52	0.26	4.09
Age group: 24 to 35 months	1225	-1.10	1.90	0.43	3.83	-0.90	1.44	-0.04	3.85
Age group: 36 to 47 months	1188	-1.16	1.79	0.23	3.73	-0.91	1.25	-0.01	3.75
Age group: 48 to 59 months	829	-1.01	1.72	-0.06	3.74	-1.03	1.24	-0.27	4.25
Sex: Male	2466	-1.03	1.84	0.39	4.01	-0.97	1.42	0.13	4.27
Sex: Female	2446	-0.93	1.86	0.26	3.78	-0.92	1.37	0.03	3.93

Z-score distribution of unweighted summary statistics by index (continued)

Group	Unweighted N	Mean (zbmi)	Standard deviation (zbmi)	Skewness (zbmi)	Kurtosis (zbmi)	Mean (zwfl)	Standard deviation (zwfl)	Skewness (zwfl)	Kurtosis (zwfl)
All	4912	-0.46	1.20	0.02	4.11	-0.58	1.16	0.04	4.26
Age group: 6 to11 months	518	-1.06	1.33	0.47	4.00	-0.94	1.37	0.57	4.46
Age group: 12 to 23 months	1152	-0.67	1.27	0.04	3.69	-0.80	1.25	0.13	3.89
Age group: 24 to 35 months	1225	-0.27	1.16	-0.21	4.77	-0.42	1.13	-0.16	4.60
Age group: 36 to 47 months	1188	-0.22	1.11	0.16	4.22	-0.36	1.07	0.00	4.41
Age group: 48 to 59 months	829	-0.45	1.00	0.53	5.01	-0.57	0.98	0.35	4.49
Sex: Male	2466	-0.45	1.22	0.00	4.01	-0.58	1.19	-0.01	4.04
Sex: Female	2446	-0.48	1.18	0.05	4.22	-0.57	1.14	0.10	4.50

Annex 6 cont. Summary of recommended data quality checks.

The Working Group (WG) on Anthropometry Data Quality recommendation is that data quality is assessed and reported based on assessment on the following seven parameters: (i) completeness; (ii) sex ratio; (iii) age distribution; (iv) digit preference of heights and weights; (v) implausible z score values; (vi) standard deviation of z scores; and (vii) normality of z scores.

The WG recommends that (i) data quality checks should not be considered in isolation; (ii) formal tests or scoring should not be conducted; and (iii) the checks should be used to help users identify issues with the data quality to improve interpretation of the malnutrition estimates from the survey. A summary of details on the various checks is provided below to help their use. Full details and more comprehensive guidance, including how to calculate, can be found in the full report on the WG's recommendations[2].

(i) Completeness: although not all statistics are included in the WHO Anthro Survey Analyzer, report on the structural integrity of the aspects listed below should be included in the final report.

- PSUs: Percent of selected PSUs that were visited
- Households: Percent of selected HHs in the PSUs interviewed or recorded as not interviewed (specifying why)
- HH members: Percent of HH rosters that were completed
- Children: Percent of all eligible children are interviewed and measured, or recorded as not interviewed or measured (specifying why), with no duplicate cases
- Dates of birth: Percent of dates of birth for all eligible children that were complete

(ii) Sex ratio

- What: Ratio of girls to boys in the survey and compare to expected for the country. The observed ratios should be compared to the expected patterns based on reliable sources.
- Why: To identify potential selection biases

(iii) Age distribution

- What: Age distributions by age in completed years (six bars weighted), months (72 bars), and calendar month of birth (12 bars) as histograms
- Why: To identify potential selection biases or misreporting

(iv) Height and weight digit preference

- What: Terminal digits, as well as whole number integer distributions through histograms
- Why: Digit preference may be a tell-tale sign of data fabrication or inadequate care and attention during data collection and recording. It should be presented by a team or other relevant disaggregation categories when possible.

(v) Implausible z score values

- What: The percent of cases outside WHO flags[3] for each HAZ, WHZ, and WAZ
- Why: A percent above one percent can indicate potential data quality issues in measurements or age determination. It should be presented by a team or other relevant disaggregation categories.

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[2] Working Group on Anthropometric Data Quality, for the WHO-UNICEF Technical Expert Advisory Group on Nutrition Monitoring (TEAM). Recommendations for improving the quality of anthropometric data and its analysis and reporting. Available at www.who.int/nutrition/team (under "Technical reports and papers").

[3] WHO Anthro Software for personal computers - Manual (2011). Available at www.who.int/childgrowth/software/anthro_pc_manual_v322.pdf?ua=1.

(vi) Standard deviations

- What: SD for each HAZ, WHZ, and WAZ
- Why: Large SDs may signify data quality problems and/or population heterogeneity. It is unclear what causes SD's size, and more research is needed to determine the appropriate interpretation. It should be noted that SDs are typically wider for HAZ than WHZ or WAZ, and that HAZ SD is typically widest in youngest (0-5 months old) and increases as children age through to five years. No substantial difference should be observed between boys and girls. It should be presented by a team or other relevant disaggregation categories.

(vii) Checks of normality

- What: Measures of asymmetry (skew) and tailedness (kurtosis) of HAZ, WHZ, and WAZ, as well as density plots
- Why: A general assumption that three indices are normally distributed but unclear if applicable to populations with varying patterns of malnutrition. One can use the rule of thumb ranges of <-0.5 or >+0.5 for skewness to indicate asymmetry and <2 or >4 for kurtosis to indicate heavy or light tails. Further research is needed to understand patterns in different contexts. Anyhow, the comparisons among the distribution by disaggregation categories might help interpret the results.

Annex 7. Coverage and response rates calculated using unweighted data.

Table 1. Cluster (Sampled EAs for the Survey) Coverage Rate by Zone and Sector (Rural-Urban)

Number of Clusters Sampled				Number of Clusters Covered			Coverage Rate (%)		
Zone	Total	Rural	Urban	Total Covered	Rural Covered	Urban Covered	Total	Rural	Urban
NC	**65**	47	18	**59**	41	18	**90.8**	87.2	100.0
NE	**65**	48	17	**55**	40	15	**84.6**	83.3	88.2
NW	**65**	49	16	**61**	45	16	**93.8**	91.8	100.0
SE	**65**	34	31	**64**	34	30	**98.5**	100.0	96.8
SS	**65**	40	25	**62**	38	24	**95.4**	95.0	96.0
SW	**65**	16	49	**63**	15	48	**96.9**	93.8	98.0
National	**390**	**234**	**156**	**364**	**213**	**151**	**93.3**	**91.0**	**96.8**

Table 2. National Response Rates of Target Groups/Sector by Modules

Target Group	Total Sampled/ Final Respondent	Response to at least 1 Module	Response to Specific Modules									
		OVERALL[1]	Diet	HbA1c	Haemoglobin genotype	Anthropometry	Biomarker questionnaire	Plasma glucose	Haemoglobin (Anaemia)	Helminth	H. pylori	Malaria
C6-59M	Respondents	5171	4968	0	4548	4912	4916	0	4674	4240	4672	4678
	Sampled	5555	5555	0	5555	5555	5555	0	5555	5555	5555	5555
	Response Rate	**93.1**	**89.4**		**81.9**	**88.4**	**88.5**		**84.1**	**76.3**	**84.1**	**84.2**
Adolescent girls	Respondents	1010	0	0	0	1006	1002	0	998	0	984	996
	Sampled	1202	0	0	0	1202	1202	0	1202	0	1202	1202
	Response Rate	**84.0**				**83.7**	**83.4**		**83.0**		**81.9**	**82.9**
WRA	Respondents	5471	5281	5089	5137	5239	5239	5109	5162	4669	5161	5159
	Sampled	6071	6071	6071	6071	6071	6071	6071	6071	6071	6071	6071
	Response Rate	**90.1**	**87.0**	**83.8**	**84.6**	**86.3**	**86.3**	**84.2**	**85.0**	**76.9**	**85.0**	**85.0**
Pregnant Women	Respondents	1031	1006	0	0	976	863	0	958	846	959	959
	Sampled	1134	1134	0	0	1134	1134	0	1134	1134	1134	1134
	Response Rate	**90.9**	**88.7**			**86.1**	**76.1**		**84.5**	**74.6**	**84.6**	**84.6**
Rural	Respondents	7573	6674	3075	5826	7281	7203	3080	7081	6079	7075	7082
	Sampled	8183	7478	3563	6810	8183	8183	3563	8183	7478	8183	8183
	Response Rate	**92.5**	**89.2**	**86.3**	**85.6**	**89.0**	**88.0**	**86.4**	**86.5**	**81.3**	**86.5**	**86.5**
Urban	Respondents	5110	4581	2014	3859	4852	4817	2029	4711	3676	4701	4710
	Sampled	5779	5282	2508	4816	5779	5779	2508	5779	5282	5779	5779
	Response Rate	**88.4**	**86.7**	**80.3**	**80.1**	**84.0**	**83.4**	**80.9**	**81.5**	**69.6**	**81.3**	**81.5**
National	Respondents	12683	11255	5089	9685	12133	12020	5109	11792	9755	11776	11792
	Sampled	13962	12760	6071	11626	13962	13962	6071	13962	12760	13962	13962
	Response Rate	**90.8**	**88.2**	**83.8**	**83.3**	**86.9**	**86.1**	**84.2**	**84.5**	**76.4**	**84.3**	**84.5**

[1] Overall Sampled is the total number selected for the survey; Overall Respondents is total number that responded to at least one of the modules; and Overall Response Rate is the percentage of the sampled respondents that answered to at least one module (that did not refuse to participate at all levels).

Table 3. Response Rate by Sector (Rural-Urban), Target Groups and Specific Modules

Sector	Target Group	Total Sampled/ Final Respondent	Response to at least 1 Module	Response to Specific Modules									
			OVERALL[1]	Diet	HbA1c	Haemoglobin genotype	Anthropometry	Biomarker questionnaire	Plasma glucose	Haemog lobin (Anaemia)	Helminth	H. pylori	Malaria
Rural	C6-59M	Respondents	3057	2909	0	2718	2925	2926	0	2793	2622	2793	2796
		Sampled	3247	3247	0	3247	3247	3247	0	3247	3247	3247	3247
		Response Rate	**94.1**	**89.6**		**83.7**	**90.1**	**90.1**		**86.0**	**80.8**	**86.0**	**86.1**
	Adolescent girls	Respondents	600	0	0	0	599	595	0	590	0	582	590
		Sampled	705	0	0	0	705	705	0	705	0	705	705
		Response Rate	**85.1**				**85.0**	**84.4**		**83.7**		**82.6**	**83.7**
	WRA	Respondents	3295	3162	3075	3108	3168	3171	3080	3119	2924	3120	3116
		Sampled	3563	3563	3563	3563	3563	3563	3563	3563	3563	3563	3563
		Response Rate	**92.5**	**88.7**	**86.3**	**87.2**	**88.9**	**89.0**	**86.4**	**87.5**	**82.1**	**87.6**	**87.5**
	Women Pregnant	Respondents	621	603	0	0	589	511	0	579	533	580	580
		Sampled	668	668	0	0	668	668	0	668	668	668	668
		Response Rate	**93.0**	**90.3**			**88.2**	**76.5**		**86.7**	**79.8**	**86.8**	**86.8**
	All Rural	Respondents	**7573**	**6674**	**3075**	**5826**	**7281**	**7203**	**3080**	**7081**	**6079**	**7075**	**7082**
		Sampled	**8183**	**7478**	**3563**	**6810**	**8183**	**8183**	**3563**	**8183**	**7478**	**8183**	**8183**
		Response Rate	**92.5**	**89.2**	**86.3**	**85.6**	**89.0**	**88.0**	**86.4**	**86.5**	**81.3**	**86.5**	**86.5**
Urban	C6-59M	Respondents	2114	2059	0	1830	1987	1990	0	1881	1618	1879	1882
		Sampled	2308	2308	0	2308	2308	2308	0	2308	2308	2308	2308
		Response Rate	**91.6**	**89.2**		**79.3**	**86.1**	**86.2**		**81.5**	**70.1**	**81.4**	**81.5**
	Adolescent girls	Respondents	410	0	0	0	407	407	0	408	0	402	406
		Sampled	497	0	0	0	497	497	0	497	0	497	497
		Response Rate	**82.5**				**81.9**	**81.9**		**82.1**		**80.9**	**81.7**
	WRA	Respondents	2176	2119	2014	2029	2071	2068	2029	2043	1745	2041	2043
		Sampled	2508	2508	2508	2508	2508	2508	2508	2508	2508	2508	2508
		Response Rate	**86.8**	**84.5**	**80.3**	**80.9**	**82.6**	**82.5**	**80.9**	**81.5**	**69.6**	**81.4**	**81.5**

Sector	Target Group	Total Sampled/ Final Respondent	Response to at least 1 Module	Response to Specific Modules										
			OVERALL[1]	Diet	HbA1c	Haemoglobin genotype	Anthropometry	Biomarker questionnaire	Plasma glucose	Haemoglobin (Anaemia)	Helminth	H. pylori	Malaria
	Women Pregnant	Respondents	410	403	0	0	387	352	0	379	313	379	379
		Sampled	466	466	0	0	466	466	0	466	466	466	466
		Response Rate	**88.0**	**86.5**			**83.0**	**75.5**		**81.3**	**67.2**	**81.3**	**81.3**
	All Urban	Respondents	**5110**	**4581**	**2014**	**3859**	**4852**	**4817**	**2029**	**4711**	**3676**	**4701**	**4710**
		Sampled	**5779**	**5282**	**2508**	**4816**	**5779**	**5779**	**2508**	**5779**	**5282**	**5779**	**5779**
		Response Rate	**88.4**	**86.7**	**80.3**	**80.1**	**84.0**	**83.4**	**80.9**	**81.5**	**69.6**	**81.3**	**81.5**
National	Total	Respondents	**12683**	**11255**	**5089**	**9685**	**12133**	**12020**	**5109**	**11792**	**9755**	**11776**	**11792**
		Sampled	**13962**	**12760**	**6071**	**11626**	**13962**	**13962**	**6071**	**13962**	**12760**	**13962**	**13962**
		Response Rate	**90.8**	**88.2**	**83.8**	**83.3**	**86.9**	**86.1**	**84.2**	**84.5**	**76.4**	**84.3**	**84.5**

Overall Sampled is the total number selected for the survey; Overall Respondents is total number that responded to at least one of the modules; and Overall Response Rate is the percentage of the sampled respondents that answered to at least one module (that did not refuse to participate at all levels).

Table 4. Zonal Response Rates of Target Groups by Modules

Zone	Target Groups	Total Sampled/ Final Respondent	Response to at least 1 Module	Response to Specific Modules									
			1 OVERALL	**Diet**	**HbA1c**	**Haemoglobin genotype**	**Anthropometry**	**Biomarker questionnaire**	**Plasma glucose**	**Haemoglobin (Anaemia)**	**Helminth**	**H. pylori**	**Malaria**
		Respondents	787	756	0	699	771	771	0	725	677	726	727
		Sampled	865	865	0	865	865	865	0	865	865	865	865
	C6-59M	**Response Rate**	**91.0**	**87.4**		**80.8**	**89.1**	**89.1**		**83.8**	**78.3**	**83.9**	**84.0**
		Respondents	152	0	0	0	151	151	0	150	0	149	150
		Sampled	181	0	0	0	181	181	0	181	0	181	181
	Adolescent girls	**Response Rate**	**84.0**				**83.4**	**83.4**		**82.9**		**82.3**	**82.9**
		Respondents	882	857	835	842	861	861	826	845	768	844	846
		Sampled	974	974	974	974	974	974	974	974	974	974	974
	WRA	**Response Rate**	**90.6**	**88.0**	**85.7**	**86.4**	**88.4**	**88.4**	**84.8**	**86.8**	**78.9**	**86.7**	**86.9**
		Respondents	162	160	0	0	155	135	0	151	134	151	151
		Sampled	179	179	0	0	179	179	0	179	179	179	179
	Pregnant	**Response Rate**	**90.5**	**89.4**			**86.6**	**75.4**		**84.4**	**74.9**	**84.4**	**84.4**
		Respondents	1983	1773	835	1541	1938	1918	826	1871	1579	1870	1874
		Sampled	2199	2018	974	1839	2199	2199	974	2199	2018	2199	2199
NC	**Total**	**Response Rate**	**90.2**	**87.9**	**85.7**	**83.8**	**88.1**	**87.2**	**84.8**	**85.1**	**78.2**	**85.0**	**85.2**
		Respondents	871	827	0	783	833	827	0	799	792	799	797
		Sampled	922	922	0	922	922	922	0	922	922	922	922
	C6-59M	**Response Rate**	**94.5**	**89.7**		**84.9**	**90.3**	**89.7**		**86.7**	**85.9**	**86.7**	**86.4**
		Respondents	167	0	0	0	167	166	0	164	0	162	164
		Sampled	187	0	0	0	187	187	0	187	0	187	187
	Adolescent girls	**Response Rate**	**89.3**				**89.3**	**88.8**		**87.7**		**86.6**	**87.7**
		Respondents	869	830	824	830	839	832	818	831	811	832	829
		Sampled	914	914	914	914	914	914	914	914	914	914	914
	WRA	**Response Rate**	**95.1**	**90.8**	**90.2**	**90.8**	**91.8**	**91.0**	**89.5**	**90.9**	**88.7**	**91.0**	**90.7**
		Respondents	187	182	0	0	180	152	0	177	171	178	178
		Sampled	197	197	0	0	197	197	0	197	197	197	197
	Pregnant	**Response Rate**	**94.9**	**92.4**			**91.4**	**77.2**		**89.8**	**86.8**	**90.4**	**90.4**
		Respondents	2094	1839	824	1613	2019	1977	818	1971	1774	1971	1968
		Sampled	2220	2033	914	1836	2220	2220	914	2220	2033	2220	2220
NE	**Total**	**Response Rate**	**94.3**	**90.5**	**90.2**	**87.9**	**90.9**	**89.1**	**89.5**	**88.8**	**87.3**	**88.8**	**88.6**
		Respondents	985	916	0	829	905	908	0	839	745	838	843
		Sampled	1022	1022	0	1022	1022	1022	0	1022	1022	1022	1022
	C6-59M	**Response Rate**	**96.4**	**89.6**		**81.1**	**88.6**	**88.8**		**82.1**	**72.9**	**82.0**	**82.5**
NW	**Adolescent girls**	Respondents	162	0	0	0	160	158	0	160	0	158	159

Zone	Target Groups	Total Sampled/ Final Respondent	Response to at least 1 Module	Response to Specific Modules									
			OVERALL[1]	Diet	HbA1c	Haemoglobin genotype	Anthropometry	Biomarker questionnaire	Plasma glucose	Haemoglobin (Anaemia)	Helminth	H. pylori	Malaria
		Sampled	209	0	0	0	209	209	0	209	0	209	209
	Adolescent girls	**Response Rate**	**77.5**				**76.6**	**75.6**		**76.6**		**75.6**	**76.1**
		Respondents	979	944	880	887	908	911	869	876	773	878	877
		Sampled	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024
	WRA	**Response Rate**	**95.6**	**92.2**	**85.9**	**86.6**	**88.7**	**89.0**	**84.9**	**85.5**	**75.5**	**85.7**	**85.6**
		Respondents	201	192	0	0	177	154	0	169	151	169	170
		Sampled	217	217	0	0	217	217	0	217	217	217	217
	Pregnant	**Response Rate**	**92.6**	**88.5**			**81.6**	**71.0**		**77.9**	**69.6**	**77.9**	**78.3**
		Respondents	2327	2052	880	1716	2150	2131	869	2044	1669	2043	2049
		Sampled	2472	2263	1024	2046	2472	2472	1024	2472	2263	2472	2472
	Total	**Response Rate**	**94.1**	**90.7**	**85.9**	**83.9**	**87.0**	**86.2**	**84.9**	**82.7**	**73.8**	**82.6**	**82.9**
		Respondents	751	731	0	678	716	716	0	691	673	692	692
		Sampled	809	809	0	809	809	809	0	809	809	809	809
	C6-59M	**Response Rate**	**92.8**	**90.4**		**83.8**	**88.5**	**88.5**		**85.4**	**83.2**	**85.5**	**85.5**
		Respondents	173	0	0	0	173	171	0	171	0	170	171
		Sampled	210	0	0	0	210	210	0	210	0	210	210
	Adolescent girls	**Response Rate**	**82.4**				**82.4**	**81.4**		**81.4**		**81.0**	**81.4**
		Respondents	914	855	845	859	871	871	861	871	837	870	870
		Sampled	1045	1045	1045	1045	1045	1045	1045	1045	1045	1045	1045
	WRA	**Response Rate**	**87.5**	**81.8**	**80.9**	**82.2**	**83.3**	**83.3**	**82.4**	**83.3**	**80.1**	**83.3**	**83.3**
		Respondents	144	140	0	0	138	128	0	138	132	138	138
		Sampled	154	154	0	0	154	154	0	154	154	154	154
	Pregnant	**Response Rate**	**93.5**	**90.9**			**89.6**	**83.1**		**89.6**	**85.7**	**89.6**	**89.6**
		Respondents	1982	1726	845	1537	1898	1886	861	1871	1642	1870	1871
		Sampled	2218	2008	1045	1854	2218	2218	1045	2218	2008	2218	2218
SE	Total	**Response Rate**	**89.4**	**86.0**	**80.9**	**82.9**	**85.6**	**85.0**	**82.4**	**84.4**	**81.8**	**84.3**	**84.4**
		Respondents	876	854	0	789	833	834	0	812	760	811	811
		Sampled	954	954	0	954	954	954	0	954	954	954	954
	C6-59M	**Response Rate**	**91.8**	**89.5**		**82.7**	**87.3**	**87.4**		**85.1**	**79.7**	**85.0**	**85.0**
		Respondents	180	0	0	0	180	180	0	179	0	174	179
		Sampled	208	0	0	0	208	208	0	208	0	208	208
	Adolescent girls	**Response Rate**	**86.5**				**86.5**	**86.5**		**86.1**		**83.7**	**86.1**
		Respondents	907	888	841	844	861	866	858	860	808	860	858
		Sampled	1046	1046	1046	1046	1046	1046	1046	1046	1046	1046	1046
	WRA	**Response Rate**	**86.7**	**84.9**	**80.4**	**80.7**	**82.3**	**82.8**	**82.0**	**82.2**	**77.2**	**82.2**	**82.0**
SS	Pregnant	Respondents	169	167	0	0	161	142	0	161	149	161	160

Zone	Target Groups	Total Sampled/ Final Respondent	Response to at least 1 Module	Response to Specific Modules									
			OVERALL[1]	Diet	HbA1c	Haemoglobin genotype	Anthropometry	Biomarker questionnaire	Plasma glucose	Haemoglobin (Anaemia)	Helminth	H. pylori	Malaria
	Pregnant	Sampled	194	194	0	0	194	194	0	194	194	194	194
		Response Rate	**87.1**	**86.1**			**83.0**	**73.2**		**83.0**	**76.8**	**83.0**	**82.5**
	Total	Respondents	2132	1909	841	1633	2035	2022	858	2012	1717	2006	2008
		Sampled	2402	2194	1046	2000	2402	2402	1046	2402	2194	2402	2402
		Response Rate	**88.8**	**87.0**	**80.4**	**81.7**	**84.7**	**84.2**	**82.0**	**83.8**	**78.3**	**83.5**	**83.6**
SW	C6-59M	Respondents	901	884	0	770	854	860	0	808	593	806	808
		Sampled	983	983	0	983	983	983	0	983	983	983	983
		Response Rate	**91.7**	**89.9**		**78.3**	**86.9**	**87.5**		**82.2**	**60.3**	**82.0**	**82.2**
	Adolescent girls	Respondents	176	0	0	0	175	176	0	174	0	171	173
		Sampled	207	0	0	0	207	207	0	207	0	207	207
		Response Rate	**85.0**				**84.5**	**85.0**		**84.1**		**82.6**	**83.6**
	WRA	Respondents	920	907	864	875	899	898	877	879	672	877	879
		Sampled	1068	1068	1068	1068	1068	1068	1068	1068	1068	1068	1068
		Response Rate	**86.1**	**84.9**	**80.9**	**81.9**	**84.2**	**84.1**	**82.1**	**82.3**	**62.9**	**82.1**	**82.3**
	Pregnant	Respondents	168	165	0	0	165	152	0	162	109	162	162
		Sampled	193	193	0	0	193	193	0	193	193	193	193
		Response Rate	**87.0**	**85.5**			**85.5**	**78.8**		**83.9**	**56.5**	**83.9**	**83.9**
	Total	Respondents	2165	1956	864	1645	2093	2086	877	2023	1374	2016	2022
		Sampled	2451	2244	1068	2051	2451	2451	1068	2451	2244	2451	2451
		Response Rate	**88.3**	**87.2**	**80.9**	**80.2**	**85.4**	**85.1**	**82.1**	**82.5**	**61.2**	**82.3**	**82.5**

[1] Overall Sampled is the total number selected for the survey; Overall Respondents is total number that responded to at least one of the modules; and Overall Response Rate is the percentage of the sampled respondents that answered to at least one module (that did not refuse to participate at all levels).

Table 5. Response Rates by Age Group and Zone

	Geo-political Zone						
Age group	**NC**	**NE**	**NW**	**SE**	**SS**	**SW**	**All Zones**
6 to 11 months	90.3	93.3	95.6	81.6	95.2	89.7	**91.4**
12 to 23 months	91.4	96.0	96.7	94.6	89.8	90.1	**93.1**
24 to 59 months	90.9	94.1	96.4	93.8	91.9	92.6	**93.3**
10 to 14 years	84.0	89.3	77.5	82.4	86.5	85.0	**84.0**
15 to 24 years	90.5	95.1	96.0	84.7	84.5	83.7	**89.4**
25 to 34 years	90.7	94.3	96.3	89.0	86.8	87.5	**90.7**
35 to 49 years	90.4	95.8	92.3	91.1	89.2	87.4	**90.7**
All Ages	**90.2**	**94.3**	**94.1**	**89.4**	**88.8**	**88.3**	**90.8**

Annex 8. Operational definitions of IYCF indicators.

WHO Indicators[1]	Definition	WHO age group for indicator	NFCMS Age group	Data collection tool
Breastfeeding indicators				
Ever breastfed	Percentage of children born in the last 24 months who were ever breastfed	Children born in the last 24 months	Children 6-23 months of age	Diet questionnaire
Early initiation of breastfeeding	Percentage of children born in the last 24 months who were put to the breast within one hour of birth	Children born in the last 24 months	Not within the scope of this survey	
Exclusively breastfed for the first two days after birth	Percentage of children born in the last 24 months who were fed exclusively with breast milk for the first two days after birth	Children born in the last 24 months	Not within the scope of this survey	
Exclusive breastfeeding under six months	Percentage of infants (0-5 months old) who were fed exclusively with breast milk during the previous day	Infants 0-5 months of age	Not within the scope of this survey	
Mixed milk feeding under six months	Percentage of infants 0–5 months old who were fed formula and/or animal milk in addition to breast milk during the previous day	Infants 0-5 months of age	Not within the scope of this survey	
Continued breastfeeding 12-23 months	Percentage of children (aged 12–23 months) who were fed breast milk during the previous day	Children 12-23 months of age (12-15, 16-19 and 20-23 months)	Children 12-23 months of age	Diet questionnaire
Complementary feeding indicators				
Introduction of solid, semisolid or soft foods 6-8 months	Percentage of infants (aged 6-8 months) who consumed solid, semi-solid or soft foods during the previous day	Infants 6-8 months of age	Children 6-8 months of age (if sample size allows)	24-hour recall data
Minimum dietary diversity 6-23 months	Percentage of children (aged 6-23 months) who consumed foods and beverages from at least five out of eight defined food groups during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Minimum meal frequency 6-23 months	Percentage of children (aged 6-23 months) who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Minimum milk feeding frequency for non-breastfed children 6-23 months	Percentage of non-breastfed children (aged 6-23 months) who consumed at least two milk feeds during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Minimum acceptable diet 6-23 months	Percentage of children (aged 6-23 months) who consumed a minimum acceptable diet during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	24-hour recall data
Egg and/or flesh food consumption 6-23 months	Percentage of children (aged 6-23 months) who consumed egg and/or flesh food during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 & 24-59 months of age	24-hour recall data
6-23 months	sentinel unhealthy foods during the previous day	age (6-11, 12-17 and 18-23 months)	59 months of age	
Zero vegetable or fruit consumption 6-23 months	Percentage of children (aged 6-23 months) who did not consume any vegetables or fruits during the previous day	Children 6-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 & 24-59 months of age	24-hour recall data
Other indicators				
Bottle feeding 0-23 months	Percentage of children (aged 0-23 months) who were fed from a bottle with a nipple during the previous day	Children 0-23 months of age (6-11, 12-17 and 18-23 months)	Children 6-23 months of age	Diet questionnaire

[1]Taken from: Indicators for assessing infant and young child feeding practices: definitions and measurement methods. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2021. Licence: CC BYNC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo.

Annex 9. Mean and percentage contribution of top foods and ingredients to total energy intake of non-pregnant women and children.

ENERGY (kcal)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm olein	218.4	11.6	Palm_olein	70.8	10.6	Palm olein	152.7	12.7
2	Rice	199.7	10.6	Rice	62.8	9.4	Rice	127.7	10.6
3	Palm oil	145.1	7.7	Maize products	47.1	7.1	Palm oil	88.3	7.3
4	Maize products	111.2	5.9	Palm oil	43.7	6.6	Maize products	71.8	6.0
5	Garri	88.4	4.7	Sugar	22.8	3.4	Garri	44.7	3.7
6	*Maize flour	60.5	3.2	Millet products	22.6	3.4	*Maize flour	42.1	3.5
7	Bread	58.9	3.1	Biscuit	20.2	3.0	*Sorghum flour	32.4	2.7
8	*Sorghum flour	51.5	2.7	Sorghum products	20.1	3.0	Bread	32.3	2.7
9	*Condiments	41.3	2.2	*Maize flour	20.0	3.0	Biscuit	32.0	2.7
10	Spaghetti	39.9	2.1	*Sorghum flour	18.6	2.8	Millet products	32.0	2.7

*Derived from the ingredient list of reported recipes

Annex 10. Mean and percentage contribution of top foods and ingredients to total energy intake of non-pregnant women by geopolitical zone

ENERGY (kcal) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	206.6	12.5	Palm olein	266.8	15.1	Palm olein	320.8	16.1
2	Palm olein	194.4	11.7	*Maize flour	177.7	10.1	Maize products	201.1	10.1
3	Maize products	168.9	10.2	Rice	165.1	9.3	Rice	170.9	8.6
4	Palm oil	139.0	8.4	*Sorghum flour	109.8	6.2	Millet products	104.1	5.2
5	Sorghum products	55.5	3.3	Maize products	99.7	5.6	Fura da nono	94.6	4.7
6	Bread	43.3	2.6	Palm oil	97.9	5.5	*Sorghum flour	92.6	4.6
7	Sugar	40.5	2.4	*Condiments	56.1	3.2	*Maize flour	86.1	4.3
8	Rice products	38.7	2.3	Sugar	52.6	3.0	Palm oil	73.4	3.7
9	Cowpea products	35.4	2.1	Spaghetti	49.9	2.8	Sorghum products	67.0	3.4
10	Beef	35.3	2.1	Maize grains grits	45.5	2.6	Spaghetti	62.4	3.1

*Derived from the ingredient list of reported recipes

Annex 10 cont. Mean and percentage contribution of top foods and ingredients to total energy intake of non-pregnant women by geopolitical zone

ENERGY (kcal) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	241.1	11.8	Garri	305.6	15.4	Rice	247.1	13.4
2	Palm oil	220.6	10.8	Palm oil	240.8	12.2	Palm oil	212.8	11.5
3	Garri	210.5	10.3	Rice	218.6	11.0	Garri	130.9	7.1
4	Palm olein	143.3	7.0	Palm olein	116.4	5.9	Palm olein	126.3	6.8
5	*Cassava flour	101.4	5.0	Bread	94.4	4.8	Bread	117.0	6.3
6	Bread	88.5	4.3	*Cassava flour	88.4	4.5	*Cassava flour	61.2	3.3
7	Banga	87.5	4.3	Banga	78.2	4.0	Cowpea products	53.0	2.9
8	White yam tuber	58.4	2.9	Beef	68.9	3.5	Cowpea	51.6	2.8
9	Beef	54.1	2.7	White yam tuber	55.6	2.8	Soft drinks	50.1	2.7
10	Cowpea	42.3	2.1	Cowpea	45.1	2.3	Semo swallow	49.8	2.7

*Derived from the ingredient list of reported recipes

Annex 11. Mean and percentage contribution of top foods and ingredients to total protein intake of non-pregnant women and children

PROTEIN (g)									
Women (15-49 years)				Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	4.4	9.3	Rice	1.4	8.5	Rice	2.8	9.8
2	Maize products	2.7	5.6	Maize products	1.1	6.7	Maize products	1.7	6.0
3	Cowpea	2.3	4.7	Cowpea products	0.8	4.6	Cowpea	1.5	5.0
4	Beef	2.2	4.7	Soybean products	0.7	4.1	*Maize flour	1.2	4.2
5	Cowpea products	2.1	4.3	Cowpea	0.7	4.1	Cowpea products	1.2	4.1
6	Bread	2.1	4.3	Powdered milk	0.6	3.9	*Condiments	1.2	4.1
7	*Condiments	1.8	3.7	Fura da nono	0.6	3.8	Bread	1.1	3.9
8	*Maize flour	1.7	3.6	*Condiments	0.6	3.6	Spaghetti	1.0	3.6
9	Spaghetti	1.4	3.0	Sorghum products	0.6	3.5	Fura da nono	1.0	3.5
10	Mackerel(fish)	1.4	2.9	*Maize flour	0.6	3.5	Beef	1.0	3.4

*Derived from the ingredient list of reported recipes

Annex 12. Mean and percentage contribution of top foods and ingredients to total protein intake of non-pregnant women by geopolitical zone

Protein (g) of Women aged 15-49 years									
North Central				North East			North West		
SN	Rice	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	4.6	11.0	*Maize flour	5.0	11.7	Maize products	5.0	10.2
2	Maize products	4.1	9.8	Rice	3.6	8.4	Rice	3.8	7.9
3	Cowpea products	2.4	5.7	*Sorghum flour	2.9	6.7	Fura da nono	3.5	7.1
4	Beef	2.3	5.4	Maize products	2.5	5.7	Groundnut products	2.7	5.6
5	Cowpea	2.0	4.7	*Condiments	2.3	5.3	Millet products	2.7	5.6
6	*Condiments	1.6	3.8	Spaghetti	1.8	4.2	*Maize flour	2.5	5.2
7	Sorghum products	1.5	3.7	Cowpea	1.6	3.7	*Sorghum flour	2.4	4.9
8	Bread	1.5	3.6	Groundnut	1.5	3.6	*Condiments	2.4	4.8
9	Catfish	1.2	3.0	Beef	1.4	3.3	Soybean products	2.3	4.7
10	Tilapia fish	1.2	2.8	Cowpea products	1.3	3.1	Spaghetti	2.2	4.6

*Derived from the ingredient list of reported recipes

Annex 12 cont. Mean and percentage contribution of top foods and ingredients to total protein intake of non-pregnant women by geopolitical zone

Protein (g) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	5.4	10.6	Rice	4.9	9.8	Rice	5.4	10.0
2	Beef	3.6	7.1	Beef	4.5	9.0	Hake fish	4.5	8.3
3	Bread	3.1	6.1	Bread	3.3	6.6	Bread	4.1	7.6
4	Cowpea	3.0	6.0	Cowpea	3.3	6.5	Cowpea	3.7	7.0
5	Shellfish	2.9	5.8	Mackerel fish	3.2	6.3	Cowpea products	3.6	6.8
6	Mackerel fish	2.6	5.0	Catfish	2.9	5.8	Beef	2.9	5.5
7	Cowpea products	2.1	4.2	Shellfish	2.8	5.6	Sardine fish	2.9	5.4
8	Chicken	1.4	2.8	Cowpea products	1.5	2.9	Mackerel fish	2.6	4.9
9	Groundnut	1.4	2.7	Tilapia fish	1.4	2.7	Semo swallow	1.6	3.1
10	Stockfish fish	1.3	2.6	Melon seeds	1.3	2.7	Chicken eggs	1.4	2.5

Annex 13. Contribution of macronutrients to total usual energy intake for non-pregnant women and children 24-59 months.

Contribution of macronutrients to total usual energy intake among non-pregnant women

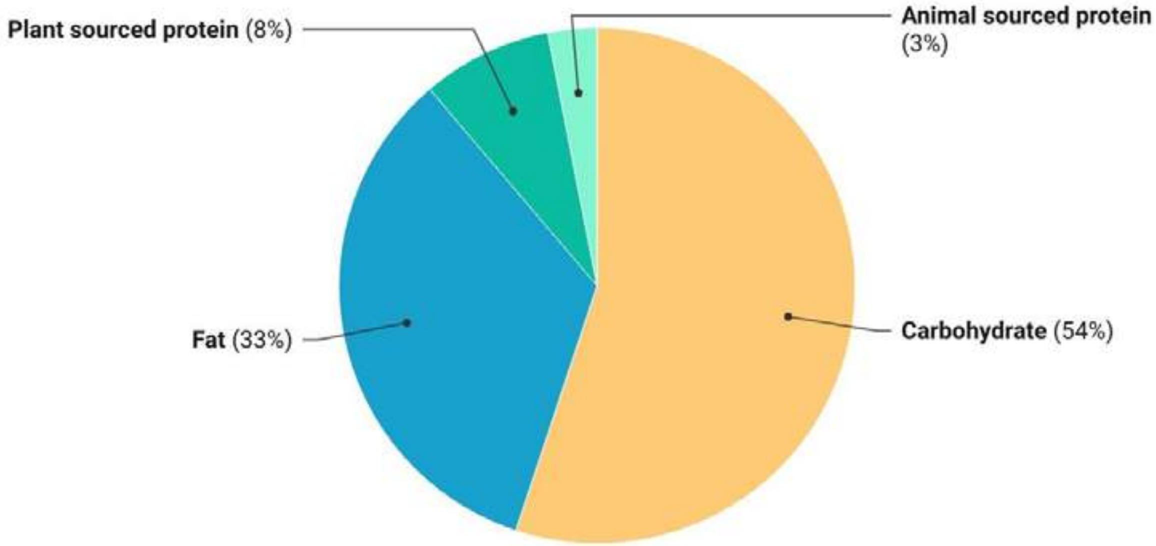


Chart: Sample weights were applied to account for survey design and non-response. • Created with Datawrapper

Contribution of macronutrients to total usual energy intake among children aged 24-59 mo

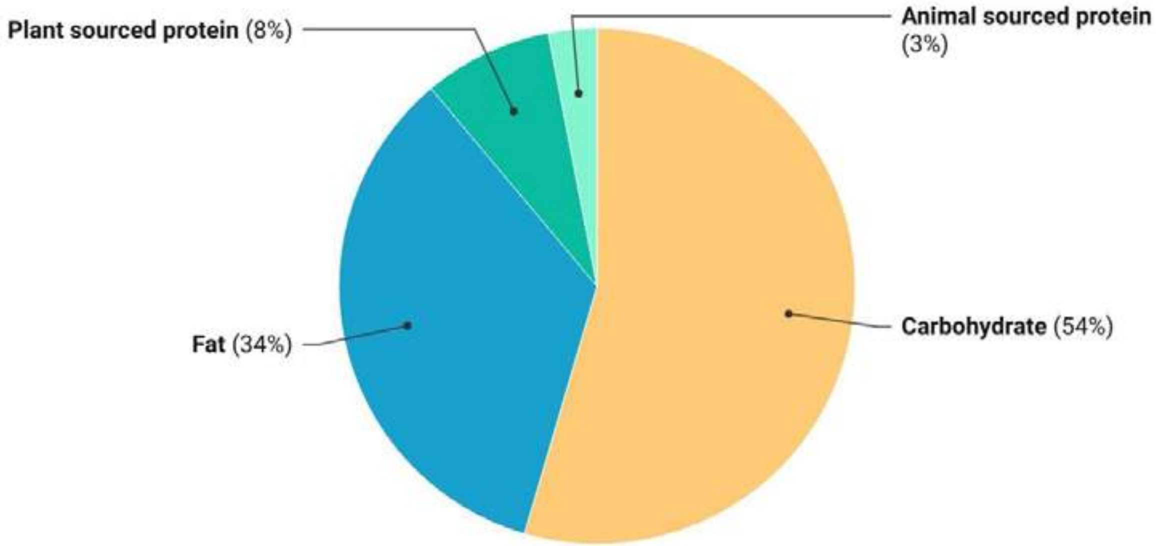


Chart: Sample weights were applied to account for survey design and non-response. • Created with Datawrapper

Annex 14. Mean and percentage contribution of top foods and ingredients to total fat intake of non-pregnant women and children

FAT (g)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm olein	24.3	35.1	Palm olein	7.9	32.4	Palm olein	17.0	37.4
2	Palm oil	16.0	23.2	Palm oil	4.8	19.9	Palm oil	9.8	21.5
3	Other vegetable oils	2.7	4.0	Other vegetable oils	1.1	4.6	Other vegetable oils	1.7	3.8
4	Beef	2.7	3.9	Biscuit	0.9	3.6	Biscuit	1.4	3.1
5	Groundnut	2.1	3.0	Powdered milk	0.7	3.1	Beef	1.2	2.8
6	Banga	1.8	2.6	Soybean products	0.7	3.0	Groundnut	1.2	2.6
7	Melon seeds	1.4	2.0	Groundnut	0.6	2.5	Banga	1.1	2.3
8	Soybean products	1.0	1.5	Millet products	0.5	1.9	Soybean products	0.8	1.7
9	Rice	1.0	1.4	Beef	0.5	1.9	Melon seeds	0.7	1.6
10	Fish (Mackerel)	1.0	1.4	Fura da nono	0.4	1.6	Millet products	0.7	1.5

Annex 15. Mean and percentage contribution of top foods and ingredients to total fat intake of non-pregnant women by geopolitical zone

Fat (g) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm olein	21.6	37.0	Palm olein	29.6	45.4	Palm olein	35.6	48.6
2	Palm oil	15.4	26.3	Palm oil	10.8	16.6	Palm oil	8.1	11.1
3	Beef	2.9	5.0	Other vegetable oils	3.6	5.5	Other vegetable oils	6.2	8.5
4	Melon seeds	1.7	2.9	Groundnut	3.2	4.8	Soybean products	2.4	3.3
5	Maize products	1.4	2.4	*Maize flour	2.0	3.1	Millet products	2.2	2.9
6	Groundnut	1.3	2.2	Beef	1.7	2.6	Fura da nono	2.1	2.9
7	Rice	1.2	2.0	Groundnut products	1.2	1.8	Maize products	1.8	2.5
8	Other vegetable oils	0.9	1.6	Soybean products	1.0	1.5	Groundnut	1.7	2.4
9	Margarine	0.7	1.2	*Sorghum flour	1.0	1.5	Beef	1.1	1.5
10	Soybean oil	0.7	1.2	*Condiments	0.9	1.4	Groundnut products	1.0	1.4

*Derived from the ingredient list of reported recipes

Annex 15 cont. Mean and percentage contribution of top foods and ingredients to total fat intake of non-pregnant women by geopolitical zone

Fat (g) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm oil	24.4	30.9	Palm oil	26.6	35.0	Palm oil	23.5	36.5
2	Palm olein	15.9	20.2	Palm olein	12.9	17.0	Palm olein	14.0	21.8
3	Banga	8.6	10.9	Banga	7.7	10.1	Beef	3.2	4.9
4	Beef	4.4	5.6	Beef	5.6	7.3	Melon seeds	2.8	4.3
5	Melon seeds	2.9	3.7	Melon seeds	3.0	3.9	Mackerel fish	1.9	2.9
6	Groundnut	2.7	3.5	Groundnut	2.7	3.5	Bread	1.7	2.7
7	Mackerel fish	1.8	2.3	Mackerel fish	2.1	2.8	Hake fish	1.6	2.6
8	Margarine	1.3	1.7	Bread	1.4	1.8	Groundnut	1.5	2.3
9	Nut other than groundnuts	1.3	1.7	Rice	1.1	1.5	Chicken eggs	1.2	1.8
10	Bread	1.3	1.7	Chicken eggs	0.9	1.2	Margarine	1.0	1.6

Annex 16. Mean and percentage contribution of top foods and ingredients to total carbohydrate intake of non-pregnant women and children

CARBOHYDRATE (g)									
Women (15-49 years)				Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	42.9	16.8	Rice	13.5	14.7	Rice	27.5	16.9
2	Maize products	22.0	8.6	Maize products	9.5	10.4	Maize products	14.2	8.7
3	Garri	20.6	8.1	Sugar	5.7	6.2	Garri	10.4	6.4
4	*Maize flour	11.3	4.4	Millet products	4.0	4.4	*Maize flour	7.9	4.9
5	Bread	10.7	4.2	Garri	4.0	4.3	Sugar	7.3	4.5
6	*Sorghum flour	10.1	4.0	Sorghum products	3.9	4.2	*Sorghum flour	6.3	3.9
7	Sugar	9.7	3.8	*Maize flour	3.8	4.1	Bread	5.9	3.6
8	Spaghetti	8.0	3.1	*Sorghum flour	3.7	4.0	Spaghetti	5.8	3.6
9	Sorghum products	7.1	2.8	Biscuit	2.7	3.0	Millet products	5.6	3.5
10	Cassava flour products	7.0	2.7	Fura da nono	2.7	2.9	Sorghum products	5.5	3.4

Annex 17. Mean and percentage contribution of top foods and ingredients to total carbohydrate intake of non-pregnant women by geopolitical zone

Carbohydrate (g) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	44.2	19.2	Rice	35.3	14.7	Maize products	39.3	14.4
2	Maize products	33.3	14.5	*Maize flour	32.6	13.6	Rice	36.5	13.4
3	Sorghum products	10.8	4.7	*Sorghum flour	21.7	9.1	*Sorghum flour	18.0	6.6
4	Sugar	10.1	4.4	Maize products	19.5	8.2	Millet products	17.9	6.6
5	Rice products	8.4	3.6	Sugar	13.1	5.5	*Maize flour	16.5	6.0
6	Bread	7.8	3.4	Spaghetti	10.0	4.2	Fura da nono	14.6	5.4
7	Cassava flour and products	7.7	3.4	Maize grains grits	9.6	4.0	Sugar	13.7	5.0
8	White yam products	7.6	3.3	*Condiments	9.1	3.8	Sorghum products	13.1	4.8
9	Cassava starch flour	6.6	2.9	Sorghum products	8.0	3.3	Spaghetti	12.5	4.6
10	*Sorghum flour	6.3	2.8	Millet flour	6.2	2.6	*Condiments	9.4	3.4

Annex 17 cont. Mean and percentage contribution of top foods and ingredients to total carbohydrate intake of non-pregnant women by geopolitical zone

Carbohydrate (g) of Women aged 15-49 years									
South East				South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	51.8	19.4	Garri	71.3	27.3	Rice	53.8	21.3
2	Garri	49.1	18.3	Rice	46.8	17.9	Garri	30.5	12.1
3	Cassava flour and products	24.6	9.2	Cassava flour and products	21.2	8.1	Bread	21.2	8.4
4	Bread	16.0	6.0	Bread	17.1	6.6	Cassava starch flour	14.3	5.7
5	White yam tuber	12.3	4.6	White yam tuber	11.7	4.5	Soft drinks	12.2	4.8
6	Soft drinks	8.7	3.2	Soft drinks	10.3	3.9	White yam products	10.0	4.0
7	Cassava tuber	7.1	2.7	Plaintain	7.7	2.9	Semo swallow	9.8	3.9
8	Cowpea	6.2	2.3	Cowpea	6.5	2.5	Maize products	8.6	3.4
9	Sugar	5.4	2.0	Noodles	4.8	1.8	Cowpea products	8.0	3.2
10	Noodles	5.3	2.0	*Condiments	4.7	1.8	Cowpea	7.5	3.0

*Derived from the ingredient list of reported recipes

Annex 18. Mean and percentage contribution of top foods and ingredients to total Calcium intake of non-pregnant women and children

CALCIUM (mg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Bread	36.2	7.6	Powdered milk	22.2	11.1	Bread	25.0	8.2
2	*Condiments	33.6	7.1	Fura da nono	14.9	7.5	Fura da nono	23.8	7.7
3	Shellfish	27.1	5.7	Soybean products	13.5	6.8	*Condiments	23.6	7.7
4	Fura da nono	25.2	5.3	*Condiments	11.6	5.8	Baobab powder_	20.9	6.8
5	Baobab powder_	18.7	3.9	Baobab powder	10.4	5.2	Shellfish	18.2	5.9
6	Soybean products	18.2	3.8	Bread	9.8	4.9	Powdered milk	14.8	4.8
7	Garri	16.6	3.5	Cocoa	9.7	4.9	Soybean products	14.5	4.7
8	Rice	14.6	3.1	Infant cereal	9.6	4.8	Cocoa	12.0	3.9
9	Powdered milk	13.7	2.9	Shellfish	7.8	3.9	Rice	10.7	3.5
10	Catfish	11.7	2.5	Infant formula	6.1	3.0	Garri	8.7	2.8

*Derived from the ingredient list of reported recipes

Annex 19. Mean and percentage contribution of top foods and ingredients to total calcium intake of non-pregnant women by geopolitical zone

Calcium (g) of Women aged 15-49 years									
North Central				North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Bread	33.6	8.8	*Condiments	47.3	13.0	Fura da nono	81.8	18.1
2	*Condiments	28.9	7.6	Dried baobab powder	46.5	12.8	Condiment	52.1	11.5
3	Shellfish	23.7	6.2	Bread	21.5	5.9	Dried baobab powder_	51.5	11.4
4	Rice	19.5	5.1	Soybean products	17.8	4.9	Soybean products	45.2	10.0
5	Catfish	17.0	4.5	Fura da nono	14.2	3.9	Bread	21.4	4.7
6	Powdered cow milk	16.4	4.3	Rice	13.7	3.8	Rice	15.1	3.3
7	Cowpea products	13.0	3.4	Pepper	12.8	3.5	Amaranthus green leaves	14.4	3.2
8	Cocoa	12.3	3.2	Okro	11.6	3.2	Pepper	11.6	2.6
9	Okro	12.3	3.2	Powdered cow milk	10.7	3.0	Okro	10.7	2.4
10	Amaranthus green leaves	12.3	3.2	*Maize flour	10.2	2.8	Powdered cow milk	9.8	2.2

*Derived from the ingredient list of reported recipes

Annex 19 cont. Mean and percentage contribution of top foods and ingredients to total calcium intake of non-pregnant women by geopolitical zone

Calcium (g) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Shellfish	116.6	19.4	Shellfish	112.0	18.8	Bread	91.1	16.4
2	Bread	68.5	11.4	Bread	73.2	12.3	Hake fish	58.0	10.5
3	Fluted pumpkin leaves	45.8	7.6	Garri	57.9	9.7	Garri	31.8	5.7
4	Garri	44.3	7.4	Catfish	32.9	5.5	Jute mallow leaves	29.6	5.3
5	*Condiments	25.3	4.2	Fluted pumpkin leaves	30.5	5.1	Cocoa	26.1	4.7
6	Powdered cow milk	21.6	3.6	Powdered cow milk	21.5	3.6	Shellfish	25.3	4.6
7	Rice	19.6	3.3	Rice	18.3	3.1	*Condiments	23.0	4.2
8	Cocoa	17.9	3.0	*Condiments	17.8	3.0	Liquid cow milk	19.2	3.5
9	Water	16.0	2.7	Cocoa	15.8	2.6	Cowpea products	18.0	3.3
10	Cassava flour and products	12.3	2.0	Water	13.0	2.2	Rice	16.8	3.0

*Derived from the ingredient list of reported recipes

Annex 20. Mean and percentage contribution of top foods and ingredients to total Iron intake of non-pregnant women and children

IRON (mg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	*Condiments	2.6	15.4	*Condiments	0.9	13.6	*Condiments	1.8	16.4
2	Millet products	1.2	7.3	Millet products	0.8	12.6	Millet products	1.1	10.1
3	Rice	1.0	5.9	Breakfast cereal	0.4	6.7	Maize products	0.6	5.8
4	Maize products	1.0	5.7	Maize products	0.4	5.6	Rice	0.6	5.8
5	Pepper	0.7	4.5	Rice	0.3	4.7	Pepper	0.5	4.5
6	Garri	0.7	4.3	Sorghum products	0.2	3.9	Sorghum products	0.4	3.5
7	Bread	0.7	3.9	Pepper	0.2	3.4	Tomato	0.4	3.4
8	Cowpea	0.6	3.4	Cocoa	0.2	3.1	Cowpea	0.4	3.3
9	Tomato	0.5	3.3	Soybean products	0.2	2.9	Bread	0.4	3.3
10	Sorghum products	0.5	3.0	Infant cereal	0.2	2.8	Garri	0.4	3.3

*Derived from the ingredient list of reported recipes

Annex 21. Mean and percentage contribution of top foods and ingredients to total iron intake of non-pregnant women by geopolitical zone

Iron (g) of Women aged 15-49 years									
North Central				North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	*Condiments	1.9	13.5	*Condiments	4.1	24.2	*Condiments	4.3	21.7
2	Maize products	1.4	10.0	*Maize flour	1.4	8.2	Millet products	3.2	16.2
3	Rice	0.9	6.3	Maize products	0.9	5.3	Maize products	2.0	9.8
4	Sorghum products	0.7	5.1	Pepper	0.9	5.3	Sorghum products	0.9	4.8
5	Tomato	0.7	4.8	Millet products	0.8	5.1	Pepper	0.9	4.4
6	Millet products	0.7	4.7	*Sorghum flour	0.8	5.0	*Sorghum flour	0.8	4.0
7	Pepper	0.6	4.5	Rice	0.8	4.9	Rice	0.8	3.9
8	Cowpea	0.5	3.5	Sorghum products	0.6	3.3	Soybean products	0.6	3.0
9	Bread	0.5	3.4	Dried baobab powder	0.5	3.1	Dried baobab powder	0.6	2.9
10	Rice products	0.4	3.0	Tomato	0.5	2.8	Tomato	0.5	2.5

*Derived from the ingredient list of reported recipes

Annex 21 cont. Mean and percentage contribution of top foods and ingredients to total iron intake of non-pregnant women by geopolitical zone

Iron (g) of Women aged 15-49 years									
South East				South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Garri	1.8	11.7	Garri	2.5	17.1	Rice	1.4	9.7
2	*Condiments	1.3	8.1	Shellfish	1.1	7.5	Bread	1.3	8.7
3	Rice	1.2	7.6	Rice	1.0	7.0	Garri	1.1	7.1
4	Shellfish	1.2	7.3	Bread	1.0	7.0	Cowpea	0.9	6.2
5	Bread	1.0	6.2	Cowpea	0.8	5.4	Pepper	0.8	5.5
6	Banga	0.8	5.1	Banga	0.7	4.9	Tomato	0.8	5.1
7	Cassava flour and products	0.8	5.0	Cassava flour and products	0.7	4.7	*Condiments	0.7	4.9
8	Cowpea	0.8	4.8	*Condiments	0.5	3.7	Jute mallow leaves	0.7	4.6
9	Melon seeds	0.5	3.0	Pepper	0.5	3.2	Cow skin	0.6	4.1
10	Tomato	0.5	2.9	Melon seeds	0.5	3.1	Cowpea products	0.6	4.0

*Derived from the ingredient list of reported recipes

Annex 22. Mean and percentage contribution of top foods and ingredients to total Zinc intake of non-pregnant women and children.

ZINC (mg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Garri	1.0	12.1	Maize products	0.3	9.9	Rice	0.6	11.5
2	Rice	0.9	10.5	Rice	0.3	9.7	Garri	0.5	9.4
3	Maize products	0.7	7.9	Garri	0.2	7.0	Maize products	0.4	8.5
4	Beef	0.4	4.5	Breakfast cereal	0.2	6.3	Millet products	0.3	5.0
5	Millet products	0.4	4.1	Millet products	0.2	5.4	Cowpea	0.2	4.3
6	Cowpea	0.3	3.9	Sorghum products	0.1	3.6	*Maize flour	0.2	3.4
7	Rice products	0.3	3.7	Cowpea	0.1	3.4	Beef	0.2	3.4
8	*Maize flour	0.3	3.1	Cowpea products	0.1	2.9	Sorghum products	0.1	2.9
9	Cowpea products	0.2	2.6	*Maize flour	0.1	2.8	Rice products	0.1	2.8
10	*Sorghum flour	0.2	2.3	Powdered milk	0.1	2.7	Cowpea products	0.1	2.6

*Derived from the ingredient list of reported recipes

Annex 23. Mean and percentage contribution of top foods and ingredients to total zinc intake of non-pregnant women by geopolitical zone

Zinc (g) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Maize products	1.0	13.4	*Maize flour	1.0	14.3	Maize products	1.2	15.0
2	Rice	0.9	12.6	Rice	0.8	11.0	Millet products	1.0	12.5
3	Rice products	0.7	9.1	Maize products	0.6	8.2	Rice	0.8	9.4
4	Beef	0.4	5.5	Rice products	0.5	6.7	Rice products	0.5	5.8
5	Cowpea	0.3	4.0	*Sorghum flour	0.4	5.8	*Sorghum flour	0.4	4.8
6	Garri	0.3	3.9	Beef	0.3	3.9	Sorghum products	0.4	4.7
7	Sorghum products	0.3	3.6	Cowpea	0.2	3.4	Groundnut products	0.4	4.3
8	Cowpea products	0.3	3.5	Millet flour	0.2	2.9	*Maize flour	0.3	3.1
9	White yam products	0.2	3.1	Millet products	0.2	2.8	Soybean products	0.2	3.0
10	Bread	0.1	2.0	*Condiments	0.2	2.8	*Condiments herbs and spice	0.2	2.5

*Derived from the ingredient list of reported recipes

Annex 23 cont. Mean and percentage contribution of top foods and ingredients to total zinc intake of non-pregnant women by geopolitical zone

Zinc (g) of Women aged 15-49 years									
South East				South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Garri	2.7	26.6	Garri	3.3	30.3	Garri	3.3	30.3
2	Rice	1.1	10.7	Rice	1.0	9.1	Rice	1.0	9.1
3	Beef	0.6	6.0	Beef	0.8	7.2	Beef	0.8	7.2
4	Cowpea	0.5	4.4	Plantain	0.5	4.5	Plantain	0.5	4.5
5	Cow skin	0.4	3.9	Cowpea	0.5	4.4	Cowpea	0.5	4.4
6	Shellfish	0.3	3.1	Bread	0.3	2.8	Bread	0.3	2.8
7	Bread	0.3	2.9	Shellfish	0.3	2.8	Shellfish	0.3	2.8
8	Cassava tuber	0.3	2.6	Melon seeds	0.3	2.3	Melon seeds	0.3	2.3
9	*Cassava flour	0.3	2.6	*Cassava flour	0.2	2.1	*Cassava flour	0.2	2.1
10	Melon seeds	0.3	2.5	Cow skin	0.2	2.1	Cow skin	0.2	2.1

*Derived from the ingredient list of reported recipes

Annex 24. Mean and percentage contribution of top foods and ingredients to total Vitamin A intake of non-pregnant women and children

VITAMIN A (mcg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm oil	560.5	59.6	Palm oil	169.6	55.9	Palm oil	348.9	59.7
2	Banga	90.3	9.6	Palm olein	19.6	6.4	Banga	53.4	9.1
3	Palm olein	60.5	6.4	Sugar	17.6	5.8	Palm olein	42.2	7.2
4	Mango	31.5	3.3	Powdered milk	17.1	5.6	Sugar	22.7	3.9
5	Sugar	30.2	3.2	Banga	15.8	5.2	Mango	18.7	3.2
6	Pepper	23.9	2.5	Pepper	6.4	2.1	Pepper	14.5	2.5
7	Tomato	14.1	1.5	Mango	6.3	2.1	Powdered milk	9.8	1.7
8	Amaranthus leaves	11.7	1.2	Infant cereal	5.4	1.8	Tomato	9.5	1.6
9	Powdered milk	9.8	1.0	Tomato	4.4	1.5	Amaranthus leaves	7.4	1.3
10	Garri	9.0	1.0	Infant formula	4.2	1.4	Jute mallow leaves	4.5	0.8

Annex 25. Mean and percentage contribution of top foods and ingredients to total vitamin A intake of non-pregnant women by geopolitical zone

VITAMIN A (mcg) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm oil	490.4	64.7	Palm oil	418.8	60.3	Palm oil	337.1	51.8
2	Palm olein	53.3	7.0	Palm olein	73.1	10.5	Palm olein	88.3	13.6
3	Mango	32.0	4.2	Sugar	40.8	5.9	Sugar	42.4	6.5
4	Sugar	31.4	4.1	Mango	35.6	5.1	Mango	40.6	6.2
5	Tomato	18.7	2.5	Pepper	29.5	4.3	Pepper	32.4	5.0
6	Pepper	16.9	2.2	Amaranthus green leave	12.2	1.8	Amaranthus green leave	19.4	3.0
7	Amaranthus green leave	16.3	2.2	Tomato	12.0	1.7	Tomato	13.7	2.1
8	Carrot	12.7	1.7	Powdered cow milk	7.7	1.1	Fura da nono	12.4	1.9
9	Powdered cow milk	9.8	1.3	Kanaski leaves	5.2	0.7	Powdered cow milk	8.3	1.3
10	Margarine	8.4	1.1	Dried baobab powder	5.1	0.7	Carrot	6.9	1.1

Annex 25 cont. Mean and percentage contribution of top foods and ingredients to total Vitamin A intake of non-pregnant women by geopolitical zone

Fat (g) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Palm oil	817.4	51.8	Palm oil	906.6	57.2	Palm oil	760.3	72.5
2	Banga	431.4	27.3	Banga	384.9	24.3	Palm olein	36.4	3.5
3	Palm olein	42.1	2.7	Garri	43.3	2.7	Jute mallow leaves	27.4	2.6
4	Mango	38.8	2.5	Palm olein	32.0	2.0	Pepper	20.7	2.0
5	Garri	29.4	1.9	Waterleaf	31.3	2.0	Sugar	19.9	1.9
6	Carrot	22.0	1.4	Mango	25.2	1.6	Wheat products	18.8	1.8
7	Water leaf	17.0	1.1	Pepper	15.2	1.0	Tomato	17.0	1.6
8	Sugar	16.7	1.1	Powdered cow milk	12.4	0.8	Banga	14.1	1.3
9	Margarine	15.6	1.0	Chicken eggs	10.7	0.7	Chickeneggs	13.5	1.3
10	Pepper	14.4	0.9	Margarine	10.5	0.7	Mango	12.7	1.2

Annex 26. Mean and percentage contribution of top foods and ingredients to total Vitamin C intake of non-pregnant women and children

VITAMIN C (mg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Pepper	19.6	31.5	Pepper	6.2	2.0	Pepper	13.8	4.6
2	Tomato	12.6	20.3	Tomato	3.8	1.3	Tomato	8.4	2.8
3	Mango	5.5	8.8	Cocoa	1.3	0.4	Mango	3.2	1.1
4	Onion	2.8	4.6	Mango	1.1	0.4	Onion	1.9	0.6
5	White sweet potato	1.5	2.3	Onion	1.0	0.3	Cocoa	1.5	0.5
6	Cocoa	1.4	2.3	Infant formula	0.8	0.3	White sweet potato	1.4	0.5
7	White yam tuber	1.4	2.2	Fruit juice unspecified	0.7	0.2	Fruit juice unspecified	1.1	0.4
8	Fruit juice unspecified	1.3	2.1	White sweet potato	0.6	0.2	White yam tuber	0.7	0.2
9	Okro	1.2	1.9	Jute mallow leaves	0.5	0.2	Jute mallow leaves	0.7	0.2
10	Amaranthus leaves	1.1	1.8	Infant cereal	0.5	0.2	Amaranthus leaves	0.7	0.2

Annex 27. Mean and percentage contribution of top foods and ingredients to total Vitamin C intake of non-pregnant women by geopolitical zone

VITAMIN C (mg) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Pepper	19.6	30.3	Pepper	22.5	40.1	Pepper	19.8	34.6
2	Tomato	15.4	23.8	Tomato	10.8	19.2	Tomato	11.7	20.4
3	Mango	5.5	8.6	Mango	6.2	11.0	Mango	7.0	12.3
4	Onion	2.7	4.2	Onion	3.0	5.2	Onion	3.3	5.8
5	Orange	2.6	4.1	White sweet potato	1.6	2.9	White sweet potato	2.8	4.9
6	Okro	2.2	3.4	Fruit juice unspecified	1.5	2.6	Amaranthus green leave	1.9	3.3
7	White yam tuber	1.8	2.8	Amaranthus green leave	1.2	2.1	Fruit juice unspecified	1.2	2.1
8	Amaranthus green leave	1.6	2.4	Okro	1.0	1.8	Yellow sweet potato	1.2	2.1
9	Jute mallow leaves	1.6	2.4	White yam tuber	0.8	1.4	Cabbage	0.8	1.3
10	Cocoa	1.5	2.4	*Maize flour	0.7	1.2	Okro	0.7	1.3

Annex 27 cont. Mean and percentage contribution of top foods and ingredients to total Vitamin C intake of non-pregnant women by geopolitical zone

VITAMIN C (mg) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Tomato	10.5	15.0	Pepper	12.3	19.8	Pepper	26.6	37.3
2	Pepper	9.8	13.9	Tomato	8.7	14.0	Tomato	17.9	25.1
3	Mango	6.7	9.6	Mango	4.4	7.0	Jute mallow leaves	4.2	5.9
4	Guava	3.8	5.4	White yam tuber	3.5	5.6	Cocoa	2.9	4.1
5	White yam tuber	3.7	5.2	Pawpaw	3.2	5.1	Onion	2.5	3.5
6	Africanstar apple	3.6	5.1	Water leaf	2.8	4.5	Mango	2.2	3.1
7	Cassavaflour and product	2.9	4.1	Onion	2.5	4.1	Okro	1.2	1.7
8	Pawpaw	2.6	3.7	Cocoa	2.5	4.0	Fruit juice unspecified	1.1	1.5
9	Cocoa	2.4	3.5	Cassava flour and product	2.4	3.9	Water leaf	0.9	1.3
10	Onion	2.4	3.4	Plaintain	2.0	3.2	White yam tuber	0.9	1.3

Annex 28. Mean and percentage contribution of top foods and ingredients to total Vitamin B1 intake of non-pregnant women and children

VITAMIN B1 (mcg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Bread	0.11	12.99	Millet products	0.03	9.0	Bread	0.06	11.04
2	Maize products	0.07	8.09	Breakfast cereal	0.03	8.4	Maize products	0.04	8.06
3	Rice	0.06	7.64	Bread	0.02	7.2	Millet products	0.04	7.88
4	Millet products	0.05	6.25	Maize products	0.02	7.0	Rice	0.04	7.29
5	Pepper	0.05	5.45	Rice	0.02	6.6	Pepper	0.03	5.84
6	*Maize flour	0.03	4.00	Cocoa	0.02	5.7	Cocoa	0.02	4.17
7	Amaranthus leaves	0.03	3.08	Noodles	0.02	4.9	*Maize flour	0.02	4.04
8	Noodles	0.03	3.02	Pepper	0.01	4.3	Noodles	0.02	4.01
9	*Sorghum flour	0.03	2.96	*Maize flour	0.01	3.2	Sorghum products	0.02	3.31
10	Sorghum products	0.02	2.76	Sorghum products	0.01	3.1	Amaranthus leaves	0.02	3.02

Annex 29. Mean and percentage contribution of top foods and ingredients to total Vitamin B1 intake of non-pregnant women by geopolitical zone

VITAMIN B1 (mcg) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Maize products	0.11	14.49	*Maize flour	0.12	14.42	Millet products	0.15	16.12
2	Bread	0.08	10.57	Maize products	0.06	7.79	Maize products	0.13	14.29
3	Rice	0.07	9.14	Rice	0.06	7.55	Rice	0.06	6.74
4	Pepper	0.04	5.58	Pepper	0.06	6.77	Bread	0.05	5.70
5	Sorghum products	0.04	4.77	Gin	0.05	6.52	Pepper	0.05	5.38
6	Amaranthus green leaves	0.04	4.74	Bread	0.05	6.33	*Sorghum flour	0.05	5.25
7	Noodles	0.02	3.10	*Sorghum flour	0.05	5.88	Amaranthus green leaves	0.04	4.79
8	Cowpea products	0.02	3.04	Millet products	0.03	4.10	Sorghum products	0.04	4.39
9	Millet products	0.02	2.83	Sorghum products	0.03	3.92	*Maize flour	0.04	4.08
10	Cocoa	0.02	2.81	Amaranthus green leaves	0.03	3.33	Groundnut products	0.03	3.64

Annex 29 cont. Mean and percentage contribution of top foods and ingredients to total Vitamin B1 intake of non-pregnant women by geopolitical zone

VITAMIN B1 (mcg) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Bread	0.17	19.63	Bread	0.18	22.37	Bread	0.22	24.70
2	Rice	0.08	9.33	Rice	0.08	9.80	Pepper	0.06	6.83
3	Noodles	0.06	6.72	Noodles	0.05	6.93	Rice	0.05	5.98
4	African star apple	0.04	4.67	Garri	0.04	5.21	Cocoa	0.05	5.48
5	Cocoa	0.03	3.89	Cocoa	0.04	4.60	Semo swallow	0.04	4.22
6	Cowpea	0.03	3.17	Cowpea	0.03	3.53	Garri	0.04	4.12
7	*Cassava flour	0.03	3.13	Pepper	0.03	3.49	Cowpea products	0.03	3.90
8	White yam tuber	0.02	2.75	*Cassava flour	0.03	3.47	Noodles	0.03	3.88
9	Pepper	0.02	2.64	White yam tuber	0.02	2.70	Cowpea	0.03	3.74
10	Banga	0.02	2.50	Mackerel fish	0.02	2.69	Hake fish	0.03	3.50

*Derived from the ingredient list of reported recipes

Annex 30. Mean and percentage contribution of top foods and ingredients to total Vitamin B2 intake of non-pregnant women and children

VITAMIN B2 (mcg)									
Women (15-49 years)				Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	0.07	10.17	Acha cereal	0.27	47.7	Rice	0.05	10.4
2	Bread	0.05	7.63	Powdered milk	0.03	4.8	Cocoa	0.03	6.8
3	Pepper	0.04	6.53	Cocoa	0.02	4.4	Pepper	0.03	6.6
4	Catfish	0.03	4.23	Rice	0.02	3.5	Bread	0.03	6.5
5	Cocoa	0.03	4.20	Breakfast cereal	0.02	3.4	Fura da nono	0.02	5.7
6	Fura da nono	0.03	4.17	Fura da nono	0.02	2.8	Powdered milk	0.02	4.1
7	Fish (Mackerel)	0.02	3.26	Pepper	0.01	2.3	Chicken egg	0.01	3.3
8	Maize products	0.02	2.73	Bread	0.01	2.0	Millet products	0.01	3.0
9	*Condiments	0.02	2.65	Infant cereal	0.01	2.0	*Condiments	0.01	2.7
10	Powdered milk	0.02	2.64	Millet products	0.01	1.7	Maize products	0.01	2.6

*Derived from the ingredient list of reported recipes

Annex 31. Mean and percentage contribution of top foods and ingredients to total Vitamin B2 intake of non-pregnant women by geopolitical zone

VITAMIN B2 (mcg) of Women aged 15-49 years									
	North Central			North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	0.04	7.92	Pepper	0.05	10.05	Fura da nono	0.09	14.55
2	Bread	0.04	6.93	Rice	0.04	7.83	Pepper	0.05	8.96
3	Pepper	0.04	6.74	*Maize flour	0.04	7.06	Millet products	0.04	7.50
4	Cocoa	0.03	5.30	Bread	0.02	4.57	Rice	0.04	7.35
5	Catfish	0.03	5.26	*Condiments	0.02	4.13	Maize products	0.03	5.00
6	Maize products	0.03	5.09	*Sorghum flour	0.02	3.49	Bread	0.02	4.13
7	Powdered cow milk	0.02	3.71	Maize products	0.02	2.91	*Condiments	0.02	3.83
8	*Condiments	0.02	3.18	Maize grains grits	0.02	2.90	*Sorghum flour	0.02	3.08
9	Mackerel fish	0.02	2.73	Fura da nono	0.01	2.78	Groundnut products	0.01	2.29
10	Tomato	0.01	2.49	Powdered cow milk	0.01	2.44	Onion	0.01	2.28

*Derived from the ingredient list of reported recipes

Annex 31 cont. Mean and percentage contribution of top foods and ingredients to total Vitamin B2 intake of non-pregnant women by geopolitical zone

VITAMIN B2 (mcg) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Rice	0.09	10.83	Catfish	0.10	12.69	Rice	0.16	17.40
2	Bread	0.08	9.57	Bread	0.08	10.26	Bread	0.10	11.15
3	Cocoa	0.05	5.56	Rice	0.06	7.93	Cocoa	0.06	6.67
4	Mackerel fish	0.04	5.21	Mackerel fish	0.05	6.65	Pepper	0.05	5.32
5	Noodles	0.03	3.64	Cocoa	0.05	5.89	Chicken eggs	0.04	4.53
6	Catfish	0.03	3.60	Chicken eggs	0.03	4.24	Mackerel fish	0.04	4.47
7	Soft drinks	0.03	3.54	Pepper	0.03	3.39	Soft drinks	0.04	4.24
8	Powdered cow milk	0.03	3.30	Powdered cow milk	0.03	3.32	Catfish	0.04	4.11
9	Chicken eggs	0.03	3.28	Noodles	0.03	3.30	Sardine fish	0.03	2.91
10	African star apple	0.02	3.02	Beef	0.02	2.95	Jute mallow leaves	0.03	2.84

Annex 32. Mean and percentage contribution of top foods and ingredients to total Vitamin B9 intake of non-pregnant women and children

VITAMIN B9 (mcg)									
Women (15-49 years)				Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Cowpea products	21.5	10.8	Cowpea products	8.1	11.9	Cowpea	12.9	10.6
2	Cowpea	20.3	10.1	Cowpea	6.3	9.2	Cowpea products	12.8	10.6
3	Garri	17.7	8.9	Garri	3.4	5.0	Garri	8.7	7.1
4	Rice	10.3	5.1	Millet products	3.4	5.0	Rice	6.5	5.3
5	*Condiments	7.6	3.8	Rice	3.2	4.7	*Condiments	5.1	4.2
6	Maize products	7.0	3.5	Cocoa	2.9	4.3	Millet products	4.9	4.0
7	Okro	6.4	3.2	*Condiments	2.5	3.6	Maize products	4.5	3.7
8	Mango	6.2	3.1	Maize products	2.4	3.6	Baobab powder	3.9	3.2
9	Millet products	6.1	3.0	Okro	2.0	3.0	Okro	3.9	3.2
10	*Maize flour	5.8	2.9	Baobab powder	1.9	2.8	Mango	3.7	3.0

Annex 33. Mean and percentage contribution of top foods and ingredients to total Vitamin B9 intake of non-pregnant women by geopolitical zone

VITAMIN B9 (mcg) of Women aged 15-49 years									
North Central				North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Cowpea products	25.3	14.2	*Maize flour	22.0	13.2	Cowpea products	18.4	9.7
2	Cowpea	17.5	9.8	Cowpea	14.3	8.6	Millet products	16.6	8.8
3	Maize products	11.1	6.2	Cowpea products	14.2	8.5	Maize products	13.4	7.1
4	Rice	10.5	5.9	Rice	9.2	5.5	*Condiments	11.5	6.1
5	Cassava starch flour	9.5	5.3	Dried baobab powder	8.7	5.2	Cowpea	11.4	6.0
6	Okro	9.5	5.3	Okro	8.0	4.8	Groundnut products	11.2	5.9
7	Mango	6.3	3.6	*Condiments	7.6	4.5	Dried baobab powder	9.4	5.0
8	*Condiments	5.9	3.3	Mango	7.1	4.2	Rice	8.9	4.7
9	Garri	4.8	2.7	Maize products	6.4	3.8	Mango	8.0	4.3
10	Onion	4.2	2.4	*Sorghum flour	5.6	3.4	Okro	6.7	3.6

Annex 33 cont. Mean and percentage contribution of top foods and ingredients to total Vitamin B9 intake of non-pregnant women by geopolitical zone

VITAMIN B9 (mcg) of Women aged 15-49 years									
	South East			South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Garri	45.2	19.4	Garri	62.2	27.7	Cowpea products	36.8	15.6
2	Cowpea	27.4	11.8	Cowpea	28.3	12.6	Cowpea	34.8	14.7
3	Cowpea products	21.7	9.4	Cowpea products	15.2	6.8	Garri	26.1	11.0
4	Rice	12.4	5.3	Rice	11.5	5.1	Cassava starch flour	20.9	8.8
5	Bread	8.4	3.6	Bread	8.8	3.9	Rice	11.6	4.9
6	White yam tuber	8.0	3.5	White yam tuber	7.5	3.3	Bread	10.8	4.6
7	Mango	7.7	3.3	*Condiments	5.4	2.4	Jute mallow leaves	7.8	3.3
8	*Condiments	7.6	3.3	Groundnut	5.2	2.3	Cocoa	7.3	3.1
9	Groundnut	6.1	2.6	Chicken eggs	5.1	2.2	White yam products	6.9	2.9
10	Cocoa	5.4	2.3	Mango	5.0	2.2	Chicken eggs	6.3	2.6

*Derived from the ingredient list of reported recipes

Annex 34. Mean and percentage contribution of top foods and ingredients to total Vitamin B12 intake of non-pregnant women and children

VITAMIN B12 (mcg)									
	Women (15-49 years)			Child (6-23 months)			Child (24-59 months)		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Fish (Mackerel)	0.71	27.77	Fish (Mackerel)	0.22	24.85	Fish (Mackerel)	0.35	26.85
2	Fish (Sardine)	0.37	14.45	Breakfast cereal	0.12	13.99	Fish (Sardine)	0.15	11.90
3	Catfish	0.19	7.26	Powdered milk	0.07	7.93	Catfish	0.07	5.34
4	Fish (Hake)	0.14	5.66	Fish (Sardine)	0.07	7.74	Beef	0.06	4.44
5	Beef	0.13	4.98	Cocoa	0.04	5.03	Cocoa	0.05	4.11
6	Stockfish	0.12	4.82	Fura da nono	0.03	3.59	Shellfish other than crayfish	0.05	4.07
7	Fish (Bonga)	0.09	3.37	Infant cereal	0.03	3.44	Fura da nono	0.05	3.83
8	Garri	0.08	3.00	Stockfish	0.02	2.83	Garri	0.05	3.67
9	Fish (Mangala)	0.07	2.86	Chicken eggs	0.02	2.65	Powdered milk	0.05	3.56
10	Shellfish	0.07	2.78	Beef	0.02	2.31	Fish (Bonga)	0.05	3.52

Annex 35. Mean and percentage contribution of top foods and ingredients to total Vitamin B12 intake of non-pregnant women by geopolitical zone

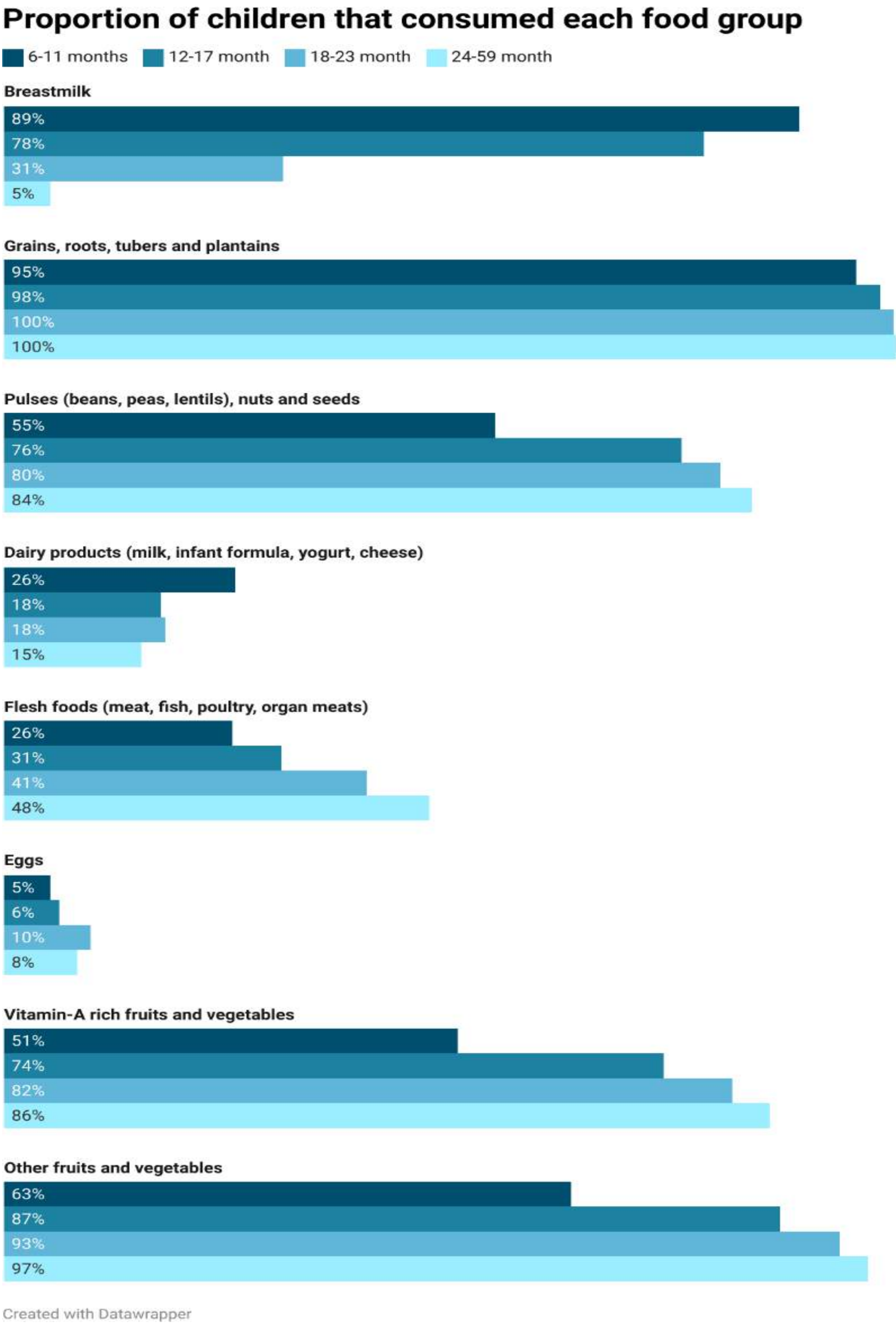
VITAMIN B12 (mcg) of Women aged 15-49 years									
North Central				North East			North West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Mackerel fish	0.45	25.00	Sardine fish	0.20	20.27	Sardine fish	0.18	23.31
2	Sardine fish	0.21	11.55	Mackerel fish	0.18	18.58	Fura da nono	0.17	21.82
3	Catfish	0.19	10.44	Catfish	0.11	10.97	Catfish	0.08	10.66
4	Beef	0.13	7.19	Beef	0.09	8.60	Beef	0.05	6.65
5	Tilapia fish	0.13	7.17	Mangala fish	0.06	5.69	Stockfish fish	0.04	5.72
6	Cassava starch flour	0.07	3.98	Stockfish fish	0.06	5.53	Mackerel fish	0.04	5.18
7	Hake fish	0.07	3.71	Tilapia fish	0.04	3.92	Tilapia fish	0.04	4.47
8	Stockfish fish	0.06	3.19	Bonga fish	0.03	3.49	Garri	0.03	3.59
9	Powdered cow milk	0.05	2.88	Powdered cow milk	0.03	3.19	Powdered cow milk	0.03	3.46
10	Bonga fish	0.05	2.80	Goat	0.03	3.15	Tiger nut milk	0.01	1.69

Annex 35 cont. Mean and percentage contribution of top foods and ingredients to total Vitamin B12 intake of non-pregnant women by geopolitical zone

VITAMIN B12 (mcg) of Women aged 15-49 years									
South East				South South			South West		
SN	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake	Food	Mean	% of total nutrient intake
1	Mackerel fish	1.48	33.31	Mackerel fish	1.77	33.30	Mackerel fish	1.44	29.59
2	Stockfish fish	0.55	12.37	Catfish	0.50	9.44	Sardine fish	1.17	23.96
3	Mangala fish	0.48	10.75	Shellfish other than crayfish	0.45	8.54	Hake fish	0.62	12.76
4	Shellfish	0.25	5.58	Bonga fish	0.31	5.79	Catfish	0.18	3.74
5	Beef	0.20	4.50	Sardine fish	0.28	5.33	Garri	0.17	3.43
6	Sardine fish	0.19	4.17	Stockfish fish	0.28	5.29	Beef	0.17	3.40
7	Catfish	0.18	3.97	Beef	0.25	4.74	*Cassava flour	0.15	3.13
8	Bonga fish	0.15	3.39	Shellfish	0.24	4.46	Cocoa	0.12	2.36
9	Offals	0.10	2.30	Garri	0.19	3.53	Soft drinks	0.11	2.36
10	Tilapia fish	0.08	1.80	Hake fish	0.18	3.35	Chicken eggs	0.11	2.22

*Derived from the ingredient list of reported recipes

Annex 36. Proportion of children that consumed each food group.



Annex 37. Type, source, and brand of vegetable oil obtained for the household, by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses vegetable oil	N=5281[2]			N=1006[2]			N=4947[2]		
Yes	90.3	88.5	92.1	90.0	87.0	93.0	88.0	85.8	90.3
No	9.7	7.9	11.5	10.0	7.0	13.0	12.0	9.7	14.2
Main type of vegetable oil used in household	N= 4749[3]			N=911[3]			N=4411[3]		
Groundnut oil	50.8	47.5	54.2	50.0	45.3	54.6	51.6	48.1	55.1
Palm olein/palm oil	43.8	40.0	47.5	46.9	42.2	51.5	42.9	39.1	46.7
Soybean oil	1.6	1.0	2.2	0.8	0.0	1.8	1.1	0.6	1.6
Oil blend	1.3	0.6	2.0	1.5	0.2	2.7	1.8	0.3	3.3
Sunflower oil	0.4	0.1	0.7	-	-	-	0.5	0.1	0.9
Other	0.8	0.4	1.3	0.4	0.0	0.9	0.8	0.3	1.3
Unknown[4]	1.3	0.8	1.9	0.4	0.0	0.9	1.3	0.8	1.8
How household obtained vegetable oil the last time it was obtained[5]	N=4646[5]			N=902[5]			N=4320[5]		
Purchased	91.6	90.1	93.2	91.2	88.5	94.0	90.6	88.7	92.5
Homemade	7.9	6.3	9.5	8.2	5.5	10.9	8.9	7.0	10.9
Received from relative/friend/food	0.4	0.3	0.6	0.6	0.1	1.1	0.5	0.2	0.7
Brand of vegetable oil obtained the last time	N=4320[6]			N=847[6]			N=4048[6]		
Unbranded	30.4	27.3	33.4	32.7	28.0	37.4	**33.8**	30.5	37.2
King's 100% vegetable oil	22.0	19.3	24.7	15.5	12.3	18.8	**17.7**	15.1	20.1
Power oil - Pure vegetable oil	12.7	11.1	14.3	12.3	9.5	15.0	**11.8**	10.2	13.4
Golden Penny-pure soya oil	0.9	0.5	1.2	0.9	0.1	1.7	**0.8**	0.4	1.2
Turkey	0.9	0.3	1.4	-	-	-	**0.7**	0.3	1.2
Oki	0.6	0.2	1.0	-	-	-	**0.5**	0.1	0.9
Laziz - Pure vegetable oil	0.5	0.2	0.8	0.4	0.0	0.7	**0.4**	0.2	0.6
Sunola - Soybean oil	0.5	0.1	0.9	0.2	0.0	0.5	**0.3**	0.0	0.6
Mamador	0.3	0.1	0.5	-	-	-	**0.1**	0.1	0.2
Gino	0.3	0.0	0.6	-	-	-			
Controller	0.2	0.0	0.4	-	-	-	**0.7**	0.0	1.4
Solive	0.1	0.0	0.2	-	-	-	**0.1**	0.0	0.2
Other	1.5	1.0	1.9	2.0	0.9	3.0	**1.1**	0.7	1.5
Unknown[4]	29.2	26.0	32.4	36.1	30.5	41.8	**33.8**	30.5	37.2

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).
[4] The response was classified as "unknown" when the respondent could not report the type, source or brand of food vehicle used in the household.
[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not "other" or "unknown" (excluding respondents with a missing value).
[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not "other" or "unknown" and the food vehicle was not "home-made". (excluding respondents with a missing value).
Differences across groups were not tested statistically.

Annex 38. Type, source, and brand of wheat flour obtained for the household, by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses vegetable oil	N=5281[2]			N=1006[2]			N=4947[2]		
Yes	90.3	88.5	92.1	90.0	87.0	93.0	88.0	85.8	90.3
No	9.7	7.9	11.5	10.0	7.0	13.0	12.0	9.7	14.2
Main type of vegetable oil used in household	N= 4749[3]			N=911[3]			N=4411[3]		
Groundnut oil	50.8	47.5	54.2	50.0	45.3	54.6	51.6	48.1	55.1
Palm olein/palm oil	43.8	40.0	47.5	46.9	42.2	51.5	42.9	39.1	46.7
Soybean oil	1.6	1.0	2.2	0.8	0.0	1.8	1.1	0.6	1.6
Oil blend	1.3	0.6	2.0	1.5	0.2	2.7	1.8	0.3	3.3
Sunflower oil	0.4	0.1	0.7	-	-	-	0.5	0.1	0.9
Other	0.8	0.4	1.3	0.4	0.0	0.9	0.8	0.3	1.3
Unknown[4]	1.3	0.8	1.9	0.4	0.0	0.9	1.3	0.8	1.8
How household obtained vegetable oil the last time it was obtained[5]	N=4646[5]			N=902[5]			N=4320[5]		
Purchased	91.6	90.1	93.2	91.2	88.5	94.0	90.6	88.7	92.5
Homemade	7.9	6.3	9.5	8.2	5.5	10.9	8.9	7.0	10.9
Received from relative/friend/food	0.4	0.3	0.6	0.6	0.1	1.1	0.5	0.2	0.7
Brand of vegetable oil obtained the last time	N=4320[6]			N=847[6]			N=4048[6]		
Unbranded	30.4	27.3	33.4	32.7	28.0	37.4	**33.8**	30.5	37.2
King's 100% vegetable oil	22.0	19.3	24.7	15.5	12.3	18.8	**17.7**	15.1	20.1
Power oil - Pure vegetable oil	12.7	11.1	14.3	12.3	9.5	15.0	**11.8**	10.2	13.4
Golden Penny-pure soya oil	0.9	0.5	1.2	0.9	0.1	1.7	**0.8**	0.4	1.2
Turkey	0.9	0.3	1.4	-	-	-	**0.7**	0.3	1.2
Oki	0.6	0.2	1.0	-	-	-	**0.5**	0.1	0.9
Laziz - Pure vegetable oil	0.5	0.2	0.8	0.4	0.0	0.7	**0.4**	0.2	0.6
Sunola - Soybean oil	0.5	0.1	0.9	0.2	0.0	0.5	**0.3**	0.0	0.6
Mamador	0.3	0.1	0.5	-	-	-	**0.1**	0.1	0.2
Gino	0.3	0.0	0.6	-	-	-			
Controller	0.2	0.0	0.4	-	-	-	**0.7**	0.0	1.4
Solive	0.1	0.0	0.2	-	-	-	**0.1**	0.0	0.2
Other	1.5	1.0	1.9	2.0	0.9	3.0	**1.1**	0.7	1.5
Unknown[4]	29.2	26.0	32.4	36.1	30.5	41.8	**33.8**	30.5	37.2

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).
[4] The response was classified as "unknown" when the respondent could not report the type, source or brand of food vehicle used in the household.
[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not "other" or "unknown" (excluding respondents with a missing value).
[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not "other" or "unknown" and the food vehicle was not "home-made". (excluding respondents with a missing value).
Differences across groups were not tested statistically.

Annex 39. Type, source, and brand of maize flour obtained for the household by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses maize flour	N=5281[2]			N=1006[2]			N=4947[2]		
Yes	57.4	53.8	61.0	62.0	56.9	67.2	62.0	58.3	65.6
No	42.6	39.0	46.2	38.0	32.8	43.1	38.0	34.4	41.7
Main type of maize flour used in household	N=2573[3]			N=515[3]			N=2476[3]		
White maize flour	91.7	89.7	93.6	90.5	87.1	93.9	92.3	90.6	94.0
Yellow maize flour	7.6	5.7	9.5	8.0	4.9	11.1	6.4	5.0	7.7
Other	0.2	0.0	0.4	0.3	0.0	0.9	0.8	0.2	1.5
Unknown[4]	0.6	0.2	1.0	1.2	0.1	2.3	0.5	0.1	1.0
How household obtained maize flour the last time it was obtained[5]	N=2542[5]			N=506[5]			N=2447[5]		
Purchased	51.6	47.5	55.8	53.7	47.4	60.1	52.7	48.6	56.7
Homemade	47.8	43.6	52.0	46.0	39.7	52.3	47.0	43.0	51.0
Received from relative/friend/food	0.5	0.2	0.9	0.3	0.0	0.7	0.1	0.0	0.2
Brand of maize flour obtained the last time	N=1231[6]			N=249[6]			N=1239[6]		
Unbranded	54.0	48.7	59.4	49.8	41.3	58.4	49.6	44.9	54.4
Ammani Foods, Maize Flour	1.2	0.0	3.0	0.6	0.0	1.7	0.9	0.1	1.7
Ultimate, Maize flour	0.8	0.1	1.4	0.6	0.0	1.4	-	-	-
Other	0.4	0.0	0.8	0.1	0.0	0.3	0.6	0.1	1.1
Unknown[4]	43.6	38.3	48.8	49.0	40.4	57.5	49.6	44.9	54.4

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).
[4] The response was classified as “unknown” when the respondent could not report the type, source or brand of food vehicle used in the household.
[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not “other” or “unknown” (excluding respondents with a missing value).

[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not “other” or “unknown” and the food vehicle was not “home-made”. (excluding respondents with a missing value).
Differences across groups were not tested statistically.

Annex 40. Type, source, and brand of semolina flour obtained for the household by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses semolina flour	N=5281[2]			N=1006[2]			N=4947[2]		
Yes	28.7	25.4	32.1	22.5	18.1	27.0	25.1	21.5	28.7
No	71.3	67.9	74.6	77.5	73.0	81.9	74.9	71.3	78.5
Main type of semolina flour used in household	N=1578[3]			N=282[3]			N=1481[3]		
Wheat based	65.1	60.8	69.5	73.7	67.5	79.9	67.2	62.0	72.3
Wheat-Maize	26.9	23.0	30.8	19.8	13.1	26.5	25.3	20.6	30.0
Other	-	-	-	0.5	0.0	1.4	0.6	0.0	1.5
Unknown[4]	7.9	5.3	10.5	6.0	2.2	9.9	6.9	4.4	9.4
How household obtained semolina flour the last time it was obtained[5]	N=1458[5]			N=266[5]			N=1376[5]		
Purchased	99.4	98.9	99.8	99.6	99.1	100.0	99.4	98.9	99.9
Homemade	0.1	0.0	0.2	-	--		0.1	0.0	0.3
Received from relative/friend/food	0.6	0.1	1.0	0.4	0.0	0.9	0.2	0.1	1.0
Brand of semolina flour obtained the last time	N=1460[6]			N=267[6]			N=1376[6]		
Golden Penny Semovita	54.9	50.9	58.8	52.3	44.5	60.1	48.9	43.2	54.5
Dangote Semolina	13.0	10.2	15.9	12.5	5.8	19.2	13.7	10.5	16.9
Honeywell Semolina	12.8	9.9	15.8	11.5	7.5	15.5	13.0	10.7	15.4
Mamagold	3.2	1.8	4.7	5.4	1.6	9.1	2.9	1.4	4.3
Unbranded	1.7	0.8	2.6	2.7	0.3	5.2	3.5	1.6	5.5
Supreme Semolina	1.4	0.7	2.0	1.1	0.1	2.0	1.1	0.6	1.7
Pure Prima	0.4	0.1	0.7	-	--		0.4	0.1	0.7
Other	0.5	0.0	1.0	0.5	0.0	1.0	0.3	0.0	0.5
Unknown[4]	12.1	9.2	14.9	14.1	9.2	19.1	16.2	11.7	20.8

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).
[4] The response was classified as "unknown" when the respondent could not report the type, source or brand of food vehicle used in the household.
[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not "other" or "unknown" (excluding respondents with a missing value).
[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not "other" or "unknown" and the food vehicle was not "home-made". (excluding respondents with a missing value).
Differences across groups were not tested statistically.

Annex 41. Type, source, and brand of sugar obtained for the household by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses sugar	N=5281[2]			N=1006[2]			N=4947[2]		
Yes	88.2	86.3	90.2	85.1	81.5	88.6	87.4	84.8	90.0
No	11.8	9.8	13.7	14.9	11.4	18.5	12.6	10.0	15.2
Main type of v used in household	N=4715[3]			N=881[3]			N=4445[3]		
White granulated	86.6	84.4	88.8	87.7	84.4	91.0	88.1	86.1	90.0
White cube	11.0	9.0	13.1	9.2	6.3	12.1	8.9	7.1	10.7
Brown granulated	1.3	0.5	2.1	2.0	0.0	4.1	1.0	0.4	1.5
Brown cube	0.7	0.3	1.0	0.5	0.0	1.1	1.3	0.5	2.2
Unknown[4]	0.4	0.1	0.8	0.6	0.0	1.2	0.5	0.2	0.9
How household obtained sugar the last time it was obtained[5]	N=4692[5]			N=871[5]			N=4401[5]		
Purchased	99.8	99.5	100.0	99.8	99.4	100.0	99.8	99.7	100.0
Homemade	0.2	0.0	0.5	0.0	0.0	0.1	0.1	0.0	0.2
Received from relative/friend/food	-	-	-	0.2	0.0	0.6	0.0	0.0	0.1
Brand of sugar obtained the last time	N=4696[6]			N=874[6]			N=4421[6]		
Unbranded	42.4	39.3	45.6	43.2	38.2	48.2	41.4	37.9	44.8
Dangote - Refined Granulated White Sugar	19.6	17.2	21.9	16.6	13.0	20.1	18.5	16.3	20.8
Golden Penny - Premium quality white granulated sugar	1.9	1.4	2.4	1.5	0.2	2.8	1.1	0.7	1.5
Bua - Premium Refined Sugar	1.8	1.1	2.5	0.6	0.1	1.1	1.6	1.0	2.1
Family - Refined granulated Sugar	1.5	0.9	2.0	1.5	0.3	2.8	0.9	0.6	1.2
St Loius	1.0	0.6	1.4	0.8	0.3	1.4	0.9	0.6	1.2
Dogan	0.8	0.5	1.1	0.8	0.3	1.3	0.6	0.4	0.9
Other	0.1	0.0	0.2	0.2	0.0	0.5	0.1	0.0	0.2
Unknown[4]	30.9	28.3	33.5	34.8	30.7	38.9	34.9	31.6	38.2

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).
[4] The response was classified as “unknown” when the respondent could not report the type, source or brand of food vehicle used in the household.
[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not “other” or “unknown” (excluding respondents with a missing value).
[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not “other” or “unknown” and the food vehicle was not “home-made”. (excluding respondents with a missing value).
Differences across groups were not tested statistically.

Annex 42. Type, source, and brand of salt obtained for the household by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses salt	N=5281[2]			N=1006[2]			N=4947[2]		
Yes	99.3	99.0	99.6	99.1	98.5	99.8	99.2	98.8	99.6
No	0.7	0.4	1.0	0.9	0.2	1.5	0.8	0.4	1.2
Main type of salt used in household	N=4715[3]			N=880[3]			N=4910[3]		
Table salt-fine	65.8	62.3	69.3	68.4	63.6	73.2	63.9	60.5	66.6
Edible/cooking salt-Coarse	29.3	26.2	32.4	26.6	22.5	30.7	30.2	27.6	32.9
Edible salt for industrial use	1.1	0.6	1.7	0.9	0.1	1.7	0.9	0.5	1.3
Sea salt-fine	0.6	0.2	1.0	1.0	0.0	2.2	0.6	0.1	1.1
Salt-low sodium	0.4	0.0	0.7	0.2	0.0	0.5	0.6	0.2	0.9
Sea salt-coarse	0.3	0.0	0.6	0.1	0.0	0.4	0.2	0.0	0.5
Unknown[4]	2.5	1.8	3.3	2.8	0.6	4.9	3.7	2.5	4.9
How household obtained salt the last time it was obtained[5]	N=4586[5]			N=862[5]			N=4748[5]		
Purchased	99.8	99.7	99.9	99.9	99.8	100.0	99.8	99.6	99.9
Homemade	0.1	0.0	0.1	-	--	-	0.2	0.0	0.3
Received from relative/friend/food	0.1	0.0	0.2	0.1	0.0	0.2	0.1	0.0	0.1
Brand of salt obtained the last time	N=4620[6]			N=864[6]			N=4781[6]		
Dangote - refined and iodized salt	29.9	27.0	32.8	23.3	19.2	27.4	26.1	22.4	29.7
Unbranded	20.2	17.7	22.7	23.8	19.5	28.1	22.6	19.5	25.7
Mr. Chef - pure refined and iodized salt	19.4	16.8	22.1	17.0	13.6	20.4	15.0	12.8	17.2
Uncle palm - iodized salt	4.3	3.1	5.5	3.9	2.3	5.6	3.7	2.7	4.6
Annapurna	0.5	0.1	0.8	0.3	0.0	0.6	0.3	0.1	0.6
Royal salt - edible iodized salt	0.3	0.1	0.5	0.5	0.0	1.1	-	-	-
Other	0.2	0.0	0.4	0.1	0.0	0.2	0.2	0.0	0.3
Unknown[4]	25.2	22.5	27.9	31.1	26.6	35.6	32.5	28.4	36.5

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).

[4] The response was classified as “unknown” when the respondent could not report the type, source or brand of food vehicle used in the household.

[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not “other” or “unknown” (excluding respondents with a missing value).

[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not “other” or “unknown” and the food vehicle was not “home-made”. (excluding respondents with a missing value).

Differences across groups were not tested statistically.

Annex 43. Type, source, and brand of bouillon obtained for the household by target group1

	Non-pregnant women (15-49 years old)			Pregnant women (15-49 years old)			Children (6-59 months old)		
	%	95%CI		%	95%CI		%	95%CI	
The household uses bouillon cube	N=5249[2]			N=1006[2]			N=4947[2]		
Yes	98.9	98.5	99.3	98.6	97.7	99.5	98.8	98.3	99.2
No	1.1	0.7	1.5	1.4	0.5	2.3	1.2	0.8	1.7
Main type of bouillon used in household	N=5178[3]			N=984[3]			N=4870[3]		
Cube	91.3	89.3	93.2	88.1	83.5	92.6	88.1	85.5	90.8
Granule	6.5	4.9	8.2	9.9	5.4	14.4	8.5	6.2	10.9
Powder	1.5	0.9	2.1	1.7	0.5	2.9	2.5	1.5	3.5
Other	0.1	0.0	0.1	-	-	-	0.6	0.2	1.1
Unknown[4]	0.6	0.3	1.0	0.3	0.0	0.7	0.2	0.0	0.4
How household obtained bouillon the last time it was obtained[5]	N=5141[5]			N=973[5]			N=4865[5]		
Purchased	99.8	99.6	99.9	99.9	99.7	100.0	99.8	99.6	99.9
Homemade	0.1	0.0	0.3	0.1	0.0	0.3	0.1	0.0	0.2
Received from relative/friend/food	0.1	0.0	0.1	-	-	-	0.0	0.0	0.1
Brand of bouillon obtained the last time	N=5135[6]			N=974[6]			N=4865[6]		
Maggi	54.8	51.2	58.4	55.8	50.2	61.4	55.0	50.4	59.5
Ajinomoto	10.0	7.7	12.3	15.1	10.1	20.1	13.0	9.9	16.2
Onga	9.9	7.5	12.2	8.4	5.6	11.3	8.7	6.6	10.7
Knorr	8.0	6.6	9.4	5.5	3.8	7.3	5.7	4.6	6.8
Tasty	7.6	6.1	9.0	5.3	3.6	7.1	6.1	4.7	7.6
Mr Cheff	2.7	1.9	3.4	1.2	0.3	2.1	2.5	1.4	3.5
Terra seasoning cubes	2.4	1.5	3.2	2.6	1.1	4.2	2.3	1.3	3.3
Royco	1.7	0.9	2.6	3.8	0.1	7.5	1.9	0.7	3.2
Gino max seasoning cube	1.5	1.0	1.9	0.8	0.3	1.3	1.0	0.6	1.3
Suppy seasoning cubes	0.2	0.1	0.4	-	-	-	0.1	0.0	0.2
Ami seasoning cube	0.2	0.1	0.3	-	-	-	-	-	-
Super seasoning Vedan	0.1	0.0	0.2	-	-	-	0.4	0.0	0.9
Other	0.3	0.0	0.6	1.2	0.3	2.1	0.5	0.2	0.8
Unknown[4]	0.7	0.5	1.0	0.2	0.0	0.5	1.1	0.5	1.7

[1] Data are weighted to account for survey design and non-response.

[2] Unweighted sample size for all respondents.

[3] Unweighted sample size for respondents who used the food vehicle in the household (excluding respondents with a missing value).
[4] The response was classified as “unknown” when the respondent could not report the type, source or brand of food vehicle used in the household.
[5] Unweighted sample size for respondents who used the food vehicle in the household and the main type of food vehicle was not “other” or “unknown” (excluding respondents with a missing value).
[6] Unweighted sample size for respondents who used the food vehicle in the household, the main type of food vehicle was not “other” or “unknown” and the food vehicle was not “home-made”. (excluding respondents with a missing value).
Differences across groups were not tested statistically.

Annex 44. Summary of the food samples collected, processed and distributed for laboratory analyses

Food vehicles	Total collected
Salt	1153
Vegetable oil	338
Sugar	400
Semolina flour	89
Wheat flour	51
Total	**2031**

Sample Distribution by Laboratory

MicroChem Lab., South Africa

Food samples	Total	Analyses to run	Comments
Wheat flour	37	VA, Fe & Zn	All samples are at least 20 g weight.
Semolina	78	VA, Fe & Zn	
Vegetable Oil	232	VA	
Sugar	274	VA	
Total	**621**		

Intertek Lab., Germany

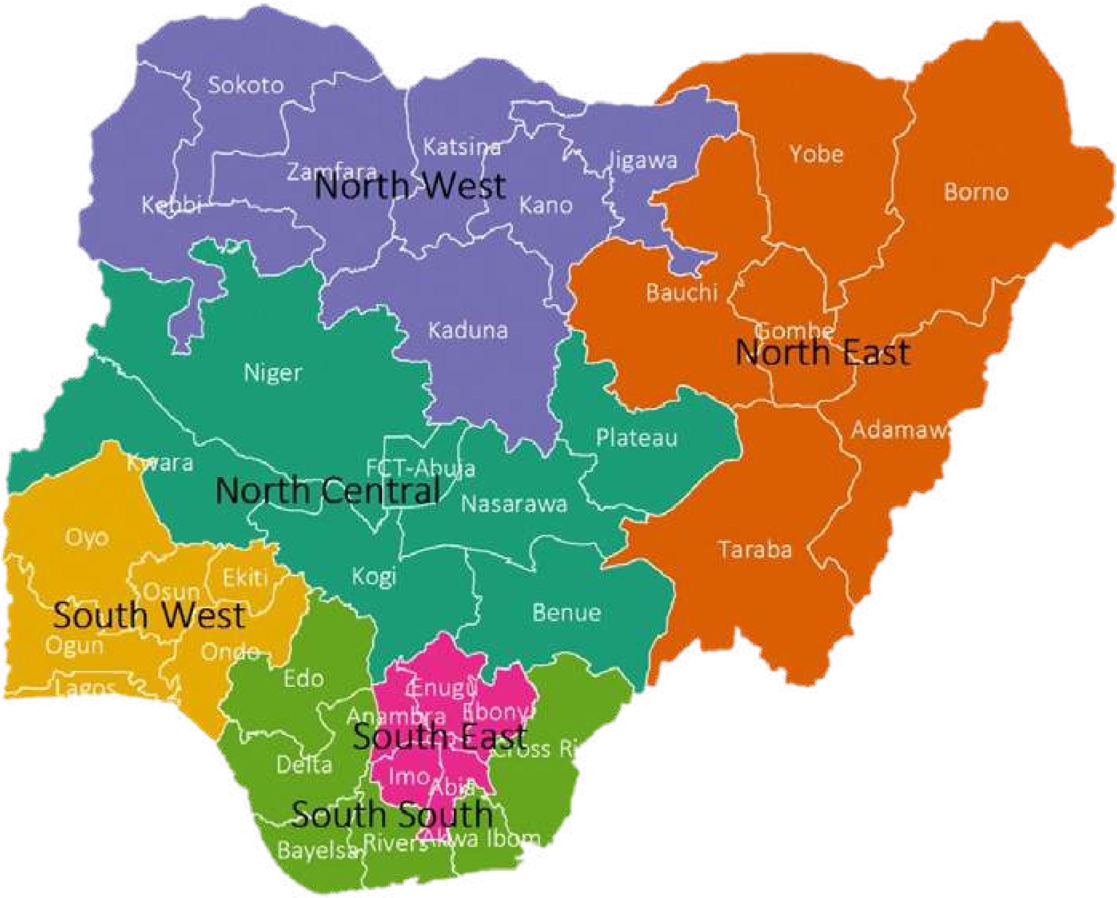
Food samples	Total	Analyses to run	Comments
Salt	73	Iodine	All samples are at least 30g weight.
Wheat flour	11	VA, Fe & Zn	
Semolina	17	VA, Fe & Zn	
Sugar	32	VA	
Total	**133**		

BATO Lab., Lagos

Food samples	Total	Analyses to run	Comments
Salt	30	Iodine	All samples are at least 30g weight.
Semolina	8	VA, Fe & Zn	
Sugar	14	VA	
Vegetable Oil	22	VA	
Total	**74**		

FIIRO, Oshodi Lagos

Food samples	Total	Analyses to run	Comments
Salt	14	Iodine	All samples are at least 20g weight.
Total	**14**		



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