REPORT

FORTIFICATION ASSESSMENT COVERAGE TOOLKIT (FACT) SURVEY IN TWO NIGERIAN STATES: EBONYI AND SOKOTO, 2017

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Abbreviations

AME	Adult male equivalent
CAPI	Computer-assisted personal interview
CI	Confidence interval
DHS	Demographic Health Survey
EAR	Estimated Average Requirement
EAs	Enumerations areas
FACT	Fortification Assessment Coverage Toolkit
FAO	Food and Agriculture Organization
FFI	Food Fortification Initiative
FFQ	Food frequency questionnaire
GAIN	Global Alliance for Improved Nutrition
HHS	Household Hunger Scale
ICFI	Infant and Child Feeding Index
IDD	Iodine deficiency disorders
IYCF	Infant and young child feeding
LGA	Local government areas
MDD-W	Minimum dietary diversity for women of reproductive age
MPI	Multi-dimensional poverty index
MUAC	Mid-upper arm circumference
NA	Not applicable
NPC	National Population Commission
OPM	Oxford Policy Management
PSUs	Primary sampling units
RDA	Recommended dietary allowance
SES	Socio-economic status
USI	Universal salt iodisation
WHO	World Health Organization
WRA	Women of reproductive age

1. Summary

Micronutrient deficiencies, such as vitamin A and iron are prevalent in Nigeria, particularly among young children and women of reproductive age. Large-scale food fortification of staple foods and condiments is a cost-effective, scalable and evidence-based strategy to help address micronutrient deficiencies if implemented under the appropriate conditions and enforcement actions. In Nigeria, mandatory fortification of salt with iodine began in 1993, and mandatory fortification of sugar and edible oil with vitamin A and wheat flour, maize flour and semolina flour with multiple micronutrients, including iron and vitamin A has been mandated by law since 2002. According to the few studies conducted that have assessed the fortification programme, performance and success have been variable by food vehicle type. That said, the lack of rigorous data on quality, coverage and utilization of fortified foods impedes the ability to identify bottlenecks, make recommendations, and effectively tackle the challenges related to large-scale food fortification in Nigeria. A cross-sectional survey consisting of household and market assessments was implemented between April and May of 2017 using the Fortification Assessment Coverage Toolkit (FACT) in two states of Ebonyi and Sokoto. The survey aimed to contribute to filling this evidence gap by providing data on household coverage of fortifiable and fortified foods, and the micronutrient contribution from fortified foods among children (less than five years of age) and women of reproductive age (15 to 49 years) in the two states.

The household component surveyed 610 households in Ebonyi and 614 households in Sokoto and collected information on household demographics and characteristics, food security, dietary diversity, fortification logo awareness, and purchasing and consumption patterns of fortifiable foods, including the six covered under the mandatory national fortification programme (salt, sugar, oil, wheat flour, maize flour and semolina flour) and three additional food vehicles (bouillon cube, rice, and tomato paste) being assessed for potential inclusion in the fortification programme. The market component assessed retail outlets in three strategically selected market hubs in Ebonyi (Abakaliki, Afikpo, and Ishiagu) and six in Sokoto (Sokoto City, Shinaka, Illela, Bunkari, Shagari, and Numba Tureta) to identify available brands of the six food vehicles mandated under the national fortification programme. Up to 12 specimens of each brand found in the marketplaces were collected and analyzed as a composite sample to determine the content of select micronutrients per brand (i.e. iodine in salt, vitamin A in sugar and oil, and iron in wheat flour, maize flour, and semolina flour).

Overall, six brands of salt, nine brands of sugar, 39 brands of oil, seven brands of wheat flour, five brands of maize flour and five brands of semolina flour brands were present in marketplaces across the two surveyed states. Laboratory analyses revealed that micronutrient content of each food vehicle brand varied by food vehicle. Overall, four brands (67%) of salt, eight brands (89%) of sugar, 18 brands (46%) of oil, six brands (86%) of wheat flour, and four brands (80%) of semolina flour were fortified to some extent. None of the maize flour brands were confirmed to be fortified at any extent. All four (67%) brands of salt were fortified in compliance with the mandated national standard for Nigeria (defined as a minimum amount for all food vehicles), while only one (11%) brand of sugar, eight (20%) brands of oil, three brands (43%) of wheat flour, and none of the brands of semolina flour met the national standard. Compliance with fortification standards also varied by place of production, particularly for oil, with more local brands being fortified at any level compared to imported brands (78% vs. 25%).

Household coverage of all food vehicles assessed in the survey was expressed as the proportion of total surveyed households that consume a food vehicle, consume a fortifiable food vehicle (i.e. industrially produced), and consume a fortified food vehicle (i.e. confirmed by brand identification and laboratory analysis of samples collected from markets).

Of the six food vehicles currently in the fortification programme, in Ebonyi, salt, sugar and oil were consumed by a large proportion of the population in general, i.e. 100%, 80% and 98% of households, respectively. For salt and sugar, an equal proportion of households consumed these foods in a fortifiable form; however only 30% of households consumed oil in a fortifiable form. Wheat, maize and semolina flours were much less widely consumed in general with only 10%, 24% and 19% of households consuming them, respectively. In terms of consumption of these foods in a fortifiable form, the figures were 9%, 11% and 17%, respectively. In Sokoto, salt, sugar, oil and maize flour were consumed in general by 100%, 91%, 98% and 88%, respectively of households, respectively. For salt and sugar, an equal proportion of households consumed these foods in a fortifiable form; while for oil and maize flour only 64% and 1% of households, respectively, consumed it in a fortifiable form. Wheat flour was consumed in general by 59% of households, with nearly an equal proportion of households consuming it in a fortifiable form (57%) while semolina flour was much less widely consumed with only 15% of households consuming it in general and 10% consuming it in a fortifiable form.

Many households were not able to report a brand for certain food vehicles or in some cases the brand reported by the household was not found in the market assessment. As a result, there was in a high proportion of households with unknown fortification status for many food vehicles when attempting to link the reported brand used in the household to the results of the laboratory analyses of food specimens collected from markets; therefore, the consumes fortified food vehicle indicators reported here may be underestimated and should be interpreted with caution. Food samples were not taken from households, and therefore the actual micronutrient content at this level is unknown. In Ebonyi, confirmed coverage of the fortified food vehicle in this survey was 85% for salt (15% unknown), 19% for sugar (60% unknown), 1% for oil (29% unknown), 3% for wheat flour (6% unknown), 0% for maize flour (11% unknown) and 10% for semolina flour (7% unknown). In Sokoto, these figures were 12% for salt (88% unknown), 8% for sugar (83% unknown), 2% for oil (62% unknown), 7% for wheat flour (46% unknown), 0% for maize flour (1% unknown) and 9% for semolina flour (2% unknown).

Micronutrient contribution from fortified foods currently included in the fortification programme was expressed as a percentage of the EAR (for iodine and vitamin A) and RDA (for iron) among the target population groups, accounting for the combined micronutrient intake from all fortified foods containing those nutrients. Estimates were made under the current conditions and modelled to assume the foods were fortified in compliance with the Nigerian national standards. In Ebonyi, fortified salt contributed on average 167.9% of the EAR for iodine among children 12-23 months, 231.6% among children 24-59 months, and 212.9% among WRA. In Sokoto, these estimates were 225.0% of the EAR for iodine among children 12-23 months, 290.1% among children 24-59 months, and 244.5% among WRA. When modelled assuming compliance with the fortification standard, the estimates were similar in both states.

Fortified sugar and oil combined contributed on average 11.1% of the EAR for vitamin A among children 12-23 months, 13.2% among children 24-59 months, and 9.6% among WRA in Ebonyi. In Sokoto, these estimates were 7.8% of the EAR for vitamin A among children 12-23 months, 13.7% among children 24-59 months, and 9.3% among WRA. If all food vehicles that are required to contain vitamin A (i.e. sugar, oil, wheat flour, maize flour and semolina flour) were fortified in compliance with the standard, these fortified foods could potentially provide 17.7% of the EAR for vitamin A among children 12-23 months, 21.2% among children 24-59 months, and 15.7% among WRA in Ebonyi, and 30.4% of the EAR for vitamin A among children 12-23 months, 35.4% among children 24-59 months, and 24.8% among WRA in Sokoto.

Fortified wheat flour, maize flour, and semolina flour combined contributed on average 0.2% of the RDA for iron among children 6-11 months, 2.2% among children 12-23 months, 2.3% among children 24-59 months, and 3.4% among WRA in Ebonyi. In Sokoto these estimates were 2% of the RDA for iron among children 6-11 months, 7.7% among children 12-23 months, 12.8% among children 24-59 months, and 19.5% among WRA. If all food vehicles were fortified in compliance with the standard, they could potentially provide 3.0% of the RDA for iron among children 6-11 months, 18.4% among children 12-23 months, 18.8% among children 24-59 months, and 21.8% among WRA in Ebonyi, and 5.8% of the RDA for iron among children 6-11 months, 18.9% among children 12-23 months, 22.7% among children 24-59 months, and 41.1% among WRA in Sokoto.

In summary, the high household coverage and utilization of fortifiable salt and sugar, reasonably high coverage of fortifiable oil, and high utilization of fortifiable wheat flour and semolina flour indicate high potential for fortification of these foods to increase micronutrient intakes in the population in Ebonyi and Sokoto. For salt, currently most producers are fortifying to some extent and as a result the population is receiving sufficient iodine from fortified salt to fulfil nutrient requirements. For other food vehicles, there was low compliance with the national fortification standards for all food vehicles and consequently low contribution to dietary requirements for vitamin A (from fortifiable sugar and oil) and iron (from fortifiable wheat, maize and semolina flour). Based on current consumption patterns of these foods, there is potential for them to make meaningful contributions to vitamin A and iron intakes but it would require significant improvements in the production and availability of appropriately fortified foods in markets. A meaningful improvement in monitoring and enforcement of fortified foods (both locally produced and imported) by regulatory authorities would be needed for the programme to reach its full potential.

Finally, bouillon cubes, tomato paste, and rice were assessed as potential new fortification vehicles. Overall, all three foods had high coverage in a fortifiable form; in Ebonyi (100%, 95% and 83%, respectively) and to a lesser extent in Sokoto (99%, 45% and 40%, respectively). However, before adding new food vehicle to the fortification program further research is needed to assess the following three things. First, it is important to assess both the nutrient contribution from fortified foods as well as the total intake of the nutrient from all dietary sources to ascertain the extent to which the nutrient gap in the diet could be filled through current fortification efforts. Second, if these analyses reveal that the current program could meaningfully contribute towards filling the nutrient gaps then it may be worthwhile to consolidate efforts to improve the compliance of producers of those food vehicles rather than adding new food vehicles that could inherit the same compliance issues. Third, if the current food vehicles do not have the potential to fill the actual nutrient gap or the feasibility to significantly improve compliance among producers is limited then consideration of these new food vehicles may be warranted. In this case, additional research would be needed to confirm their coverage and utilization in other areas of the country as well as their market share, value chains, and, for bouillon cubes, possibilities of excessive salt consumption. It is important to underscore these formative steps to avoid inheriting current constraints with any new food vehicles for fortification.

2. Introduction

Micronutrient deficiencies are prevalent in Nigeria, particularly among young children and women of reproductive age (WRA). While recent national-level data is limited, the National Nigeria Food Consumption and Nutrition Survey 2001-2003 found relatively high rates of vitamin A and iron deficiencies among children under five years of age, mothers and pregnant women. Among children under five, 29.5% were deficient in vitamin A and 27.5% were at various stages of iron deficiency (8.1% with serum ferritin < 20 ng/ml suggestive of depleted iron stores and 19.4% with serum ferritin <10 ng/ml suggestive of iron deficiency); among mothers, 13.1% were deficient in vitamin A and 24.3% in iron (serum ferritin < 12 ng/ml); and among pregnant women, the rates were 19.2% and 35.3%, respectively (Maziya-Dixon 2004). Micronutrient deficiencies, often referred to as the ‘hidden hunger’, are known to negatively impact an individual’s health and well-being, possibly leading to grave consequences such as mental impairment, chronic diseases and death if not prevented or treated (Black et al. 2013).

Large-scale food fortification of staple foods and condiments is a cost-effective, scalable and evidence-based strategy to help address micronutrient deficiencies (World Health Organization (WHO) and Food and Agriculture Organization (FAO) 2006; Horton, Alderman, and Rivera 2008). In Nigeria, national fortification of salt with iodine began in 1993, and fortification of wheat flour, semolina flour, maize flour, with multiple micronutrients and sugar and edible oil with vitamin A has been mandated by law since 2002 (Standard Organizations of Nigeria, 2000a, 2000b, 2000c, 2010, 2015a, 2015b).

In the case of salt iodisation, Nigeria was recognised for its achievement in programme performance, receiving the universal salt iodisation (USI) certificate award in 2007. Between 1995 and 2005, government records of inspection consistently showed that more than 90% of edible salt being imported through the country’s four major ports was fortified according to standard (UNICEF, 2005). At the same time, a sharp downward trend in iodine deficiency disorders (IDD), and particularly in goitre rates, in sentinel sites around the country was observed between 1993 and 2003 (Egbuta 2003, Maziya-Dixon 2004, UNICEF 2005). Continuous monitoring remains essential to retain these benefits and to ensure that risks of iodine overconsumption are minimized.

Programme performance of other fortified foods such as oil, sugar, wheat, maize and semolina flours has been less consistent. While data are limited, a 2013 nationwide survey assessing content of vitamin A in oils and sugar, and iron in flours sampled from factories and markets found that only 15% to 20% of oils, 12% to 17% of sugars, and 12% to 33% of flours were fortified at or above the minimum national standard for vitamin A, and only 1% to 21% of flours were fortified at or above the minimum national standard for added iron (Ogunmoyela 2013). In addition, the Fortification Assessment Coverage Toolkit (FACT) 2015 survey, conducted in two states, Kano and Lagos, found overall low and inconsistent levels from samples collected from households; in Kano, 28% of salt, 1% of sugar, 47% of oil, 27% of wheat flour, 0% of maize flour, and 26% of semolina flour were fortified at or above the minimum national standard; and in Lagos, 12% of salt, 2% of sugar, 31% of oil, 73% of wheat flour, 0% of maize flour, and 24% of semolina flour were fortified at or above the minimum national standards (Food Fortification Initiative (FFI), Centers for Disease Control and Prevention (CDC), Global Alliance for Improved Nutrition (GAIN) and Oxford Policy Management (OPM) 2015). Together, these studies suggest substantial challenges in large-scale fortification of staple food vehicles related to quality and compliance with national standards at both production and retail levels. However, the ability to adequately assess and evaluate the fortification programme's performance, as well as its coverage, is substantially hampered by the lack of recent representative data from around the country. To date, the FACT 2015 survey provides the only data on the coverage and consumption of fortified food vehicles but is limited to the states of Lagos and Kano, which is not indicative of performance in other areas of the country. This second FACT survey, covering the two states of Sokoto and Ebonyi, represents an important step towards filling this information gap, a step necessary to shed more light on the performance and quality of the fortification programme in Nigeria and to help identify solutions to the on-going challenges for the programme.

3. The Fortification Assessment Coverage Toolkit (FACT) Survey

3.1 BACKGROUND

Between April and May 2017, GAIN and OPM conducted a cross-sectional survey in Sokoto and Ebonyi states in Nigeria using the FACT with the aim of assessing programme coverage of fortified staple foods and micronutrient contributions as well as the use of other potentially fortifiable food vehicles. This survey results build on the evidence base that began following the 2015 FACT survey conducted in Lagos and Kano states (FFI, CDC, GAIN and OPM, 2015).

FACT is a survey instrument that was developed by GAIN for carrying out coverage assessments of both population-based (i.e. staple foods and/or condiments) and targeted (e.g. infant and young child) fortification programmes (Friesen, VM et al. 2017). The toolkit was developed to help stakeholders achieve greater programme impact by documenting successes, identifying potential barriers related to programme coverage, and improving programmes based on evidence of programme performance.

3.2 OBJECTIVES

The general objective of the survey was to determine the household coverage of fortified foods and their potential contribution to the micronutrient intake among children (under five years of age) and WRA (15 to 49 years of age) in Sokoto and Ebonyi states in Nigeria.

The specific objectives of the survey were:

1. To assess the coverage of fortified salt, sugar, oil, wheat flour, maize flour and semolina flour among households;

2. To assess the availability of fortified brands of salt, sugar, oil, wheat flour, maize flour and semolina flour in purposively selected markets across each state;

3. To measure the content of select nutrients in specimens of salt (iodine), sugar (vitamin A), oil (vitamin A), wheat flour (iron), maize flour (iron) and semolina flour (iron) collected from markets to assess the presences of fortified foods as well as the quality compared to the national fortification standards;

4. To estimate the consumption of fortified salt, sugar, oil, wheat flour, maize flour and semolina flour by children (under five years) and WRA when possible;

5. To estimate the contribution of fortified salt, sugar, oil, wheat flour, maize flour and semolina flour to the intakes of select nutrients in the diets of children (under five years of age) and WRA;

6. To measure levels of awareness about fortified foods and their benefits among households;

7. To evaluate indicators that may be predictive of inadequate micronutrient intake and determine their association with the consumption of fortified foods. These indicators are:
    a. Risk of poverty,
    b. Economic status,
    c. Women’s dietary diversity,
    d. Infant and child feeding practices, and

e. Household food security;

8. To assess the potential of alternative food vehicles for fortification, i.e. rice, tomato paste and bouillon cubes, based on their coverage, consumption and production patterns.

4. Survey methodology

4.1 OVERVIEW

The FACT survey was comprised of two components: a household survey and a market survey. This section presents key elements of the survey methodology for each component of the FACT survey. This includes details on the target population (Section 4.2.1), sampling strategy (Sections 4.2.2 and 4.3.1), sample size (Sections 4.2.2 and 4.3.1), data collection (Section 4.2.3 and 4.3.2) and data quality assurance of each component (Sections 4.2.4 and 4.3.3). This section concludes with definitions of key indicators (Section 4.5), ethical considerations (Section 4.6) and the methodological limitations of the study (Section 4.7).

4.2 HOUSEHOLD COMPONENT

4.2.1 Target population and household definition

The target population of this research was children (under five years of age) and WRA (15–49 years old) as these two groups are among those most at risk of micronutrient deficiencies.

The household component of the FACT survey was designed to be representative at the state level of all children under five years of age and households with a child under five. A household in this survey is defined as 'a person or group of related or un-related persons that live together in the same compound and acknowledge one adult male or female as the head of the household'. A household was eligible if at least one member was a child under five years of age.

4.2.2 Sampling strategy and sample size

This section summarises the core features of the sampling strategy and the sample size for the household survey component of the FACT survey. Further technical details can be found in Annex 1.

The survey used a stratified multi-stage sampling method. The sample aimed to be representative at the state level and to adhere to the minimal requirements for statistical precision. For the sample size determination, it was assumed that the survey would estimate proportions of 50% and assume a margin of error of five percentage points at the statistical significance level of 5% (based on 95% confidence intervals). See Annex 1 for additional details on the sample size calculation.

Stage 1: Selection of enumeration areas

In the first stage of sampling, a stratified systematic sampling method was used to select the enumerations areas (EAs) which served as primary sampling units (PSUs) in each state. The list of EAs was obtained from the National Population Commission (NPC) using the 2006 Nigeria census data. EAs are statistical units of approximately the same size (number of households) and are embedded into administrative units such as local government areas (LGA) and localities.

The two states, Sokoto and Ebonyi, were defined as explicit strata and designated samples were drawn for each separately so as to ensure that statistics were representative at the state level. Implicit strata were also defined. First, the hierarchy of statistical units (supervisory areas, which are agglomerations of a number of EAs that are supervised by a single supervisor during census activities) and administrative units were used as the main strata. Second, the numbering of those supervisory area units, as provided by the NPC, was used as a proxy for the geographic proximity of EAs. Finally, the fact that EAs of equal size were embedded into higher administrative areas was used to estimate an approximate indicator of population density and three distinct strata of population density were defined. This proxy indicator was used as an initial stratum to ensure the even spread of the sample across states.

The sampling process yielded 51 EAs per state. Using the same sampling method, 10 EAs per state were drawn from the sampled 51 EAs and designated as replacements. Therefore, a total of 82 EAs were sampled for the survey, with 41 in each state.

Stage 2: Selection of households within EAs

The second stage involved selecting 15 households within the chosen EAs. Prior to data collection, a listing exercise was conducted to list all households within each EA and identify eligible households with a child under the age of five. Using a systematic random draw, 15 households were sampled within each EA from the pool of eligible households. In each state, 615 households were randomly selected to be interviewed.

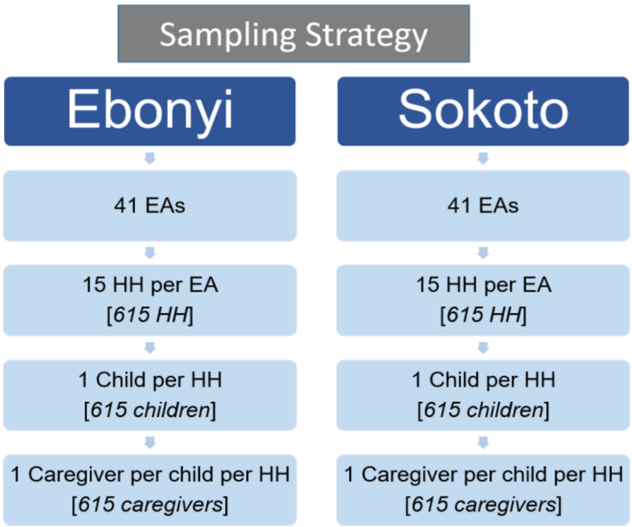
Stage 3: Selection of child under five and caregiver within households

The final stage of sampling involved randomly selecting one child under five within the sampled household. This stage happened at the time of the interview according to the protocol for administering the household questionnaire. The selection was based on the Kish grid method and was automatically generated within the computer-assisted household questionnaire after the successful completion of the household roster whereby the head of the household listed all household members currently living in the household. If the selected household did not have a child under five years of age, the interview was immediately terminated and the household was replaced according to a pre-defined replacement protocol. In all households, one child under five years of age was randomly selected and the primary caregiver of that child was asked to respond to the remainder of the household questionnaire collecting data on that child and caregiver. Figure 1 below summarises the sampling strategy.

Replacement protocol and sample

If a selected EA could not be visited, it was replaced with another EA in that state. In the process of sampling, a pool of 10 replacement EAs per state were drawn simultaneously, with the main EA sample selection (41 EAs per state) and the use of this list being carefully controlled. Within an EA, if a selected household could not be surveyed, it was replaced with another household in that EA. Similarly, a pool of 10 replacement households per EA was drawn simultaneously with the main household sample selection (15 households per EA).

Figure 1 Summary of the sampling strategy for the Nigeria FACT survey 2017



4.2.3 Data collection

Data collection consisted of a listing survey followed by a household survey in each EA. Separate specialist teams were employed to implement each survey. The listing survey was implemented between 21 April and 6 May 2017 and the household survey was implemented from 29 April to 13 May 2017.

Each state had a State Coordinator responsible for all data collection activities within his or her respective state. There were three data collection teams in each state, with each team composed of one supervisor and three interviewers. Each team was assigned specific EAs in which they conducted the household survey. The supervisors were responsible for coordinating with community leaders and maintaining the quality of the data collection team. This was achieved through a combination of sitting in on interviews and getting feedback from the state coordinators.

Data collection was conducted through computer-assisted personal interview (CAPI) software to maintain high standards of data quality (see Section 4.2.4 for further details).

One household questionnaire was administered per household. First, the household roster was administered to the household member (that is, at least 15 years of age) most knowledgeable about the household. Then the primary caregiver of the selected child under five was then asked to complete the remainder of the household questionnaire.

The main components of the household questionnaire are summarised in Table 1 and the full questionnaire can be found in Annex 2. All survey modules were taken or adapted from validated instruments where available. Showcards were developed to aid the precision of reported amounts of food items purchased and consumed. Separate showcards were created for Ebonyi and Sokoto to include specific foods found in each state (see Annex 3 for example of showcards).

Table 1 Components of the household questionnaire

Component	Description
Household roster	Questions on the composition of the household and the gender, age and education of all household members.
Household characteristics and assets	Questions on features of the household dwelling and ownership of assets.
Water, sanitation and hygiene	Questions on access to drinking water and toilet facilities.
Birth history	Questions on live births and child mortality.
Household hunger scale	Questions on household hunger in the last 30 days.
Child-feeding practices	Questions on breastfeeding and feeding frequency of the child.
Dietary diversity	Questions on food items consumed in the previous day by caregiver and child.
Coverage of food vehicles	Questions on the household usage, source, brand, quantity purchased and cost of food vehicles covered in the national fortification programme (i.e. salt, sugar, oil, semolina flour, maize flour and wheat flour) and potentially fortifiable food vehicles not covered in the programme (i.e. bouillon cubes, tomato paste and rice).
Individual wheat and semolina flour consumption	Questions on frequency of consumption and portion sizes of specific food items made from semolina and wheat flour by both caregiver and child (separate tailored questionnaires in each state).
Fortification logo knowledge and influence	Questions on awareness and knowledge of vitamin A and iodine fortification logos and their influence on household purchasing decisions.
Health and nutrition for caregiver and child	Measurement of mid-upper arm circumference for both caregiver and child.

4.2.4 Training and data quality assurance

Before data collection commenced, separate training sessions for the listing survey and household survey were held. The listing training session was conducted on 20–21 April 2017, in parallel in both states, followed by a central household survey training that took place in Abuja from 21 to 26 April 2017 for both state teams. The main objective of the training was to ensure that team members mastered the instruments and could understand and correctly implement survey protocols, and comfortably use CAPI.

The training session included classroom-based learning as well as community-based pilots that were monitored closely by the trainers. A central component of the quality assurance was the supervision that each enumerator received during the training, piloting and roll-out of the survey. Interviewers were frequently assessed during the training and individual feedback was provided to identify and resolve any difficulties.

All supervisors participated in the main interviewer training and then received additional training on their additional tasks of coordination and quality assurance.

Several data quality assurance mechanisms were put in place throughout the survey implementation to ensure high quality data. These are listed and summarised below:

1. Data was collected electronically through CAPI software, which enabled automated live data checks during the implementation of the household interview. Extensive validations and cross-checks were programmed into the CAPI software to reduce errors and inaccuracies during the household interview.

2. Sampling the child under five for interview was fully automated in the CAPI software, thus eliminating any possibility of interviewer error or influence on the random selection process.

3. Data was uploaded to the cloud daily, which enabled the central survey management team in Abuja to carry out a range of consistency checks on a daily basis. Any issues identified at this stage were immediately communicated to the relevant state coordinator and team supervisors for action.

4. A data collection monitoring dashboard on PowerBi was used to monitor on a daily basis the progress of data collection as well as the performance of data collection teams and individual enumerators, allowing state coordinators and supervisors to give feedback to teams on a regular basis and continuously improve the quality of data collection.

5. Quality assurance officers conducted back-check interviews, which involved revisiting a sample of households that had already interviewed. The purpose of the back-check interview was to confirm that the interviews had indeed been conducted and to cross-check the accuracy of key information by means of a short questionnaire. The back-check questionnaire included questions that were unlikely to have changed since the initial interview, such as the number of rooms in the household. Comparisons between the back-check questionnaire and the main household questionnaire were conducted daily, with results being fed back to the team for continuous improvement. Furthermore, the quality assurance officers also randomly visited survey teams in selected EAs with the data collection team, and sat in on some of the interviews to observe whether the interviewer was properly administering the interview.

4.3 MARKET COMPONENT

The market survey was designed to collect data on the availability and fortification quality of brands of salt, sugar, oil, wheat flour, maize flour and semolina flour in the two states.

4.3.1 Selection of market sites and sample size

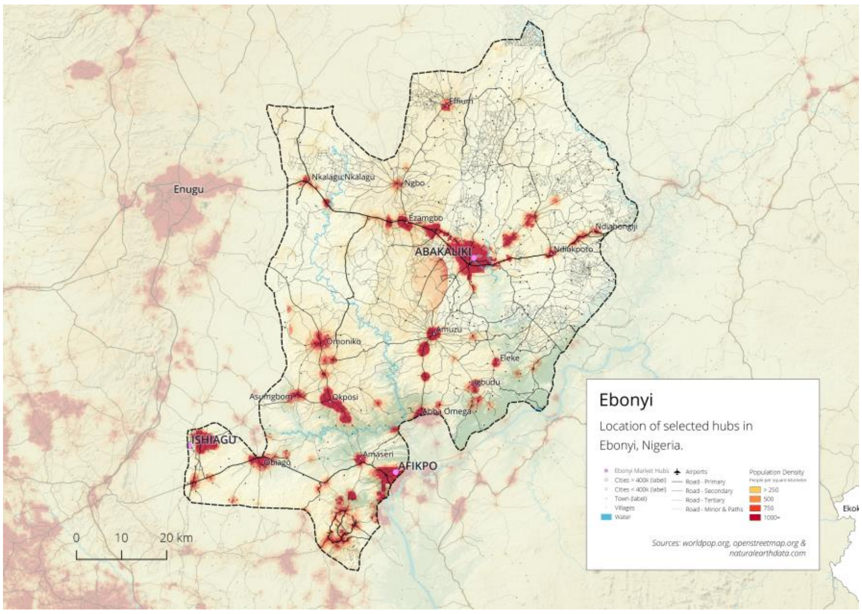
The market survey component of the FACT survey was designed to purposively sample retail outlets in each state. Market hubs are agglomerations (higher population density, e.g. city, town, village) where larger volumes of food products are sold or pass through and are dispatched to other places. Market hubs are located on the nodes of the main supply routes for different food vehicles; we can expect to find a wider variety of products in these hubs than in the places they supply. Places supplied from these hubs are expected to have the same or a selection of the variety of brands available in the market hub from which they are supplied.

The selection of market hubs was based on the following criteria: population size and density, geography and road networks. Market hubs located in areas of high population density and at intersection of roads used to dispatch the food vehicles from production or import sites towards populated areas were prioritised. Based on the above criteria, six market hubs were selected in Sokoto and three market hubs were selected in Ebonyi. Figure 2 shows the location of all markets hubs selected in each state.

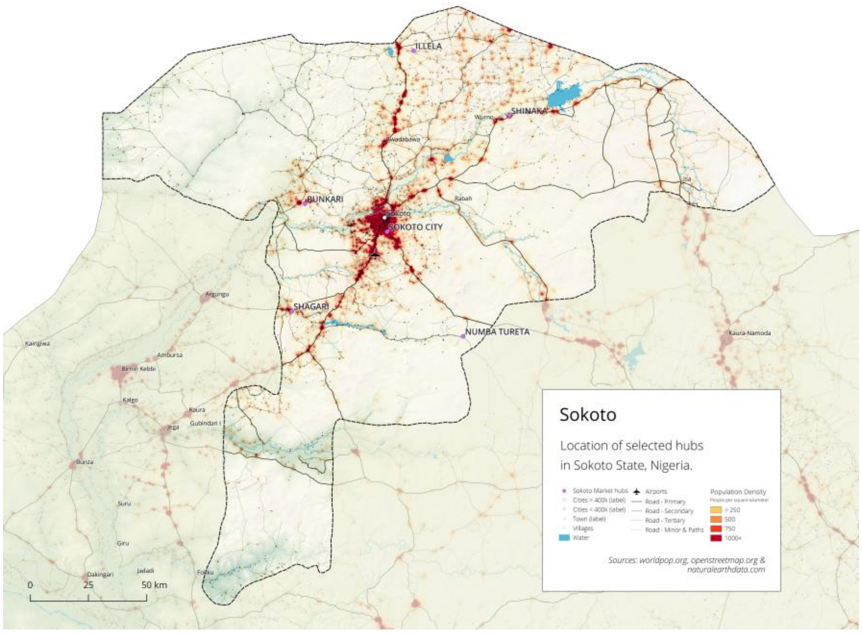
Within each market hub, up to five main marketplaces were selected, with a marketplace being defined as a large concentration of all types of retail outlets in a large geographic area within the market hub that allows buyers and sellers of the food vehicle to interact. From the selected list of marketplaces, a number of retail outlets (wholesale, retail or supermarket) that sold at least one of the six food vehicles of interest were visited.

Figure 2 Location of market hubs in Ebonyi and Sokoto

A. Ebonyi



B. Sokoto



4.3.2 Data collection

The market survey took place between 12 May and 2 June 2017 and was implemented by two teams, one in each state. Each team consisted of senior researchers, who were closely monitored by the survey director. The market survey teams collected data from each market hub sequentially in each state, starting with Sokoto and later on moving to Ebonyi. Key informant interviews were first undertaken in each market hub to obtain a list of the total number and type of marketplaces available in each hub. From this list of marketplaces, retail outlets (wholesale, retail or supermarket) that sold at least one of the six food vehicles of interest were identified. Upon visiting each marketplace, a scoping exercise was conducted to understand the market structure in terms of the arrangement of shops within the market and a local guide was recruited to facilitate ease of access to shops and ensure retailers' collaboration. In each retail outlet visited, available brands were registered.

In order to determine the fortification quality of available brands, specimens of each registered brand were collected and sent to a laboratory for analysis of their micronutrient content. In order to ensure sufficient variability, the teams were asked to collect a total of 12 specimens per brand (ideally from different batches). The target number of specimens collected was achieved through specimen collection across multiple market hubs across both states. Note that some specimens were collected in Abuja upon completion of data collection in market hubs (in case the teams did not manage to find 12 specimens from different batches in either Ebonyi or Sokoto). A detailed protocol was prepared to ensure systematic collection, transport and storage of food specimens.

The main survey tool was a market questionnaire, which included registering brands available in the visited retail outlets and registering the food specimens that were collected from the retail outlets (see market questionnaires in Annex 4). Table 2 summarises the components of the market questionnaire. All specimens collected were purchased from retail outlets.

Table 2 Components of the market questionnaire

Component	Description
Marketplace form	One form per market hub. There were up to five marketplaces identified per market hub, or as few as one. All retail outlets visited were listed.
Brand registration form	One form per food vehicle per retail outlet type in a given market hub. These forms include unique brand identification numbers.
Specimen registration form	One form per food vehicle per market hub. These forms include unique specimen identification numbers.

Specimens were stored in hotel rooms at under the recommended temperature and secured from direct sunlight throughout the duration of the data collection. After all market hubs had been visited in each state, specimens were sent to the OPM office, where they continued to be stored in a temperature-controlled room until shipment to a laboratory in Germany for analysis.

4.3.3 Training and data quality assurance

Training for the market survey took place on 26 April and 9 May 2017. The main objective of the training was to ensure that team members had mastered the instruments and could understand and correctly implement survey protocols, and comfortably use CAPI. Special emphasis was put on brand registration, specimen collection and labelling protocols.

Several data quality assurance mechanisms were put in place throughout the survey implementation to ensure high quality data:

1. The survey was implemented by a small team of senior researchers, who were closely monitored by the survey director.

2. The survey was implemented in market hubs sequentially – no two hubs were done at the same time. This allowed the team to ensure that there were no brand duplicates

within a retail outlet type in a given market hub. It also enabled the team to track the total number of unique specimens collected per brand accurately to ensure that the 12 specimens collected per brand were indeed from different batches of production.

3. The market survey team sent data and briefing notes to the central data management unit at the completion of the data collection at a market hub. Both data and notes were reviewed by the central survey team to ensure survey protocols were being followed and challenges were appropriately addressed.

4. To ensure correct labelling of food specimens, adhesive labels printed with pre-filled information were used. Each label had its own unique ID and there was a set of IDs for each food vehicle.

5. Validations and consistency checks were built into the CAPI software for the market survey to maintain data quality.

6. All interviews at retail outlets were conducted by two interviewers so that one interviewer could conduct the interview and code responses while the other collected and labelled the specimen.

4.4 DATA MANAGEMENT AND ANALYSES

4.4.1 Data processing, cleaning and storage

Data collected were transferred electronically from CAPI by the supervisors to the data processing staff at the OPM office daily. At the end of each day, supervisors uploaded the data and synchronised it with the main server. The OPM data management team was responsible for conducting a daily analysis of errors on the interviews completed to date, such as inconsistencies and gross outliers. Additionally, a dashboard for monitoring the progress of data collection and enumerator performance was developed using the PowerBi visualisation tool, and updated and reviewed daily. Any errors or performance issues identified were communicated to the state coordinators and supervisors for immediate action.

The electronic data collection system allowed for a large proportion of the data cleaning to be carried out alongside the data collection, thereby increasing efficiency and enabling quick identification of any issues with the data so these could be remedied while the team was in the field.

Additional cleaning took place at the end of data collection and included formatting the datasets, labelling the variables, assigning unique identification numbers to households, and adding any other necessary parameters. Three clean raw datasets were produced: a household roster dataset; a household questionnaire dataset; and a market survey dataset.

All data collected from the survey were stored on computers at OPM and backed up on a secure central data base. At the end of data collection and before delivery to the data analysis team, the data manager anonymised the household and market data.

4.4.2 Data analyses

Data were analysed using STATA software (version 14.2). Descriptive statistics are presented as mean (95% confidence interval), percentage (95% confidence interval) or median (25th percentile, 75th percentile). Results are presented by state. All analyses were population weighted, where appropriate (see Annex 5 on how sampling weights were calculated). This was necessary to account for the sampling strategy because, although the units of analysis (households and children) were randomly sampled, they were not sampled with equal probability and so un-weighted averages might have been misleading. For the disaggregation by risk factors, a t-test was used to assess significant difference between groups, and significance below 5% level was reported for all means/proportions over the disaggregating variable.

4.5 DEFINITIONS OF KEY INDICATORS

4.5.1 Indicators of risk

Six indicators of risk associated with poor micronutrient intakes were used to assess the relationship between coverage and micronutrient contribution, and vulnerability. The risk indicators were:

- At risk of poverty – This is defined according to the **multi-dimensional poverty index (MPI)**. The MPI is a composite indicator constructed from indicators on living standards, education, and health and nutrition; a household is classified as at risk of poverty if the MPI score is greater than or equal to 0.33 (Alkire and Santos, 2014).

- Low socio-economic status (Demographic Health Survey (DHS) wealth quintiles) – This is defined according to the **DHS Wealth Index** used in the Malaria Indicator Survey (MIS) 2015 survey in Nigeria (Nigeria Malaria Indicator Survey, 2015). The DHS index is a composite measure of a household's cumulative living standards and is constructed using Principal Component Analysis calculated using data on a household's ownership of selected assets, materials used for housing construction, and types of water access and sanitation facilities. The index in this survey was built by replicating the national index construction as per the MIS 2015, i.e. using the same variables and same weights for each variable. Households were then divided into wealth quintiles using the national cut-offs from the MIS 2015 analysis to be able to compare our survey sample to the national distribution. A household was classified as having low socio-economic status if it fell into the two lowest wealth quintiles using the MIS 2015 cut-offs[1].

- Household food insecurity – This is defined according to the **Household Hunger Scale (HHS)**. The HHS captures household reactions to the experience of food deprivation or insecurity in a score on a scale from 0 to 6. The HHS instruments and scoring were adapted from Deitchler et al. (2010) and Ballard et al. (2011). A household was classified as being food insecure if it had moderate or severe household hunger according to the HHS.

- Low women's dietary diversity – This is defined according to the **minimum dietary diversity for WRA** (MDD-W). A household is classified as having low dietary diversity if the selected caregiver is a WRA who did not meet the MDD-W, meaning she consumed foods from fewer than five food groups out of 10 the previous day (FAO and FHI 360, 2016). The 10 food groups include grains (white roots and tubers and plantains); pulses (beans, peas and lentils); nuts and seeds; dairy; meat, poultry and fish; eggs; dark green leafy vegetables; other vitamin A-rich fruits and vegetables; and other vegetables and other fruits.

[1] A household has low SES if its DHS wealth score is <-0.4.

- Poor infant and young child feeding (IYCF) practices – This is defined according to the **Infant and Child Feeding Index (ICFI)**, which is an age-specific score calculated as a sum of the age-specific breast-feeding score, the age-specific meal frequency score and the age-specific dietary diversity score (Guevarra et al., 2014). A household is classified as having poor IYCF practices if the selected child has an ICFI score less than 6.

4.5.2 Indicators of coverage

Three indicators of coverage were defined according to the Tanahashi coverage framework (Tanahashi, 1978; Aaron, GJ et al., 2017) and reported as the proportion of households meeting the criteria out of the total number of surveyed households:

1. **Consumption** of the food vehicle – the household consumes the food vehicle at home;

2. Consumption of the **fortifiable** food vehicle – the food vehicle used by the household is processed industrially and hence is well suited to large-scale fortification; and

3. Consumption of the **fortified** food vehicle – the food vehicle used by the household is fortified (i.e. it contains any content of added nutrients above the intrinsic levels). Households are classified as consuming a fortified or non-fortified food vehicle based on linking the reported brand to the results of the laboratory analyses of food specimens analysed from that brand. Households for which a brand could not be determined were classified as unknown fortification status in the analyses. For more information on analysis of micronutrients see section 4.5.4.

4.5.3 Indicators of consumption and micronutrient contribution

The daily amount of fortifiable food vehicle consumed per individual was estimated and used in conjunction with the micronutrient content results to determine the micronutrient contribution (as a percentage of the estimated average requirements (EAR) values for iodine and vitamin A, and as a percentage of the recommended dietary allowance (RDA) for iron) coming from consumption of fortified foods among children under five and WRA.

Consumption:
For all food vehicles (except for wheat and semolina flour), the daily apparent food consumption per individual household member was determined using the adult male equivalent method (AME) (Weisell and Dop, 2012). At the household level, the daily quantity of the particular food vehicle consumed was estimated based on the reported quantity purchased and the duration it lasted in the household. Each member of the household was assigned an age- and sex-specific AME and the AMEs were summed together to calculate a household AME. Each individual AME was divided by the household AME and then multiplied by the quantity of food vehicle consumed by the household to calculate the quantity in grams of the food vehicle consumed per day per individual household member. Individuals from households that reported not usually consuming the food vehicle were assigned zero for grams consumed per day.

For wheat and semolina flour, an individual assessment of the frequency and quantity of foods prepared from fortifiable wheat and semolina flour consumed in the past seven days was conducted to quantify the total daily wheat and semolina flour consumed from all sources using a semi-quantitative food frequency questionnaire (FFQ). This method was selected because the majority of people consume prepared wheat and semolina flour products made outside the household (e.g. bread) and thus better reflects the total daily flour intake compared to the AME method. The respondent was asked to report whether s/he and the child had consumed any of the 20 foods containing wheat/semolina flour on a pre-determined list in the last seven days. For foods they consumed, the frequency was asked and the typical portion size eaten in one sitting was estimated using a photo album for each food (see example in Annex 3). The grams of flour in each portion size reported being consumed was multiplied by the frequency of consumption to estimate the intake of flour for the individual per week; this was then divided by seven to calculate intake per day. A cumulative total of flour consumed in grams per day was obtained by summing all food items containing flour for the individual per day. For any of the 20 foods an individual did not consume, the grams consumed for that food item were assigned a zero.

Micronutrient contribution:
For the mandatorily fortified food vehicles (i.e. salt, sugar, oil, wheat flour, maize flour, and semolina flour), the quantity of food vehicle consumed (in grams/day per person) was used to estimate the amount of micronutrient consumed daily by multiplying it by a fortification exposure level. For actual estimates, each household was assigned a micronutrient content for each food vehicle using a hot deck imputation approach whereby one of the average nutrient values from all available brands found in the market in a particular state was randomly allocated to a household in that state so as to recreate in the household population the same distribution of fortification value as found in the market survey (see Annex 6 for more details). This approach was selected due to the high number of households in which a brand was unknown. For modelled estimates, all households were assigned a theoretical target average micronutrient content for each food vehicle estimated assuming 20% coefficient of variation and 90% compliance from the minimum national standard requirement.

The amount of micronutrient consumed daily was then expressed as a percentage of the EAR or RDA among the population groups, accounting for the combined micronutrient intake from all fortified foods containing those nutrients. Percentage of EAR was used for iodine and vitamin A because it allows for comparison to the EAR cut-point method, which is recommended to be used when setting goals and evaluating the impact and safety of fortification for these nutrients (WHO and FAO, 2006). The EAR cut-point approach is not recommended for estimating prevalence of inadequate iron intakes among children and WRA because their requirements are not normally distributed; therefore, the percentage of RDA was estimated as an alternative for presenting the iron contribution coming from the fortified foods. EAR and RDA values were taken from the Institute of Medicine Dietary Reference Intakes (Food and Nutrition Board, 2001).

4.5.4 Analysis of micronutrients in food vehicles

Food specimens collected from markets were shipped to a reference laboratory in Germany for analyses. Fortification content was determined for each food vehicle brand by laboratory analyses of micronutrient content in the food specimens.

For oil, sugar and salt, brand-specific composite samples were created by pooling individual samples from the same brand and quantitative analyses were conducted using iCheck Fluoro and iCheck Chroma 3 to determine vitamin A content in oil and sugar, respectively, and iCheck Iodine to determine iodine content in salt.

For wheat, semolina and maize flours, first qualitative analyses of individual samples were conducted using the iron spot test (AACC 4040) to determine the presence of added iron. Then brand-specific composite samples were created by pooling individual samples from the same brand that tested positive for added iron in the spot test and quantitative analyses were conducted using atomic absorption spectrometry (ICP-MS – DIN EN 15763, mod by SGS Fresenius) to determine total iron content. An additional composite sample for each type of flour was created using all individual samples that tested negative in the spot test. Negative composite samples were similarly analysed to estimate total intrinsic iron content by type of flour. To determine the average added iron amount in each type of flour, the intrinsic amount of iron found in the unfortified composite samples was subtracted from the total iron found in the fortified composite samples. See Annex 7 for further details on laboratory analyses.

4.6 ETHICAL CONSIDERATIONS

Ethical approval to conduct the survey was obtained from the National Health Research Ethics Committee of Nigeria on 20 March 2017 (Ebonyi State: ERC/EB/31/019; Sokoto State: SMH/1580/V.IV). Verbal consent to carry out the survey was obtained from all respondents. Respondents were informed of the nature of the study and what would be required of them as study participants; they were also given an indication of the time that would be required to complete the survey (see second page of household questionnaire in Annex 1).

All personal data collected as part of this survey are stored securely within the OPM office, are only available to authorised individuals for analytical purposes and are handled in accordance with data protection best practices. Each respondent was assigned a unique identifier that was used to analyse the data. All anonymised data related to this survey will be made publicly available.

4.7 LIMITATIONS TO THE SURVEY

This section presents limitations to the survey design and implementation.

1. Ebonyi and Sokoto states were purposively selected for the implementation of the survey and are not representative of all states in the country or region. Therefore, generalisations of the results in these states to other regions are not appropriate.

2. Results are not representative of the entire population of households in each state or of WRA, but rather of households with at least one child under five. This is due to the specific sampling strategy deployed for this survey. The sampling strategy aimed at randomly selecting children under five in the randomly selected households and then interviewing the child's caregiver. This was based on the assumption that the majority of caregivers would be WRA; however, WRA were not randomly selected through the process.

3. Market hubs sampled were not in all selected PSUs due to cost and time limitations, and in the interest of using a standardised method that could be repeated independently from a household survey; therefore, availability results may not be representative of all food vehicle brands available in each PSU.

4. Due to the nature of many of the retail marketplaces in both surveyed states, whereby these food vehicles (salt, sugar, oil, and flours) are purchased in bulk containers by vendors to be repackaged and sold to consumers in smaller quantities, some of the brand specimens were collected from already opened containers and therefore may have been exposed to heat and sunlight before collection. By contrast, other specimens, particularly for brands predominantly sold in supermarkets, were collected from sealed packages at the point of retail. Since nutrients are sensitive to heat and

light, the conditions under which some specimens were collected may have affected the results of laboratory analysis.

5. We did not randomly sample markets and, due to cost and time constraints, could not visit small markets closest to the surveyed households. As such, while the list of brands found in the market is exhaustive for those markets visited, it may not have captured all brands found throughout the state. In addition, the risk of seasonality of production for some food vehicles may have affected the results of brand presence.

6. No information on market share of the identified food vehicle brands present in the market was available at the time of the surveys. As a result, it was not possible to identify which are the major brands that make up a large market share and should be targeted to ensure they are fortifying appropriately to have the highest availability of fortified foods in the market and potential coverage at household level.

7. Use of iCheck for the determination of vitamin A in oil may have produced unreliable results.

8. The added iron levels for wheat, semolina and maize flour were based on the nutrient content in samples confirmed to have added iron (via the iron spot test) less an estimate of intrinsic iron based on analysis of unfortified flours of various types. However, the intrinsic iron content of flour can change from growing season to growing season based on the crop variety grown, the soil it was grown in, fertiliser application and other factors. The intrinsic iron identified during this survey may vary from the intrinsic content measured at another time.

9. The coverage indicator for consumes fortified food was based on the fortification status of the brand reported as most recently obtained in the household, which is subject to recall bias and may not be indicative of the usual brand used in the household. Furthermore, many households were not able to report a brand for certain food vehicles, resulting in a high proportion of households with unknown fortification status when attempting to link the reported brand used in the household to the results of the laboratory analyses of food specimens from that brand collected from markets; therefore, this indicator may be underestimated. Food samples were not taken from households, and therefore the actual micronutrient content at this level is unknown.

10. When calculating the actual micronutrient contribution from fortified foods the household was assigned a fortification exposure level using an imputation method. This method recreates the same distribution of nutrient values found in the market survey among households in each state, but may not accurately reflect the actual fortification content in foods consumed in the household.

11. The AME method used to estimate intake of all food vehicles (except wheat and semolina flour) is an indirect approach that assumes homogenous intra-household food distribution in the household based on the person's AME number, which depends on age, sex and physiological status. Additionally, the individual food frequency recall method used to estimate intake of wheat and semolina flour has not yet been validated. Both methods are subject to recall bias.

5. Results

This section presents key results from the FACT survey in Ebonyi and Sokoto states. It begins by presenting survey response rates, background characteristics of the survey population (Sections 5.1 and 5.2), and fortification logo awareness among the survey population (Section 5.3). It then reports results from the market survey on the presence of brands in the market for each of the six mandatorily fortified food vehicles (Section 5.4) and the brand fortification contents (Section 5.5). Next, it presents the household coverage indicators of food vehicles, by state and disaggregated by risk factor (Section 5.6). Finally, it presents the consumption of fortified foods and corresponding micronutrient contribution indicators (Section 5.7 and 5.8)

5.1 SURVEY RESPONSE RATES

Attainment of the target sample size was high in both states, with a response rate of 99.2% in Ebonyi and 99.8% in Sokoto (Table 3). In summary, 610 out of the required 615 households in Ebonyi and 614 out of the required 615 households in Sokoto were interviewed.

Table 3 Response rate for the survey, Ebonyi and Sokoto, Nigeria, 2017

	Ebonyi	Sokoto
Planned households, n	615	615
Interviewed households, n	610	614
Response rate, %	99.2	99.8

The high response rate was achieved through replacement. In total, 214 out of the originally sampled 1,230 households were replaced according to the survey protocol. This was mainly due to the household being unavailable or because there was no child under five in the household, making it ineligible for inclusion in the survey. The survey team was unable to locate nine households either because the dwelling was not found or was uninhabited. There were 12 cases where a household either refused to participate or refused to continue once the survey had started (Table 4).

The actual sample size fell short of the required sample size because in four EAs in Ebonyi and in one EA in Sokoto the required target of 15 households could not be attained. In these EAs, the survey teams were unable to find 15 households to interview even after exhausting the replacement household list. In some of these EAs, households were unavailable as they mostly resided in neighbouring cities and only returned to their villages for special occasions, while in one of the EAs the village had recently suffered a land conflict crisis and most residents had been displaced to other locations.

Table 4 Reasons for replacement of households, Ebonyi and Sokoto, Nigeria, 2017

Reason for replacement	Number of households	Share of households (%)
Household refused to participate	7	3.3
Household refused to continue after starting the interview	5	2.3
Household ineligible (i.e. no child under five)	67	31.3
Household unavailable	126	58.9
Dwelling not found	6	2.8
Dwelling not inhabited	3	1.4
Total	214	100

5.2 SURVEY POPULATION CHARACTERISTICS

5.2.1 Demographics

Table 5 presents the demographic characteristics of the sampled households. The median household size was 6 in Ebonyi and 7 in Sokoto, with 1.3 dependents, on average, for every working-aged person in a household in both states. Most households were headed by a male: only 11% of households in Ebonyi and less than 1% in Sokoto were female-headed. The mean age of a child included in this study was between 28 and 29 months (i.e. two and three years of age). The mean age of caregivers was 32 years in Ebonyi and 29 years in Sokoto. Caregivers in Sokoto tended to have fewer years of education, with only 13% of caregivers having five or more years of education, compared to 82% of caregivers in Ebonyi.

Table 5 Household and demographic characteristics of the survey sample, Ebonyi and Sokoto, Nigeria, 2017[1]

Variable	Ebonyi N = 610	Sokoto N = 614
Household		
Household size (n), median	6.0 (5.0, 8.0)	7.0 (5.0, 10.0)
Household dependency ratio, median[2]	1.3 (1.0, 2.0)	1.3 (1.0, 2.0)
Female-headed household, %	10.8 (7.8, 13.8)	0.6 (0.0, 1.1)
Age of household head (years), mean	46.2 (45.1, 47.3)	42.9 (42.1, 43.7)
Caregiver		
Age (years), mean	32.4 (31.4, 33.5)	29.2 (28.5, 29.8)
≥ Five years education, %	82.4 (78.2, 86.5)	13.2 (8.3, 18.1)
Child		
Age (months), mean	28.4 (26.7, 30.0)	29.2 (27.6, 30.7)
Sex female, %	45.9 (41.5, 50.3)	50.5 (45.3, 55.8)

[1] All values are mean/percentage (95% confidence interval) or median (25th, 75th percentile) as indicated, and are weighted to correct for unequal probability of selection.

[2] Household dependency ratio = number of household members below 15 years of age and above 64 years of age/number of household members between 15 and 64 years of age.

5.2.2 Indicators of risk

Poverty

Table 6 shows the number of households at risk of acute poverty in Ebonyi and Sokoto along with the different components of the MPI. The risk of poverty was higher in Sokoto (76%) compared to Ebonyi (33%). Households had low levels of access to key living standard components, such as no access to electricity (62% in Ebonyi and 60% in Sokoto), unimproved sanitation (93% in Ebonyi and 75% in Sokoto), unsafe drinking water sources (66% in Ebonyi and 77% in Sokoto), inadequate flooring (52% in Ebonyi and 56% in Sokoto) and inadequate cooking fuel (93% in Ebonyi and 79% in Sokoto).

The level of deprivation along the education component was more severe in Sokoto than in Ebonyi. While only 14% of households in Ebonyi had at least one child of school age not attending school, the figure was 61% of households in Sokoto. Similarly, only 4% of households in Ebonyi had no members of the household with greater than five years of education, while in Sokoto the figure was 50% of households.

The level of deprivation on the health component was high in both Ebonyi and Sokoto. In Ebonyi, 13% of households lost at least one child under five years of age in the last five years and in Sokoto 22% had experienced the same. Mid-upper arm circumference (MUAC) measurements revealed that 6% and 19% of children or caregivers were malnourished in Ebonyi and Sokoto, respectively.

Table 6 Multidimensional poverty index and its component indicators, Sokoto and Ebonyi, Nigeria, 2017[1]

Variable	Ebonyi N = 610	Sokoto N = 614
At risk of poverty[2]	32.8 (27.5, 38.5)	76.0 (67.2, 83.0)
Living standard component		
No electricity	61.5 (52.5, 69.8)	60.0 (48.6, 70.5)
Unimproved sanitation[3]	93.2 (89.6, 95.7)	74.6 (66.5, 81.2)
Unsafe drinking water source[4]	65.6 (57.6, 72.9)	76.9 (68.0, 83.9)
Inadequate flooring[5]	51.5 (44.0, 59.0)	56.3 (46.8, 65.3)
Inadequate cooking fuel source[6]	93.2 (87.1, 96.6)	78.5 (70.3, 85.0)
Fewer than two key assets and no car/truck[7]	18.7 (15.6, 22.3)	22.5 (18.4, 27.3)
Education component		
At least one child (5–14 years old) not currently attending school	13.6 (10.2, 17.9)	60.6 (55.0, 65.9)
No member aged 10 years or older has completed five years of school	4.4 (2.7, 7.1)	50.3 (41.1, 59.4)
Health and nutrition component		
At least one child born in the last five years has died	12.8 (10.3, 15.9)	22.1 (17.6, 27.2)
Caregiver or child is malnourished[8]	5.6 (3.8, 8.2)	19.4 (16.0, 23.4)

[1] All values are percent (95% confidence interval) and weighted to correct for unequal probability of selection.
[2] Households with multi-dimensional poverty score ≥ 0.33.
[3] The household does not have access to an improved sanitation facility, i.e. a flush toilet or latrine, a ventilated improved pit or composting toilet, or it is improved but shared with other households.
[4] The household does not have access to safe drinking water, i.e. piped water, public tap, borehole or pump or tube well, protected well, protected spring, or safe drinking water is more than a 30-minute round-trip walk from home.
[5] The household has an earth, sand or dung floor.
[6] The household cooks with dung, wood, coal or charcoal.
[7] From an asset list including: radio, television, mobile/non-mobile phone, bicycle, motorcycle, refrigerator, and/or car or truck.
[8] Mid-upper arm circumference of female caregiver <230 mm or of child under six months <115 mm or child six months or older <125 mm.

Socio-economic status

Table 7 presents the distribution of households by wealth quintile, as defined by the DHS wealth index. There were more households in the lowest two quintiles of the wealth distribution in Sokoto (73%) than in Ebonyi (50%). In Ebonyi, 22% of households were in the highest two quintiles, while in Sokoto the equivalent figure was 14%.

Table 7 Demographic health survey wealth index, Ebonyi and Sokoto, Nigeria, 2017[1]

Variable	Ebonyi N = 610	Sokoto N = 614
Low socio-economic status[2] %	50.3 (42.9, 57.7)	73.0 (63.2, 81.0)
Distribution of households by wealth quintile		
Lowest, %	22.2 (18.0, 27.1)	37.0 (28.7, 46.1)
Second, %	28.1 (23.0, 33.8)	36.0 (30.0, 42.5)
Middle, %	27.8 (23.2, 32.8)	13.2 (9.2, 18.6)
Fourth, %	16.2 (12.4, 20.9)	6.8 (4.0, 11.4)
Highest, %	5.7 (3.2, 10.0)	6.9 (3.6, 12.9)

[1] All values are percent (95% confidence interval) and weighted to correct for unequal probability of selection.
[2] Lowest two wealth quintiles.

Women's dietary diversity

As shown in table 8, median dietary diversity score for WRA was lower in Ebonyi compared to Sokoto, 5 and 6 food groups out of ten the previous day, respectively. Overall, 32% of WRA in Ebonyi did not meet the minimum dietary diversity score of 5, while in Sokoto the equivalent figure was 26%.

Furthermore, the consumption of vitamin A-rich, plant-based foods (dark leafy greens and other vitamin A rich fruits and vegetables) is high in both states (98% and 87% in Ebonyi and Sokoto, respectively). However, a bigger difference was seen in the consumption of vitamin A-rich animal source foods (dairy, organ meat or eggs): 64% in Sokoto compared to only 29% in Ebonyi. By contrast, consumption of iron-rich foods (meat, fish or poultry) was higher in Ebonyi (88%) compared to Sokoto (46%). The proportion of WRA consuming zinc-rich foods (flesh or organ meat) was similar between the two states (46% and 40% in Ebonyi and Sokoto, respectively).

Table 8 Minimum dietary diversity score for women of reproductive age (MDD-W) and its components, Sokoto and Ebonyi, Nigeria, 2017[1]

Variable	Ebonyi N = 514	Sokoto N = 592
Dietary diversity score,[2] median	5.0 (4.0, 6.0)	6.0 (4.0, 7.0)
Did not meet MDD-W,[3] %	31.7 (25.5, 38.6)	26.0 (20.8, 31.9)
Plant sources of Vitamin A,[4] %	97.6 (95.9, 98.5)	86.7 (81.7, 90.4)
Animal sources of Vitamin A,[5] %	28.9 (24.1, 34.2)	63.6 (58.0, 68.8)
Iron-rich foods,[6] %	88.2 (88.2, 91.8)	46.2 (40.6, 51.9)
Zinc-rich foods,[7] %	46.0 (41.1, 51.0)	40.1 (34.7, 45.8)

[1] All values are median (25th, 75th percentiles) or percent (95% confidence interval) as indicated and weighted to correct for unequal probability of selection.
[2] Median score based on a score of ten food groups consumed the previous day: 1) grains, white roots and tubers, and plantains; 2) pulses (beans, peas, and lentils); 3) nuts and seeds; 4) dairy; 5) meat, poultry, and fish; 6) eggs; 7) dark green leafy vegetables; 8) other vitamin A-rich fruits and vegetables; 9) other vegetables; and 10) other fruits.
[3] Consumed less than five out of ten food groups the previous day.
[4] Consumed dark green leafy vegetables or other vitamin-A rich fruits and vegetables.
[5] Consumed dairy, organ meats or eggs.
[6] Consumed flesh meat, organ meat or fish.
[7] Consumed flesh meat or organ meat.

Infant and young child feeding practices

As shown in Table 9, IYCF practices were poor for 80% of children under five years of age in Ebonyi and 56% in Sokoto. For children less than 6 months, this indicator is derived from exclusive breastfeeding rates, which were 44% and 9% in Ebonyi and Sokoto, respectively. For children 6-23 months and 24-59 months, this indicator is derived from an infant and child feeding index (ICFI) score based on age-appropriate continued breastfeeding and/or dietary diversity and meal frequency. According to the index, 23% and 44% of children 6-23 months and 16% and 49% of children 24-59 months were appropriately fed in Ebonyi and Sokoto, respectively.

Table 9 Infant and young child feeding practices and its components, Sokoto and Ebonyi, Nigeria, 2017[1]

Variable	Ebonyi	Sokoto
All children 0–59 months	***N = 610***	***N = 614***
Poor infant and young child feeding practices,[2] %	79.3 (75.2, 82.8)	56.3 (49.8, 62.6)
Children <6 months	***N = 52***	***N = 60***
Exclusively breastfed, %	44.4 (NA)	9.0 (NA)
Children 6–23 months	***N = 220***	***N = 195***
Infant and child feeding index (ICFI) score, median	5.0 (NA)	5.0 (NA)
ICFI score[3] = 6, %	23.2 (NA)	43.6 (NA)
Currently breastfed, %	64.0 (NA)	82.9 (NA)
Dietary diversity component score[4] ≥ 2, %	69.4 (63.1, 75.7)	72.8 (65.2, 80.4)
Meal frequency component score[5] ≥ 2, %	84.3 (77.9, 90.6)	84.8 (78.7, 90.8)
Children 24–59 months	***N = 338***	***N = 359***
ICFI score, median	4.0 (NA)	5.0 (NA)
ICFI score = 6, %	15.9 (NA)	49.1 (NA)
Dietary diversity component score = 3, %	30.3 (24.1, 36.4)	53.6 (45.2, 62.0)
Meal frequency component score ≥ 2, %	82.7 (76.9, 88.4)	98.9 (97.8, 99.9)

[1] All values are either median (25th, 75th percentile) or percent (95% confidence interval) as indicated, and are weighted to correct for unequal probability of selection. Confidence interval is not applicable (NA) when the sample size was too small to estimate or where there was only one enumeration area with data within a sampling stratum.
[2] Defined as non-exclusive breastfeeding for children under six months and an ICFI score of <6 for children 6–59 months.
[3] ICFI score = 6 is equivalent to good practice based on continued breastfeeding, increased dietary diversity and increased meal frequency based on child's age range.
[4] Good dietary diversity score based on child's age range (≥ 2 food groups for 6–8 months, ≥ 3 food groups for 9–11 months, ≥ 4 food groups for 12–23 months, and ≥ 5 food groups for 24–59 months).
[5] Good mean frequency score based on child's age range (≥ 2 times for 6–8 months, ≥ 3 times for 9–11 months, and ≥ 4 times for 12–59 months).

Household food insecurity

As shown in Table 10, 25% of households in Ebonyi and 12% of households in Sokoto experienced moderate or severe hunger as determined using the household hunger score.

Table 10 Household food insecurity, Sokoto and Ebonyi, Nigeria, 2017[1]

Variable	Ebonyi N = 610	Sokoto N = 614
Moderate or severe household hunger,[2] %	25.2 (21.0, 29.8)	12.2 (8.9, 16.3)

[1] All values are percent (95% confidence interval) and weighted to correct for unequal probability of selection.
[2] Household hunger score >1.

5.3 FORTIFICATION LOGO AWARENESS

Nigeria has fortification logos, one for vitamin A and one for iodine (shown in Figure 3). As presented in Table 11, 9% of households in Ebonyi and 6% in Sokoto reported ever seeing the vitamin A fortification logo. Out of the households that reported seeing the vitamin A logo, 47% in Ebonyi and 30% in Sokoto believed that the logo had a positive connotation (such as, “good for health”, “good quality”), and 58% and 44%, respectively, indicated that the logo motivated them to buy a food product. Few, if any, of the households reporting seeing the logo indicated that it discouraged them from buying a food product (0% and 3% in Ebonyi and Sokoto, respectively).

More households were aware of the iodine fortification logo compared to the vitamin A one: 13% in Ebonyi and 17% in Sokoto reported ever seeing the iodine fortification logo. Out of these households, 41% and 11% respectively reported that they thought the logo had a positive connotation, and 52% and 32% respectively reported that it influenced their decision to buy a food product. As with the results seen with the vitamin A logo, very few if any households said that it discouraged them from buying a food product (0% in Ebonyi, 1% in Sokoto).

Figure 3 Vitamin A and iodine fortification logos

Table 11 Proportion of households that know about the fortification logos, Sokoto and Ebonyi, Nigeria, 2017[1]

Variable	N	Ebonyi	N	Sokoto
Vitamin A fortification logo				
Reported ever seeing logo	610	8.9 (6.8, 11.7)	614	5.9 (3.6, 9.5)
Reported positive attributes of the logo[2]	55	46.9 (0.0, 0.0)	45	29.6 (0.0, 0.0)
Reported that logo influences decision to buy:	55		45	
Does not influence decision to buy		34.8 (NA)		50.8 (NA)
Motivates to buy		57.2 (NA)		43.8 (NA)
Discourages to buy		0.0 (NA)		2.8 (NA)
Don't know		8.1 (NA)		2.6 (NA)
Iodine fortification logo				
Reported ever seeing logo	610	12.7 (9.8, 26.2)	614	16.4 (12.4, 21.4)
Reported positive attributes of the logo	76	40.5 (NA)	111	10.9 (NA)
Reported that logo influences decision to buy:	76		111	
Does not influence decision to buy		28.7 (NA)		58.7 (NA)
Motivates to buy		52.2 (NA)		31.7 (NA)
Discourages to buy		0.0 (NA)		1.0 (NA)
Don't know		19.1 (NA)		8.6 (NA)

[1] All values are percent (95% confidence interval) and weighted to correct for unequal probability of selection. Confidence interval is not applicable (NA) when the sample size was too small to estimate.
[2] Reported that logo means “fortified/enriched/added micronutrients”, “good for health” or “better quality”.

5.4 BRAND PRESENCE IN THE MARKET

Table 12 presents the number of brands found per market hub for each food vehicle. Overall, six brands of salt, nine brands of sugar, 39 brands of oil, seven brands of wheat flour, five brands of maize flour and five brands of semolina flour brands were present in marketplaces across the two surveyed states. With a few exceptions, the most brands per food vehicle were found in each of the capital cities, Sokoto City and Abakaliki. Detail by type of retail shops and origin can be found in Annex 8

Table 12 Number of available brands by food vehicle and market hub, Ebonyi and Sokoto, Nigeria, 2017

State	Market hub	Number of available brands					
		Salt	Sugar	Oil	Wheat flour	Maize flour	Semolina flour
Ebonyi	Abakaliki (capital city)	2	4	16	2	1	2
	Afikpo	2	2	13	3	2	3
	Ishiagu	1	1	2	2	0	0
Sokoto	Sokoto City (capital city)	5	6	21	4	2	4
	Shinaka	3	2	7	3	0	1
	Illela	2	5	5	3	0	2
	Bunkari	0	1	6	3	0	0
	Shagari	1	1	7	3	0	0
	Numba Tureta	1	2	3	3	0	0
Total number of unique brands[1]		**6**	**9**	**39**	**7**	**5**	**5**

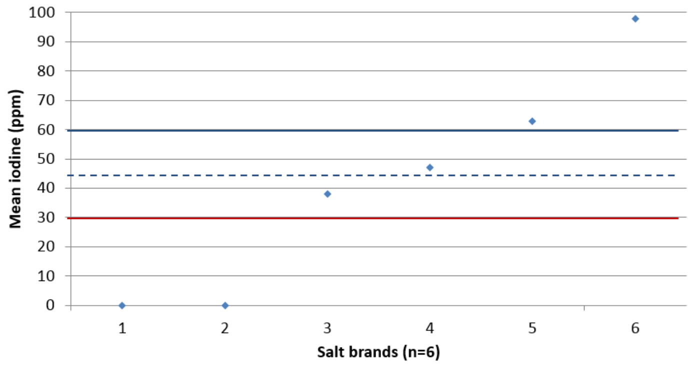
[1] The total number of brands found across all markets hubs does not equal the total number of unique brands because some brands were found across multiple market hubs.

5.5 MICRONUTRIENT CONTENT OF FOODS BY BRAND

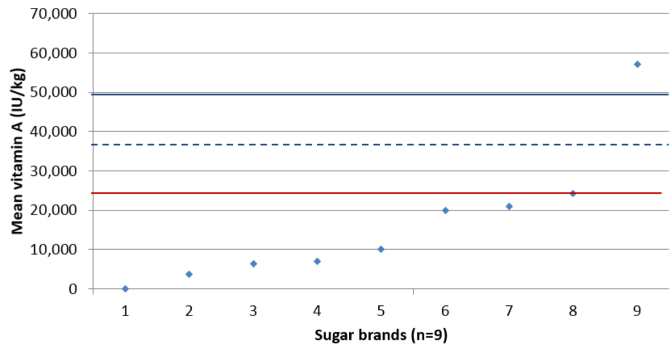
In this section, results of the micronutrient content of food vehicles by brand based on laboratory analyses of food specimens collected from markets are presented. Figure 4 shows, for each food vehicle brand, the average nutrient content compared to the minimum required nutrient content according to the Nigerian national standards and also compared to theoretical target average and maximum nutrient content assuming 20% coefficient of variance and 90% compliance based on the standard minimum requirement. For further detail on number of specimens analysed per brand and measured nutrient content per brand see Annex 8.

Figure 4 Micronutrient content of food vehicles by brand compared to Nigeria national standards, across both Ebonyi and Sokoto, Nigeria, 2017

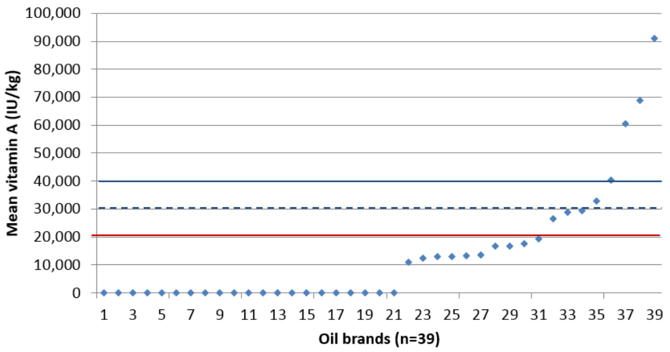
a. Salt



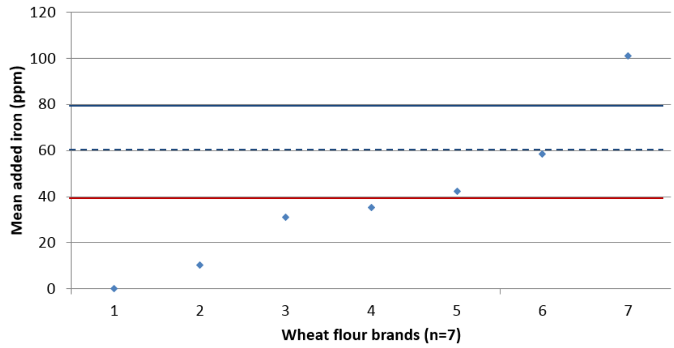
b. Sugar



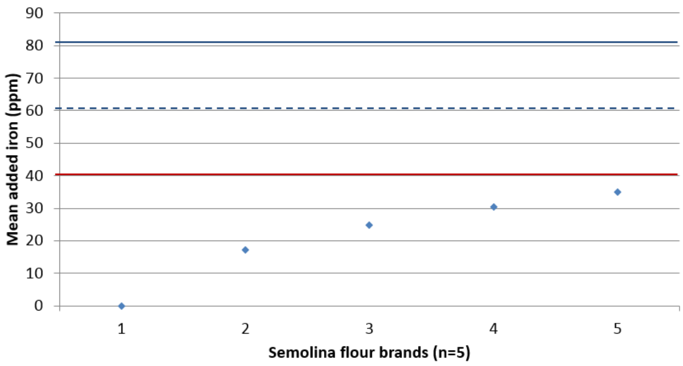
c. Oil



d. Wheat flour



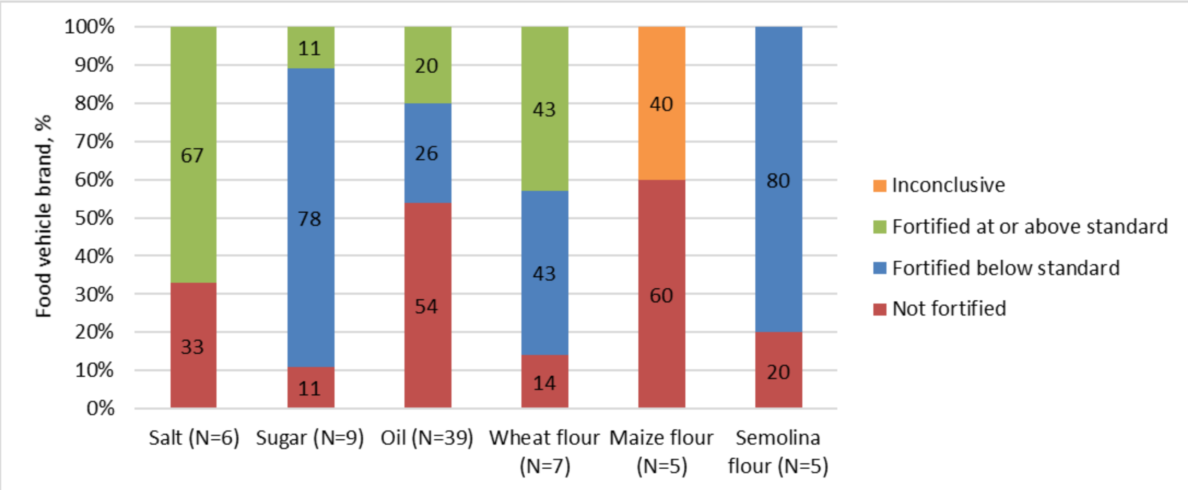
e. Semolina flour



The red solid line indicates the minimum mandatory micronutrient content according to the most recent Nigerian national standards: 20,000 IU/kg vitamin A in oil; 25,000 IU/kg vitamin A in sugar; 40 ppm added iron in wheat and semolina flour; and 30 ppm for iodine in salt. The blue dashed and solid lines indicate the theoretical average and maximum micronutrient content, respectively, assuming 20% coefficient of variance and 90% compliance based on the standard minimum.

Figure 5 summarises the results of the fortification content by brand for each food vehicle. Micronutrient content varied for each food vehicle. The results revealed that four brands (67%) of salt, eight brands (89%) of sugar, 18 brands (46%), six brands (86%) of wheat flour, and four brands (80%) of semolina flour were fortified to some extent. None of the maize flour brands were confirmed to be fortified at any extent. All four (67%) brands of salt were fortified in compliance with the mandated minimum national standard range for Nigeria (defined as a minimum amount for all food vehicles), while only one (11%) brand of sugar, eight (20%) brands of oil, 3 brands (43%) of wheat flour, and none of the brands of semolina flour met the minimum standard.

Figure 5 Fortification content of brands by food vehicle compared to Nigeria National Standards, Ebonyi and Sokoto, Nigeria, 2017



Fortification content was defined as follows: iodine in salt: not fortified (<5 ppm), fortified below standard (5 to <30 ppm), fortified at or above standard (≥30 ppm); vitamin A in sugar: not fortified (<1,650 IU/kg), fortified below standard (1,650 to <25,000 IU/kg), fortified at or above standard (≥25,000 IU/kg); vitamin A in oil: not fortified (<10,000 IU/kg), fortified below standard (10,000 to <20,000 IU/kg), fortified at or above standard (≥20,000 IU/kg); and added iron in wheat, maize and semolina flours: not fortified (negative iron spot test), fortified below standard (>0 to <40 ppm), fortified at or above standard (≥40 ppm).

As shown in Table 13, the fortification content also varied by place of production (imported versus local), with more local brands being fortified than imported brands. All salt and wheat flour brands fortified at or above the national standard were locally produced with the remaining not fortified brands being imported. For oil, 18 brands (46%) were fortified to some extent, of which 11 (28%) were locally produced. For sugar, the only brand that was not fortified was imported, while the remaining imported (1) and locally produced (7) brands were all fortified to some extent. None of maize or semolina flour brands found were imported.

Table 13 Fortification content of brands by source of production, Ebonyi and Sokoto, Nigeria, 2017[1]

	Imported				Local			
Food vehicle	Not fortified	Fortified below standard	Fortified at or above standard	Total	Not fortified	Fortified below standard	Fortified at or above standard	Total
Salt	2	0	0	2	0	0	4	4
Sugar	1	1	0	2	0	6	1	7
Oil	18	4	2	24	3	5	6	14
Wheat flour	1	0	0	1	0	3	3	6
Maize flour	0	0	0	0	5	0	0	5
Semolina flour	0	0	0	0	1	4	0	5

[1] Fortification content was defined as follows: iodine in salt: not fortified (<5 ppm), fortified below standard (5 to <30 ppm), fortified at or above standard (≥30 ppm); vitamin A in sugar: not fortified (<1,650 IU/kg), fortified below standard (1,650 to <25,000 IU/kg), fortified at or above standard (≥25,000 IU/kg); vitamin A in oil: not fortified (<10,000 IU/kg), fortified below standard (10,000 to <20,000 IU/kg), fortified at or above standard (≥20,000 IU/kg); and added iron in wheat, maize and semolina flours: not fortified (negative iron spot test), fortified below standard (>0 to <40 ppm), fortified at or above standard (≥40 ppm).

5.6 HOUSEHOLD COVERAGE OF FOODS

5.6.1 Household coverage of foods by state

This section shows the coverage of all food vehicles assessed in this study, i.e. the proportion of households that consume a food vehicle, the proportion of households that consume a fortifiable form of that food vehicle (i.e. industrially produced), and the proportion of households that consume a fortified food vehicle.

In Ebonyi (Figure 6a), salt, sugar and oil were consumed by 80-100% of households in general. For salt and sugar, an equal proportion of households consumed these foods in a fortifiable form; however only 30% of households consumed oil in a fortifiable form, with the majority producing it at home. Wheat, maize and semolina flours were much less widely consumed in general. Semolina flour, consumed by 19% of households, was consumed mainly in its fortifiable form (17% of all households). Similarly, wheat flour, consumed by 10% of households, was also mainly consumed in its fortifiable form (9% of all households). However, maize flour, consumed by 24% of households, was consumed in its fortifiable form by only 11% of all households.

In Sokoto (Figure 6b), salt, sugar, oil and maize flour were consumed by 88-100% of households in general. For salt and sugar, an equal proportion of households consumed these foods in a fortifiable form; while for oil only 64% of households consumed it in a fortifiable form and for maize flour only 1% of households consumed it in a fortifiable form. Wheat flour was consumed in general by 59% of households, with nearly an equal proportion of households consuming it in a fortifiable form (57%). Semolina flour was much less widely consumed with only 15% of households consuming it in general and 10% consuming it in a fortifiable form.

As described in the survey limitations, many households were not able to report a brand for certain food vehicles or in some cases the brand reported by the household was not found in the market survey. As a result, there was in a high proportion of households with unknown fortification status for many food vehicles when attempting to link the reported brand used in the household to the results of the laboratory analyses of food specimens from that brand collected from markets; therefore, the consumes fortified food vehicle indicators reported here may be underestimated and should be interpreted with caution. Food samples were not taken from households, and therefore the actual micronutrient content at this level is unknown.

In Ebonyi, salt was the only food vehicle for which it was possible to link a large majority of households with a fortification status based on the reported brand: 85% of households were confirmed to consume fortified salt (15% classified as unknown). For the other food vehicles there were high proportions of unknown for this indicator: coverage of the fortified food vehicle among households was 19% for sugar (60% unknown), 1% for oil (29%) unknown, 3% for wheat flour (6% unknown), 0% for maize flour (11% unknown) and 10% for semolina flour (7% unknown).

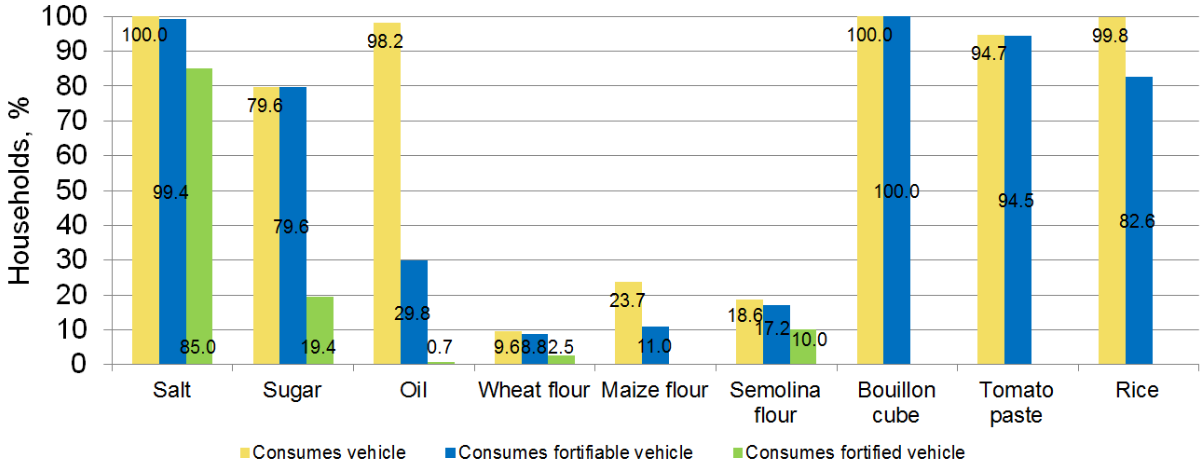
In Sokoto, there were also high proportions of unknown for the consumes fortified vehicle indicator for most food vehicles except for semolina flour of which 9% of households were confirmed to consume fortified semolina flour (2% classified as unknown) and maize flour of which no households were confirmed to consume fortified maize flour (1% classified as unknown). For the other food vehicles, coverage of the fortified food vehicle among households was: 12% for salt (88% unknown), 8% for sugar (83% unknown), 2% for oil (62% unknown) and 7% for wheat flour (46% unknown).

Of the food vehicles assessed for potential inclusion in the fortification programme, in Ebonyi, there was nearly universal coverage of bouillon cube, tomato paste, and rice in general (100%, 95%, and 100%, respectively) with similarly high coverage of the fortifiable forms of the food vehicles (100%, 95%, and 83%, respectively). In Sokoto, there was high coverage of bouillon cube and rice (99% and 93%, respectively) with slightly lower coverage of tomato paste (65%) in general. An equal proportion of households consumed bouillon cube in a fortifiable form (99%) while household coverage of fortifiable tomato paste and rice was lower (45% and 40%, respectively).

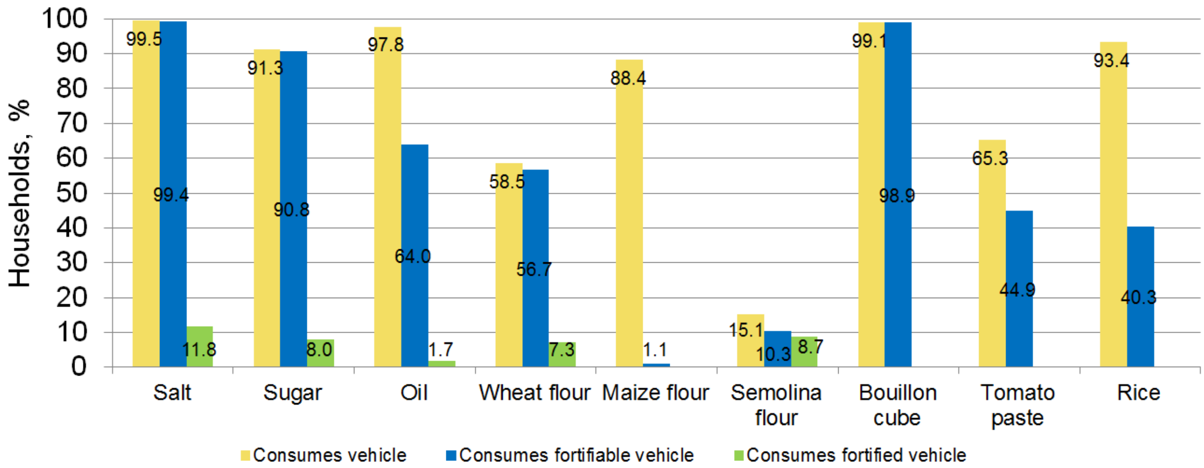
Annex 8 presents these results in a tabular format.

Figure 6 Household coverage of foods, Ebonyi and Sokoto, Nigeria, 2017

a. Ebonyi



b. Sokoto



Ebonyi, N=610; Sokoto, N=614.The proportion of households for which fortification status was unknown because no brand was reported or the brand reported was not found in the market survey was: 14.5% for salt, 60.2% for sugar, 29.1% for oil, 6.4% for wheat flour, 11.0% for maize flour, and 7.3% for semolina flour in Ebonyi;and 87.6% for salt, 82.8% for sugar, 62.0% for oil, 49.5% for wheat flour, 1.1% for maize flour, and 1.6% for semolina flour in Sokoto. Fortification status of bouillon cubes, tomato paste or rice was not assessed as they are not currently in the fortification programme.

5.6.2 Household coverage by risk factors

The consumes fortified vehicle indicator is not presented disaggregated by risk factors due to small sample sizes resulting from the high proportion of households classified as unknown in the analyses.

Poverty status

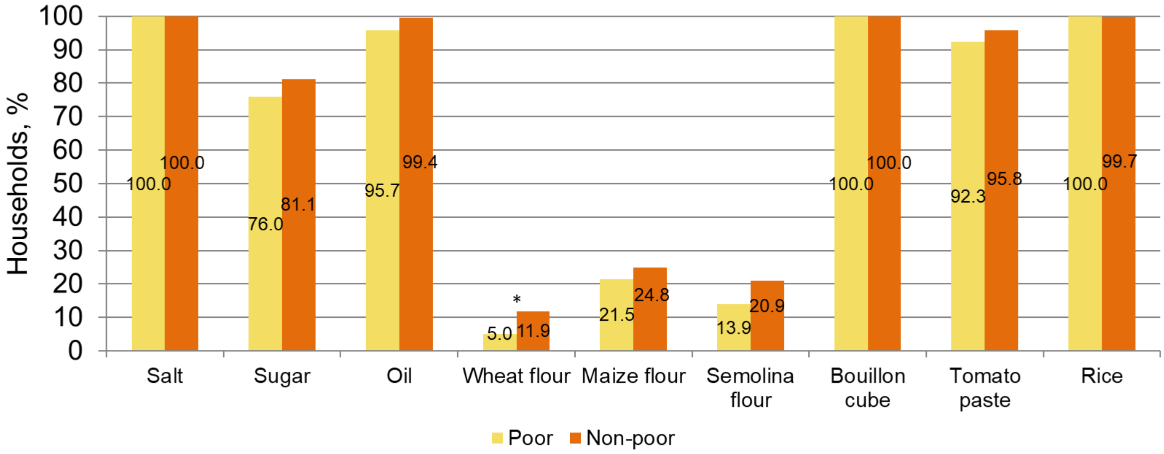
Figure 7 and Figure 8 present the coverage indicators disaggregated by household poverty status as defined by the MPI in Ebonyi and Sokoto, respectively.

In Ebonyi, there were no statistically significant differences between poor and non-poor households in their consumption of the various food vehicles except for wheat flour. Fewer poor households consumed wheat flour (in general and in its fortifiable form) compared to non-poor households.

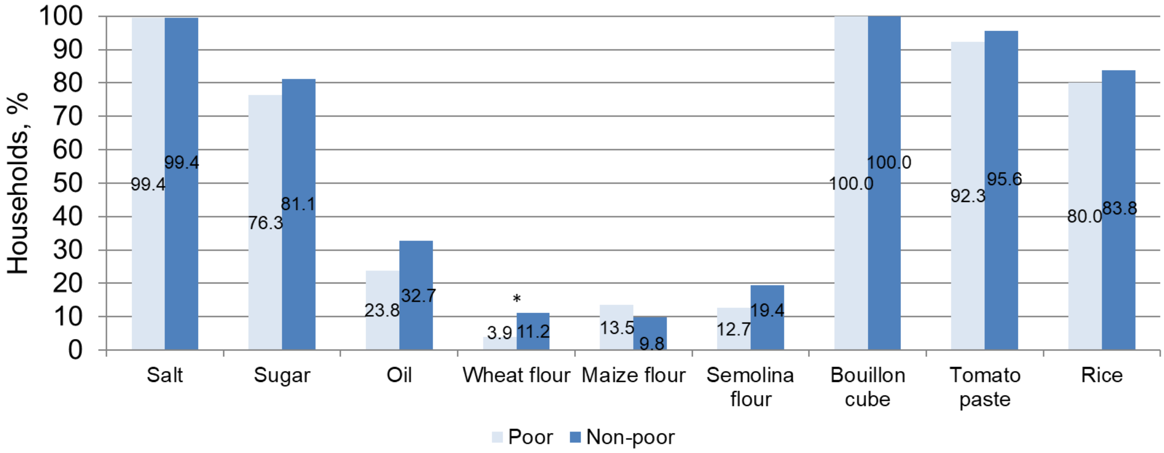
In Sokoto, significantly fewer poor households consumed sugar and semolina flour (in general and in a fortifiable form) and wheat flour and tomato paste (in general) compared to non-poor households, while the reverse was true for consumption of maize flour (in general) with more poor households consuming it compared to non-poor households. Additionally, fewer poor households consumed fortifiable oil and rice compared to non-poor households.

Figure 7 Household coverage of foods by poverty status, Ebonyi, Nigeria, 2017

a. Consumes food vehicle



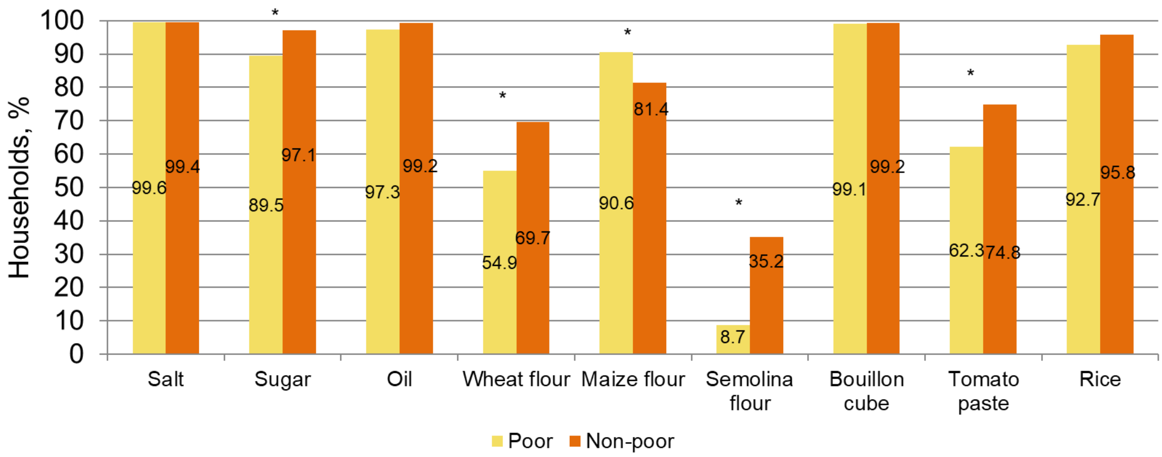
b. Consumes fortifiable food vehicle



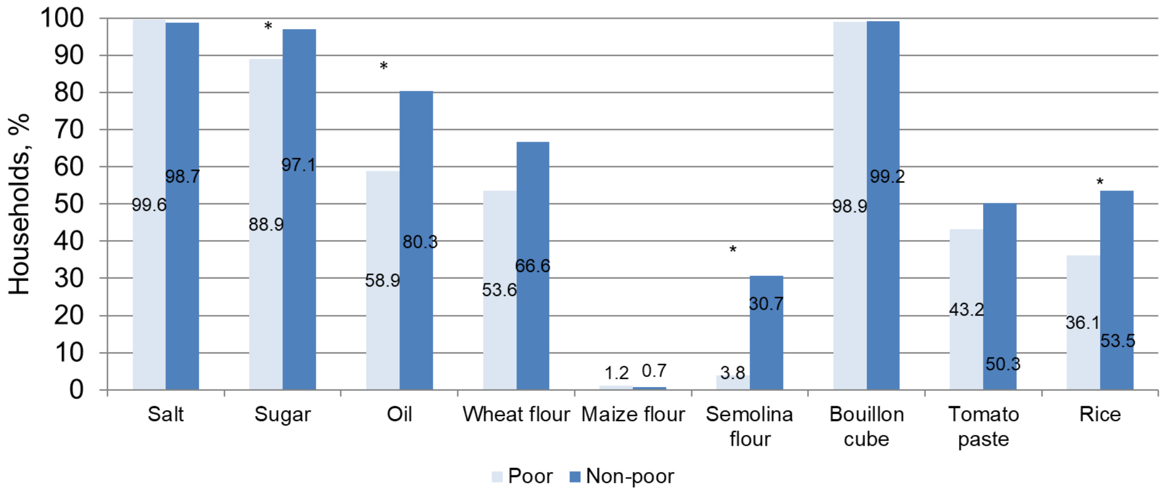
Poor = multi-dimensional poverty index ≥ 0.33. Poor, N=192; Non-poor, N=418. *P < 0.05.

Figure 8 Household coverage of foods by poverty status, Sokoto, Nigeria, 2017

a. Consumes food vehicle



b. Consumes fortifiable food vehicle



Poor = multi-dimensional poverty index ≥ 0.33. Poor, N=448; Non-poor, N=166. *P<0.05.

Socio-economic status

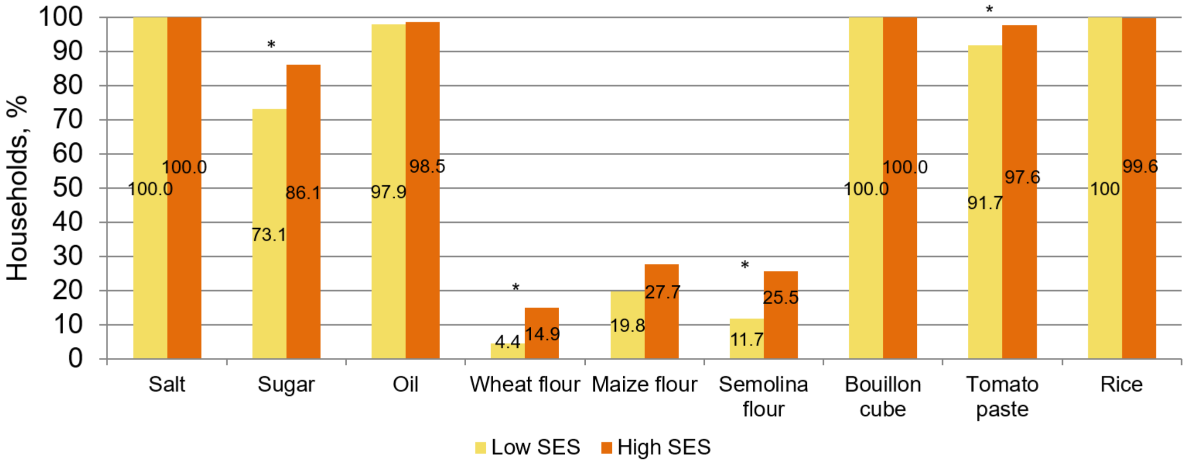
Figure 9 and Figure 10 present results disaggregated by household socio-economic status, as defined by the DHS wealth index in Ebonyi and Sokoto, respectively.

In Ebonyi, there was a significant difference between low socio-economic status and high socio-economic status households in their consumption of sugar, wheat flour, semolina flour, tomato paste in general and in a fortifiable form, as well as oil in a fortifiable form only, with significantly fewer low socio-economic status households consuming these foods.

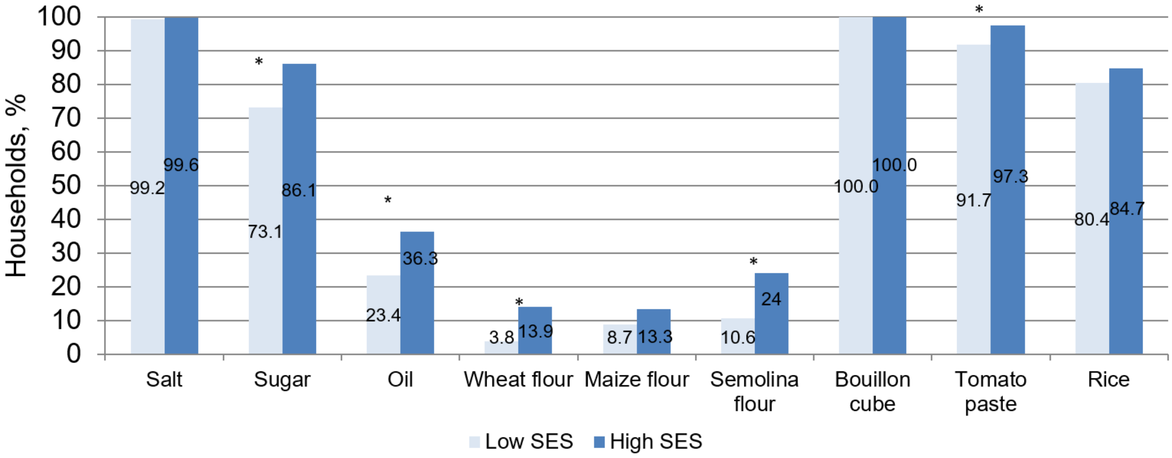
In Sokoto, there was a significant difference between low socio-economic status and high socio-economic status households in their consumption wheat flour, semolina flour and tomato paste in general and in a fortifiable form, as well as salt, oil and rice in a fortifiable form, with significantly fewer low socio-economic status households consuming these foods. For maize flour, the reverse was evident with significantly more low socio-economic status households consuming it in general compared to high socio-economic status households.

Figure 9 Household coverage of foods by socio-economic status (SES), Ebonyi, Nigeria, 2017

a. Consumes food vehicle



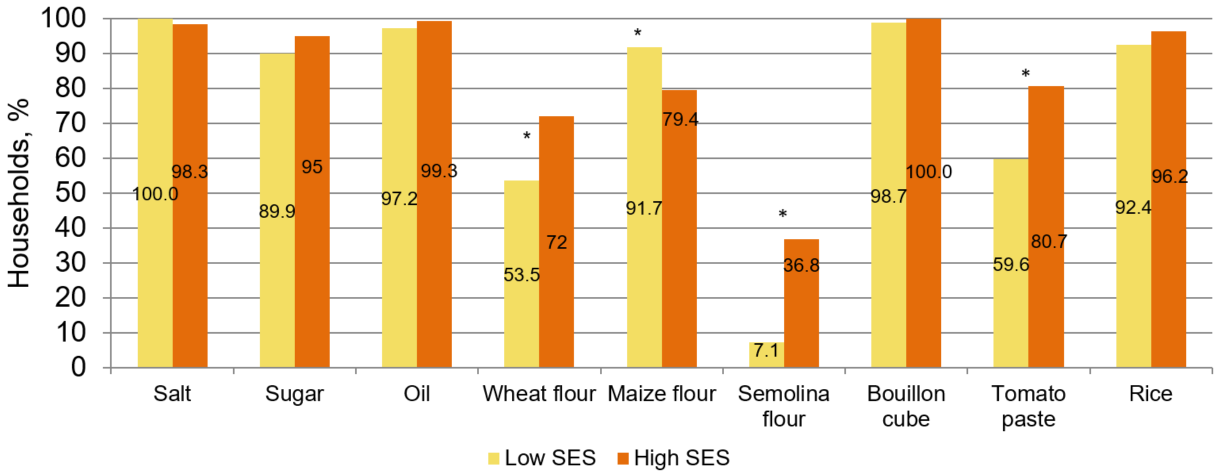
b. Consumes fortifiable food vehicle



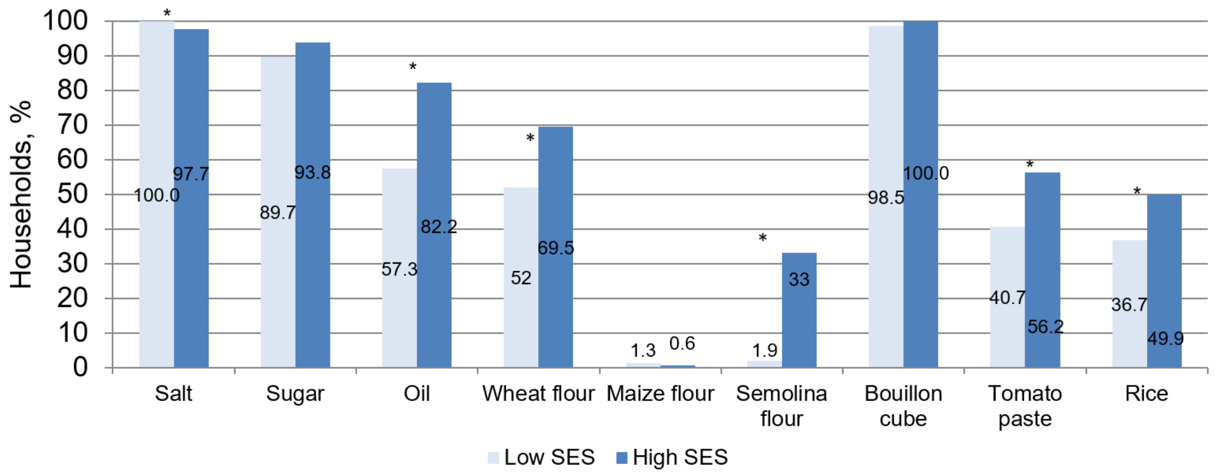
Low SES = lowest two wealth quintiles. Low SES, N=293; High SES, N=317. *P<0.05.

Figure 10 Household coverage of foods by socio-economic status (SES), Sokoto, Nigeria, 2017

a. Consumes food vehicle



b. Consumes fortifiable food vehicle



Low SES = lowest two wealth quintiles. Low SES, N=427; High SES, N=187. *P<0.05.

Women's dietary diversity

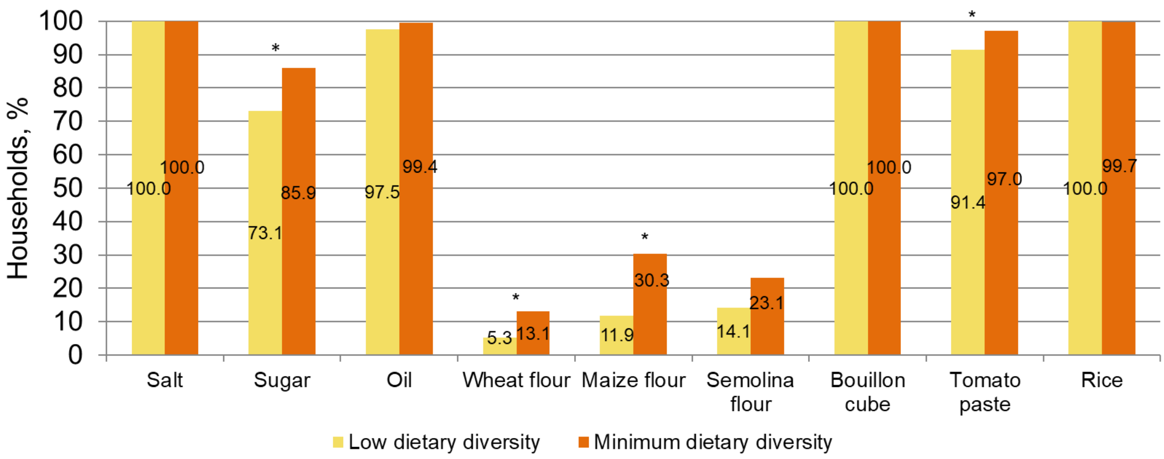
Figure 11 and Figure 12 present results disaggregated by women's dietary diversity as defined by the MDD-W for WRA in Ebonyi and Sokoto, respectively.

In Ebonyi, significantly fewer households with low dietary diversity compared to households with minimum dietary diversity consumed sugar, wheat flour, maize flour and tomato paste in general and in a fortifiable form. Alternatively, significantly more households with low dietary diversity consumed fortifiable oil compared to households with minimum dietary diversity.

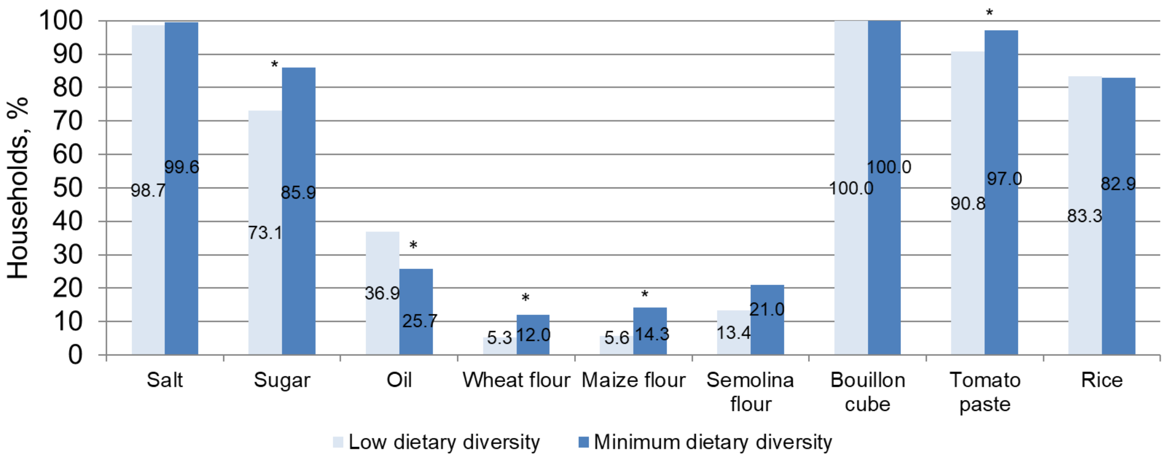
In Sokoto, significantly fewer households with low dietary diversity compared to households with minimum dietary diversity consumed sugar, oil, wheat flour and tomato paste in general and in a fortifiable form. Additionally, significantly fewer households with low dietary diversity compared to households with minimum dietary diversity consumed wheat flour and rice in general, and semolina flour in a fortifiable form.

Figure 11 Household coverage of foods by women's dietary diversity, Ebonyi, Nigeria, 2017

a. Consumes food vehicle



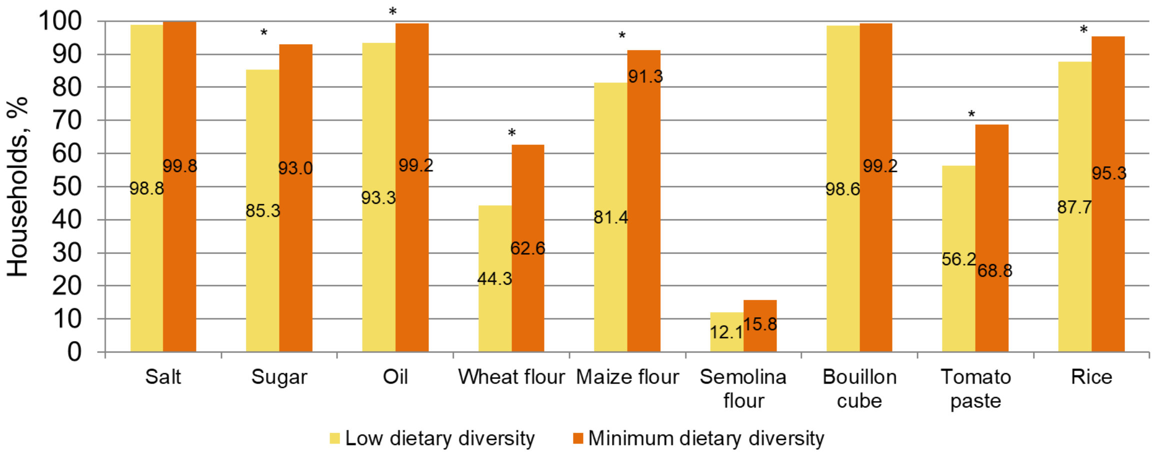
b. Consumes fortifiable food vehicle



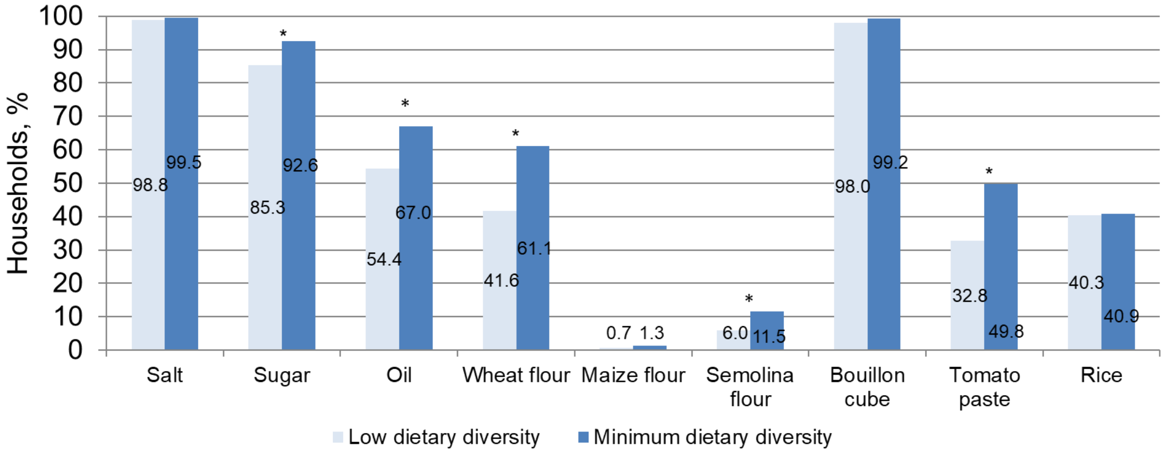
Low dietary diversity = women's dietary diversity score < 5. Low dietary diversity, N=163; Minimum dietary diversity, N=351. *P<0.05.

Figure 12 Household coverage of foods by women's dietary diversity, Sokoto, Nigeria, 2017

a. Consumes food vehicle



b. Consumes fortifiable food vehicle



Low dietary diversity = women's dietary diversity score < 5. Low dietary diversity, N=149; Minimum dietary diversity, N=443.
*P<0.05.

Infant and child feeding practices

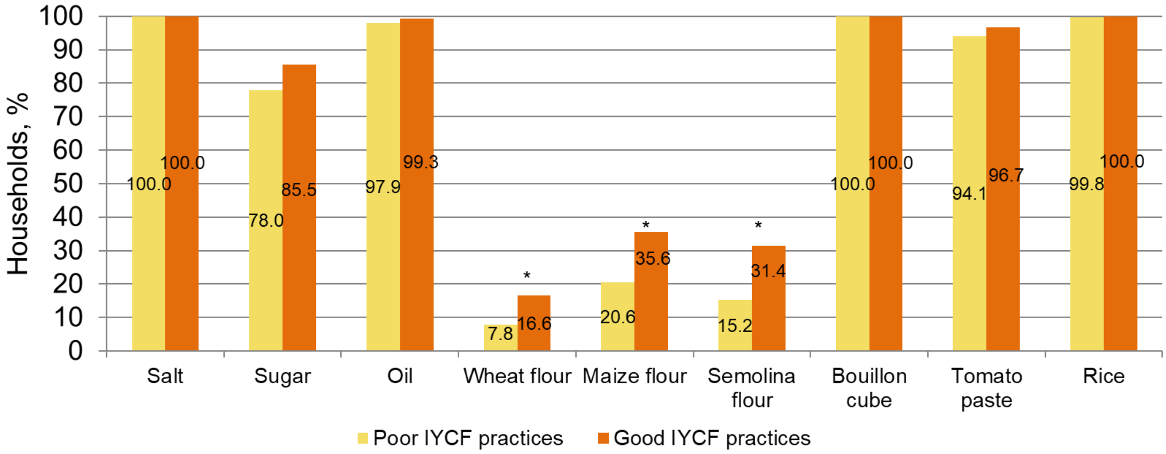
Figure 13 and Figure 14 present results disaggregated by IYCF practices in Ebonyi and Sokoto, respectively.

In Ebonyi, fewer households with poor IYCF practices compared to households with good IYCF practices consumed wheat flour, maize flour and semolina flour in general and in a fortifiable form.

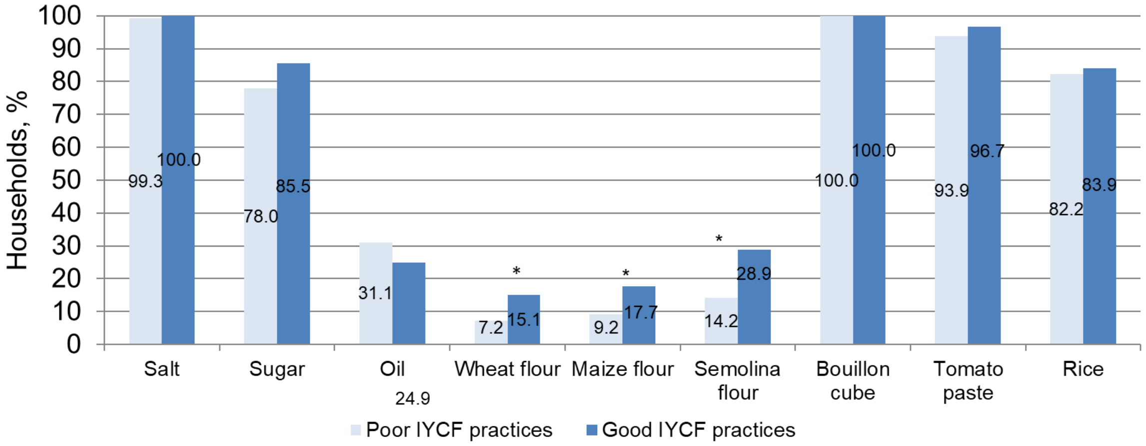
In Sokoto, fewer households with poor IYCF practices compared to households with good IYCF practices consumed sugar, oil, wheat flour, tomato paste and rice in general. Additionally, fewer households with poor IYCF practices compared to households with good IYCF practices consumed salt, sugar, wheat flour and tomato paste in a fortifiable form.

Figure 13 Household coverage of foods by infant and child feeding (IYCF) practices, Ebonyi, Nigeria, 2017

a. Consumes food vehicle



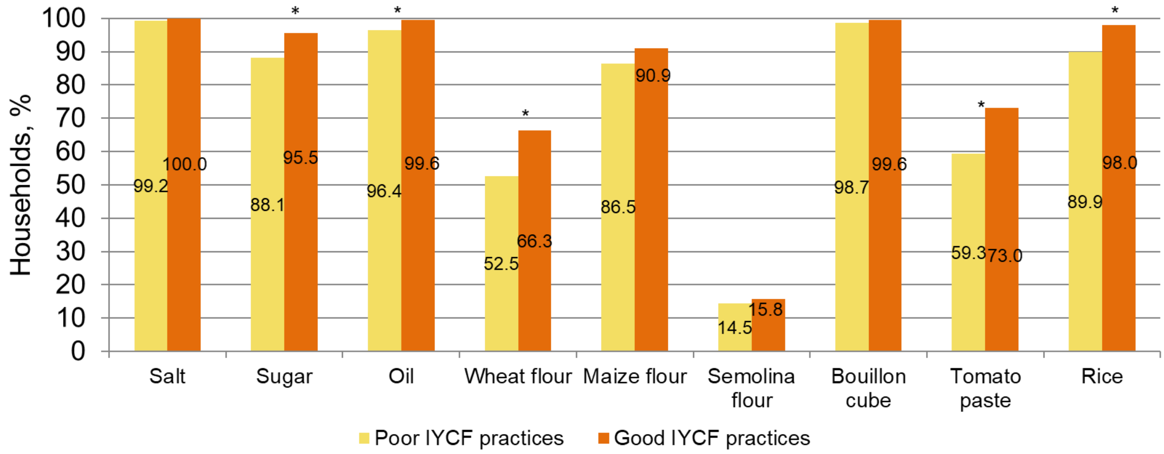
b. Consumes fortifiable food vehicle



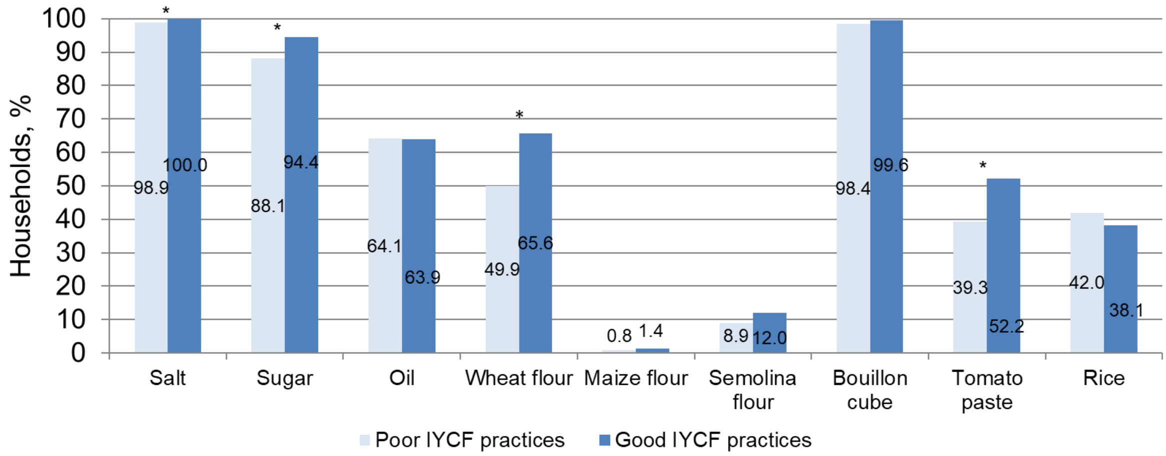
Poor IYCF practices = infant and child feeding index score < 6. Poor IYCF practices, N=482; Good IYCF practices, N=128.
*P<0.05.

Figure 14 Household coverage of foods by infant and child feeding (IYCF) practices, Sokoto, Nigeria, 2017

a. Consumes food vehicle



b. Consumes fortifiable food vehicle



Poor IYCF practices = infant and child feeding index score < 6. Poor IYCF practices, N=326; Good IYCF practices, N=268. *P<0.05.

Household food security

Results were disaggregated by household food security in Ebonyi and Sokoto (figure not shown).

In Ebonyi, more food insecure households compared to food secure households consumed oil in general and in a fortifiable form. Alternatively, fewer food insecure households compared to food secure households consumed wheat flour, maize flour, semolina flour and tomato paste in general and in fortifiable forms.

In Sokoto, more food-insecure households compared to food-secure households consumed salt in general and in a fortifiable form.

Annex 9 presents all results of coverage indicators disaggregated by risk factors in a tabular format.

5.7 CONSUMPTION OF FORTIFIABLE FOODS

Table 14 and Table 15 present the daily apparent consumption of fortifiable food vehicles for children in four age groups (6–8 months, 9–11 months, 12–23 months and 15–49 months) and WRA in Ebonyi and Sokoto, respectively.

In Ebonyi, daily apparent consumption of fortifiable salt and sugar were similar and ranged from 1.7 g/day to 3.0 g/day among children in all age groups and from 5.5 g/day to 6.1 g/day among WRA. In Sokoto, these figures were 2.5 g/day to 4.3 g/day among children and 8.7 g/day to 9.1 g/day among WRA.

In Ebonyi, daily apparent consumption of fortifiable oil ranged from 0.8 g/day to 2.6 g/day among children, increasing by age group and was 5.3 g/day among WRA. In Sokoto, these figures were highest among children 6-11 months (6.4 g/day) then ranged from 3.3 g/day to 4.6 g/day among children in the older age groups and was 9.8 g/day among WRA.

Among the flours, daily apparent consumption of wheat flour was highest relatively followed by semolina flour then maize flour in both states. In Ebonyi, apparent daily consumption of wheat flour was 1.0 g/day among children 6-11 months, 4.8 g/day among children 9-11 months, 19.5 g/day to 19.9 g/day among children 12-59 months, and 38.6 g/day among WRA. In Sokoto, these figures were 3.2 g/day among children 6-11 months, 14.9 g/day among children 9-11 months, 21.7 g/day to 35.9 g/day among children 12-59 months and 92.7 g/day among WRA. For semolina flour, daily apparent consumption ranged from 0.9 g/day to 10.1 g/day among children in all age groups and was 17.0 g/day among WRA in Ebonyi. In Sokoto, these figures were 1.1 g/day to 9.2 g/day among children and 23.4 g/day among WRA. For maize flour, daily apparent consumption ranged from 4.3 g/day to 7/1 g/day among children in all age groups and was 12.5 g/day among WRA in Ebonyi. In Sokoto, these figures were 0.0 g/day to 5.9 g/day among children and 2.8 g/day among WRA.

Among the potential foods for inclusion in the fortification programme, for bouillon cube, daily apparent consumption ranged from 0.6 g/day to 1.0 g/day among children in all age groups and was 2.0 g/day among WRA in Ebonyi. In Sokoto, these figures were 1.0 g/day to 1.5 g/day among children and 3.4 g/day among WRA. For tomato paste, daily apparent consumption ranged from 6.1 to 13.6 g/day among children in all age groups and was 26.8 g/day among WRA in Ebonyi. In Sokoto, these figures were 2.9 g/day to 4.1 g/day among children and 7.9 g/day among WRA. For rice, daily apparent consumption ranged from 24.8 g/day to 40.4 g/day among children in all age groups and was 79.7 g/day among WRA. In Sokoto, these figures were 32.1 g/day to 38.1 g/day among children and 97.3 g/day among WRA.

Table 14 Daily apparent consumption of fortifiable foods by population group, Ebonyi, Nigeria, 2017[1]

Fortifiable food vehicle[2]	Children				Women
	6-8 months	9-11 months	12-23 months	24-59 months	15-49 years
Salt, g/day	1.7 (1.4, 3.3)	1.7 (1.4, 3.3)	2.2 (1.4, 3.3)	3.0 (1.4, 3.3)	6.1 (5.6, 6.6)
N	32	35	142	324	498
Sugar, g/day	1.7 (1.1, 2.3)	1.2 (0.8, 1.5)	2.1 (1.8, 2.4)	2.6 (2.3, 2.9)	5.5 (4.9, 6.1)
N	34	36	146	327	502
Oil, ml/day	0.8 (-0.1, 1.8)	1.2 (0.4, 2.1)	1.7 (1.0, 2.4)	2.6 (1.7, 3.5)	5.3 (3.5, 7.0)
N	35	36	148	334	512
Wheat flour, g/day	1.0 (0.3, 1.8)	4.8 (2.5, 7.1)	19.5 (13.1, 25.8)	19.9 (16.2, 23.7)	38.6 (31.5, 45.7)
N	35	36	149	338	514
Maize flour, g/day	4.3 (0.2, 8.4)	2.1 (-0.5, 4.7)	4.1 (0.4, 7.8)	7.1 (3.7, 10.5)	12.5 (6.7, 18.3)
N	35	36	146	337	511
Semolina flour, g/day	0.9 (0.3, 1.6)	3.3 (1.2, 5.4)	8.7 (5.0, 12.5)	10.1 (7.2, 13.0)	17.0 (12.8, 21.2)
N	35	36	149	338	514
Bouillon cubes, g/day	0.6 (0.5, 0.8)	0.7 (0.4, 1.0)	0.7 (0.6, 0.8)	1.0 (0.9, 1.1)	2.0 (1.8, 2.2)
N	35	36	148	332	507
Tomato paste, g/day	6.1 (4.0, 8.3)	9.2 (5.7, 12.8)	10.4 (8.9, 11.8)	13.6 (12.1, 15.1)	26.8 (24.7, 28.8)
N	33	36	147	321	491
Rice, g/day	25.5 (18.0, 33.0)	24.8 (18.2, 31.3)	28.5 (24.3, 32.7)	40.4 (33.9, 46.9)	79.7 (70.1, 89.2)
N	35	36	148	333	511

[1] All values are mean (95% confidence interval) unless otherwise indicated and are weighted to correct for unequal probability of selection. Note that some confidence intervals are negative because the sample size is too small to estimate them precisely.
[2] Fortifiable refers to a food vehicle that is industrially processed (i.e. not made at home).

Table 15 Daily apparent consumption of fortifiable foods by population group, Sokoto, Nigeria, 2017[1]

Fortifiable food vehicle[2]	Children				Women
	6-8 months	9-11 months	12-23 months	24-59 months	15-49 years
Salt, g/day	2.5 (1.9, 3.1)	2.6 (2.1, 3.2)	3.4 (3.0, 3.8)	4.1 (3.7,4.5)	8.7 (8.1, 9.3)
N	26	37	122	335	558
Sugar, g/day	3.4 (2.4, 4.3)	2.9 (2.3, 3.5)	3.5 (3.0, 4.1)	4.3 (3.9, 4.6)	9.1 (8.4, 9.8)
N	27	39	119	337	561
Oil, ml/day	6.4 (3.1, 9.7)	3.9 (2.6, 5.2)	3.3 (2.2, 4.5)	4.6 (3.7, 5.4)	9.8 (8.1, 11.4)
N	28	39	123	350	577
Wheat flour, g/day	3.2 (-0.5, 7.0)	14.9 (4.1, 25.6)	21.7 (17.3, 26.2)	35.9 (28.0, 43.9)	92.7 (75.9, 109.4)
N	35	36	149	338	592
Maize flour, g/day	0.0 (NA)	5.9 (-5.2, 16.9)	5.0 (-1.7, 11.6)	0.0 (NA)	2.8 (-1.0, 6.5)
N	29	40	124	358	588
Semolina flour, g/day	1.1 (-0.2,2.5)	3.1 (0.7, 5.5)	6.5 (3.7, 9.2)	9.2 (6.1, 12.3)	23.4 (17.5, 29.3)
N	29	40	126	359	592
Bouillon cubes, g/day	1.5 (1.2, 1.8)	1.0 (0.8, 1.2)	1.3 (1.1, 1.5)	1.6 (1.4, 1.7)	3.4 (3.1, 3.6)
N	29	39	122	332	563
Tomato paste, g/day	4.1 (0.8, 7.3)	3.2 (1.4, 4.9)	2.9 (2.0, 3.8)	3.9 (2.9, 4.9)	7.9 (6.3, 9.6)
N	28	39	125	352	580
Rice, g/day	32.1 (12.0, 52.1)	33.7 (19.1, 48.3)	35.4 (23.3, 47.4)	38.1 (29.0, 47.2)	97.3 (78.9, 115.6)
N	27	38	124	334	571

[1] All values are mean (95% confidence interval) unless otherwise indicated and are weighted to correct for unequal probability of selection. Note that some confidence intervals are negative because the sample size is too small to estimate them precisely.
[2] Fortifiable refers to a food vehicle that is industrially processed (i.e. not made at home).

5.8 MICRONUTRIENT CONTRIBUTION FROM FORTIFIED FOODS

This section presents the micronutrient contribution from the consumption of fortified foods as a percentage of the EAR (for iodine and vitamin A) or RDA (for iron). These are based on actual consumption estimates of the six mandatory foods vehicles assessed (see Table 14 and Table 15) and a fortification exposure level, both actual (i.e. using measured micronutrient content for each food vehicle found in the market assessment) and modelled (i.e. using a theoretical target average micronutrient content estimated from the minimum national standard requirement assuming 20% variation and 90% compliance). Tables with detailed results can be found in Annex 9.

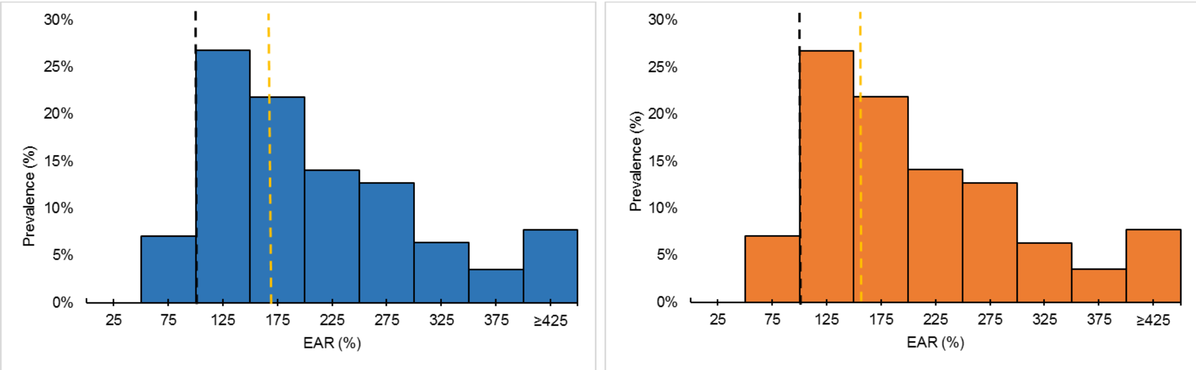
Figure 15 and Figure 16 present the current and modelled iodine contribution from the consumption of fortified salt as a percentage of the EAR in Ebonyi and Sokoto, respectively. The current and modelled contributions from fortified salt to dietary iodine requirements were high across all target populations.

In Ebonyi, fortified salt was estimated to contribute on average 167.9% of the EAR for iodine among children 12-23 months, 231.6% among children 24-59 months, and 212.9% among WRA. When modelled assuming compliance with the fortification standard, the estimates were similar: 155.4% among children 12-23 months, 207.0% among children 24-59 months, and 193.8% among WRA.

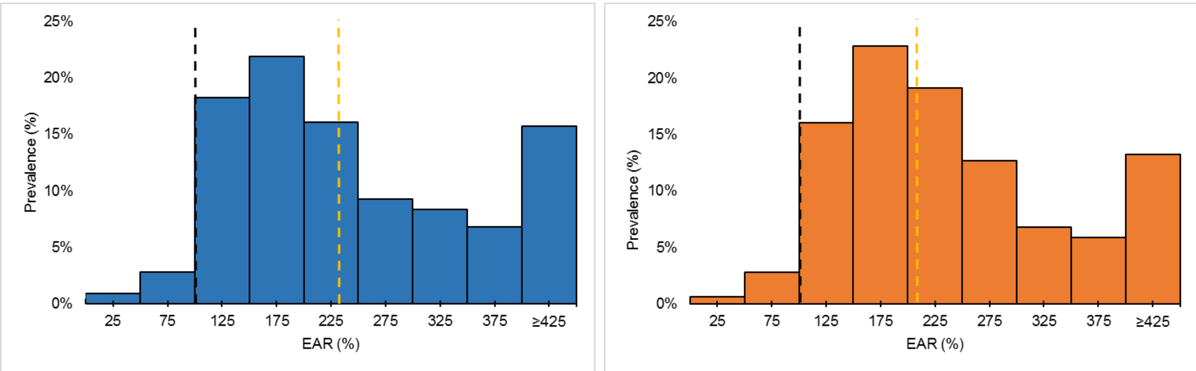
In Sokoto, fortified salt was estimated to contribute on average 225.0% of the EAR for iodine among children 12-23 months, 290.1% among children 24-59 months, and 244.5% among WRA. When modelled assuming compliance with the fortification standard, the estimates were similar: 237.2% among children 12-23 months, 284.1% among children 24-59 months, and 245.5% among WRA.

Figure 15 Actual and modelled iodine contribution from consumption of fortified salt as a percentage of estimated average requirements (EAR), Ebonyi, Nigeria, 2017

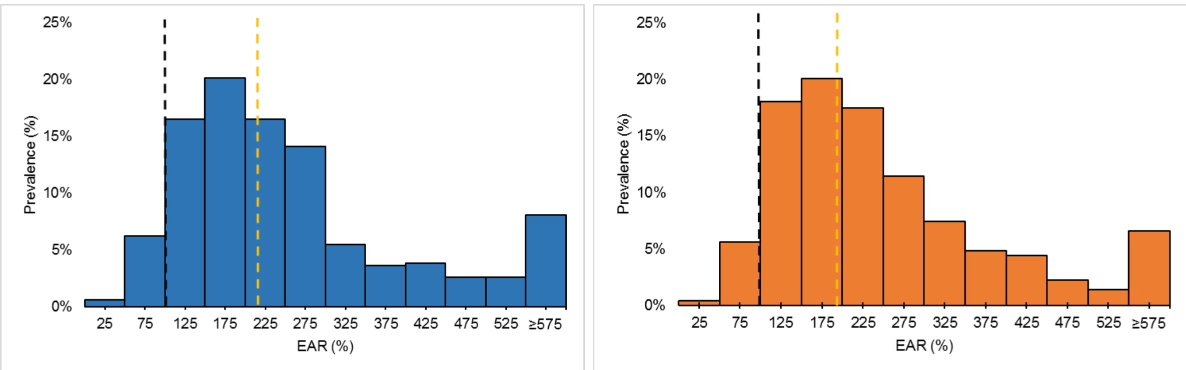
a. Children (12-23 months)



b. Children (24-59 months)



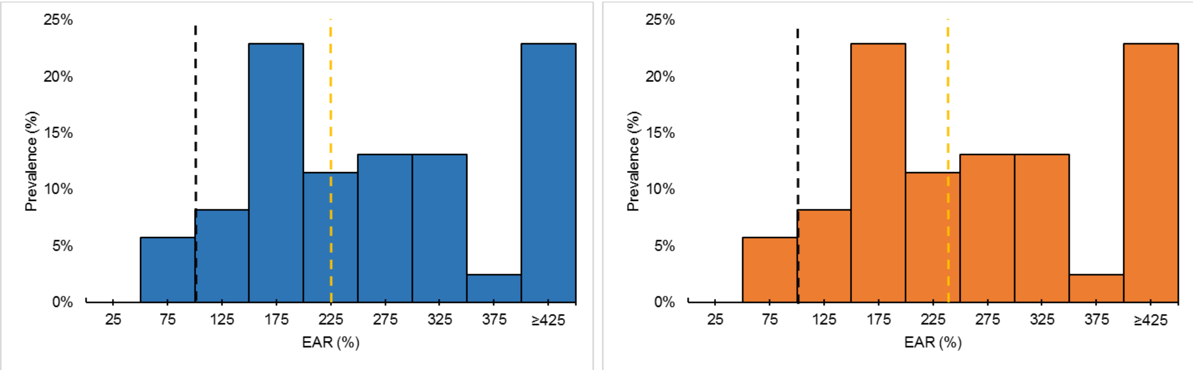
c. Women of reproductive age (15-49 years)



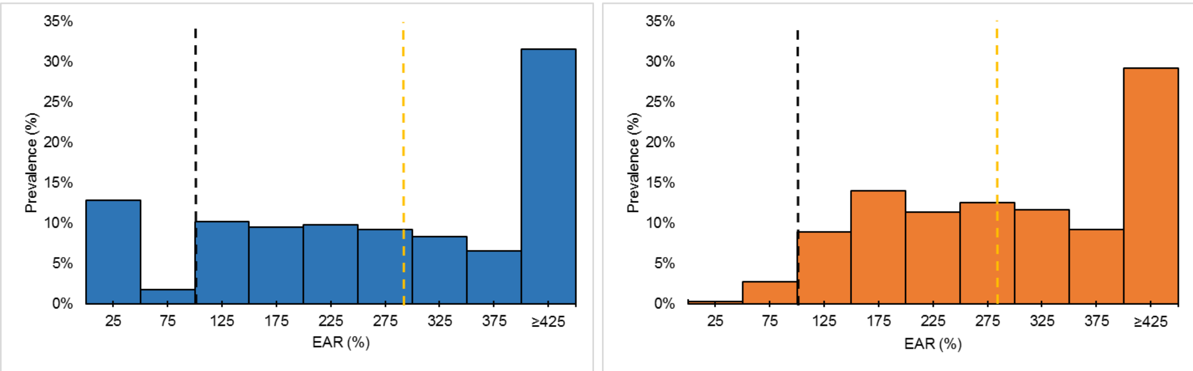
Blue and orange bars indicate actual and modelled estimates, respectively. Dotted black line is at 100%; dotted yellow line is at the median %.

Figure 16 Actual and modelled iodine contribution from consumption of fortified salt as a percentage of estimated average requirements (EAR), Sokoto, Nigeria, 2017

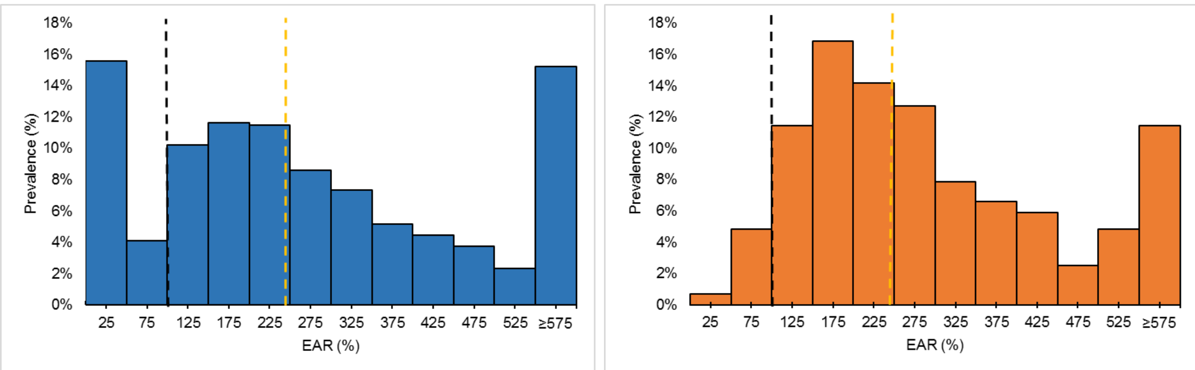
a. Children (12-23 months)



b. Children (24-59 months)



c. Women of reproductive age (15-49 years)



Blue and orange bars indicate actual and modelled estimates, respectively. Dotted black line is at 100%; dotted yellow line is at the median %.

Figure 17 and Figure 18 present the actual and modelled vitamin A contribution from the consumption of fortified foods as a percentage of the EAR in Ebonyi and Sokoto, respectively. The current contribution from fortified foods to dietary vitamin A requirements was generally low across all target populations but the modelled estimates demonstrate that there is potential for fortified foods to make an important contribution to vitamin A intakes if producers are compliant with the standard.

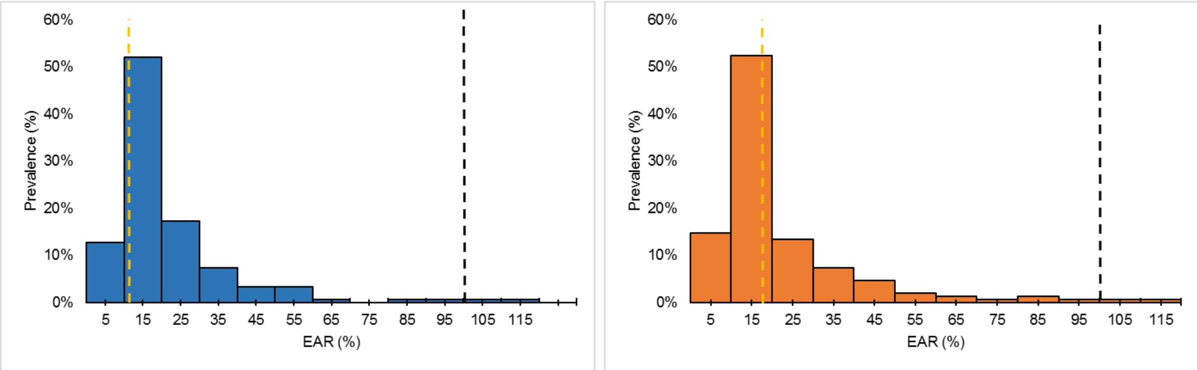
In Ebonyi, fortified sugar and oil combined[2] were estimated to contribute on average 11.1% of the EAR for vitamin A among children 12-23 months, 13.2% among children 24-59 months, and 9.6% among WRA. If all food vehicles that are required to contain vitamin A (i.e. sugar, oil wheat flour, maize flour and semolina flour) were fortified in compliance with the standard, these fortified foods could potentially provide 17.7% of the EAR for vitamin A among children 12-23 months, 21.2% among children 24-59 months, and 15.7% among WRA.

In Sokoto, fortified sugar and oil combined[1] were estimated to contribute on average 7.8% of the EAR for vitamin A among children 12-23 months, 13.7% among children 24-59 months, and 9.3% among WRA. If all food vehicles that are required to contain vitamin A (i.e. sugar, oil wheat flour, maize flour and semolina flour) were fortified in compliance with the standard, these fortified foods could potentially provide 30.4% of the EAR for vitamin A among children 12-23 months, 35.4% among children 24-59 months, and 24.8% among WRA.

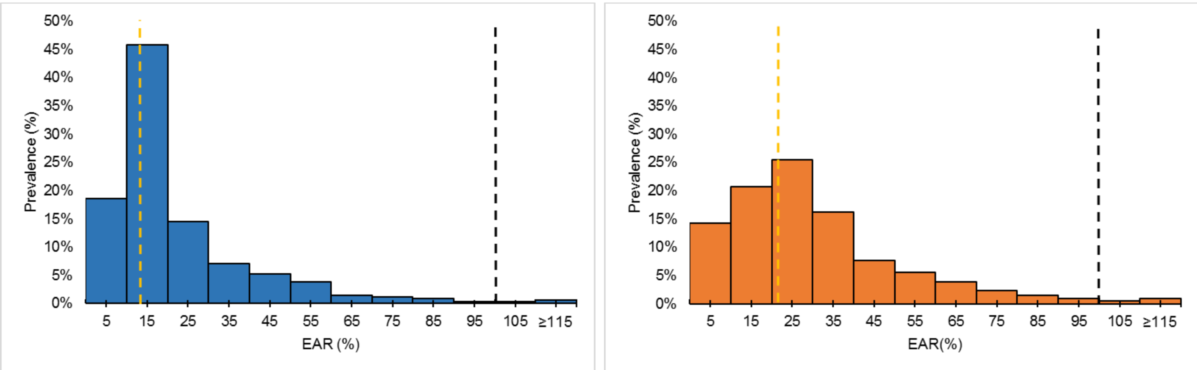
[2] Vitamin A is also mandated to be added to wheat, maize and semolina flours; however, vitamin A content was not directly measured in those vehicles in this study (only iron was measured). Additional calculations were done to estimate the current vitamin A content in the flours using the measured iron content as a proxy based on the prescribed premix formulation. When accounting for the estimated vitamin A content from the flours in addition to that from sugar and oil, the overall current vitamin A contribution estimates changed only in the third decimal place of the estimate. As it was not possible to confirm the presence of vitamin A in the premix of the flours and the results did not greatly differ when they were included in the overall estimate, the current contribution of vitamin A is reported from fortified foods where vitamin A was directly measured, i.e. sugar and oil only.

Figure 17 Actual and modelled vitamin A contribution from consumption of fortified sugar, oil, wheat flour, maize flour and semolina flour as a percentage of estimated average requirements (EAR), Ebonyi, Nigeria, 2017

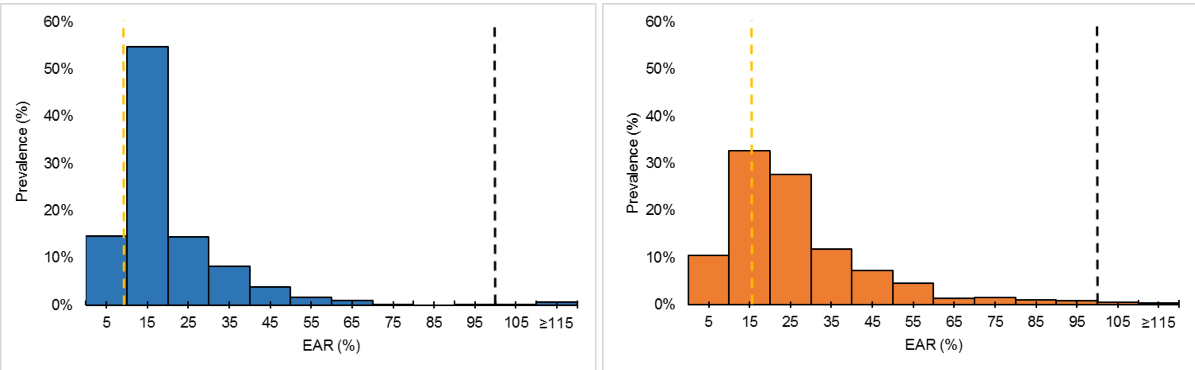
a. Children (12-23 months)



b. Children (24-59 months)



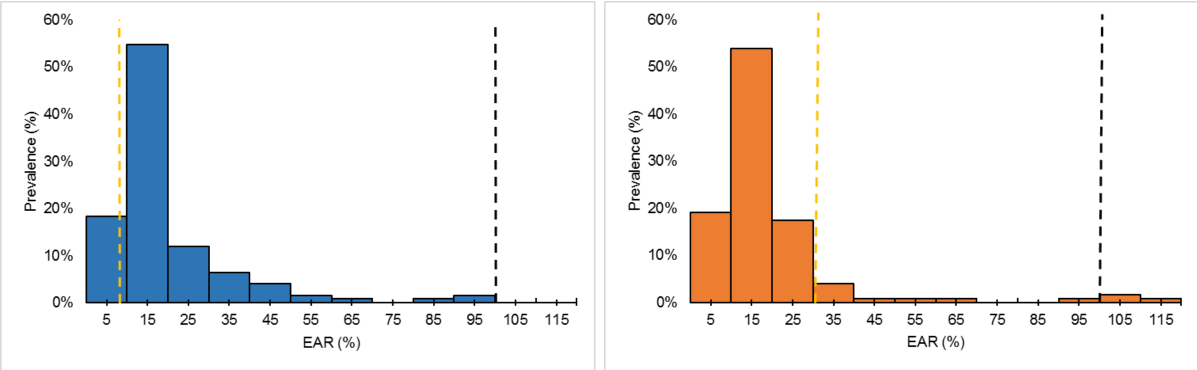
c. Women of reproductive age (15-49 years)



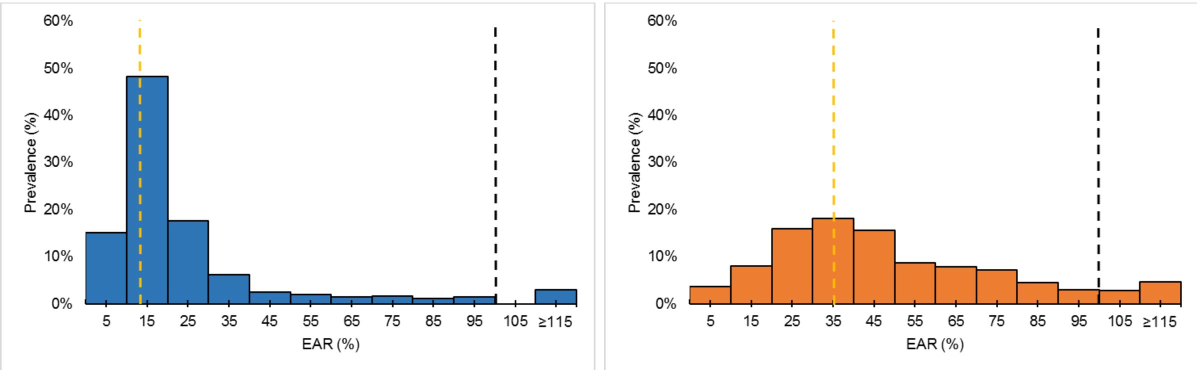
Blue and orange bars indicate actual and modelled estimates, respectively. Dotted black line is at 100%; dotted yellow line is at the median %.

Figure 18 Actual and modelled vitamin A contribution from consumption of fortified sugar, oil, wheat flour, maize flour and semolina flour as a percentage of estimated average requirements (EAR), Sokoto, Nigeria, 2017

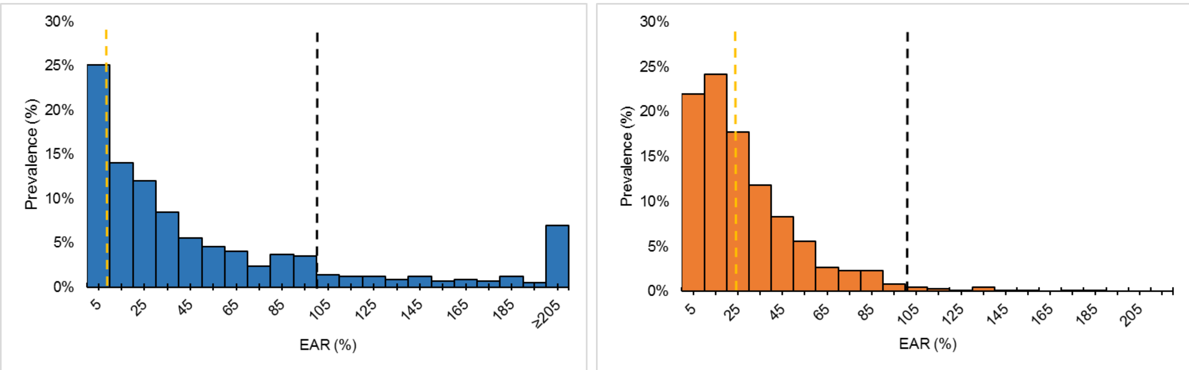
a. Children (12-23 months)



b. Children (24-59 months)



c. Women of reproductive age (15-49 years)



Blue and orange bars indicate actual and modelled estimates, respectively. Dotted black line is at 100%; dotted yellow line is at the median %.

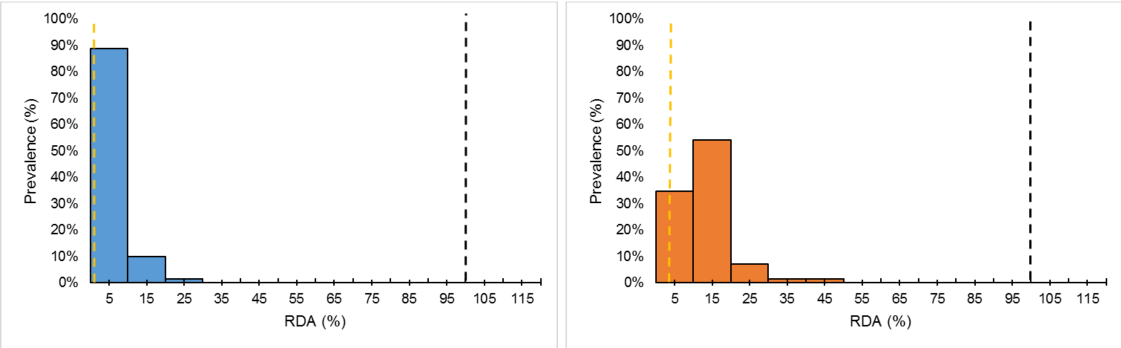
Figure 19 and Figure 20 present the current and modelled iron contribution from the consumption of fortified foods as a percentage of the RDA in Ebonyi and Sokoto, respectively. The current contribution from fortified foods to dietary iron requirements was generally low across all target populations but the modelled estimates demonstrate that there is potential for fortified foods to make an important contribution to iron intakes among most population groups (except children 6-11 months) if producers are compliant with the standard.

In Ebonyi, fortified wheat flour, maize flour, and semolina flour combined were estimated to contribute on average 0.2% of the RDA for iron among children 6-11 months, 2.2% among children 12-23 months, 2.3% among children 24-59 months, and 3.4% among WRA. If all food vehicles were fortified in compliance with the standard, these fortified foods could potentially provide 3.0% of the RDA for iron among children 6-11 months, 18.4% among children 12-23 months, 18.8% among children 24-59 months, and 21.8% among WRA.

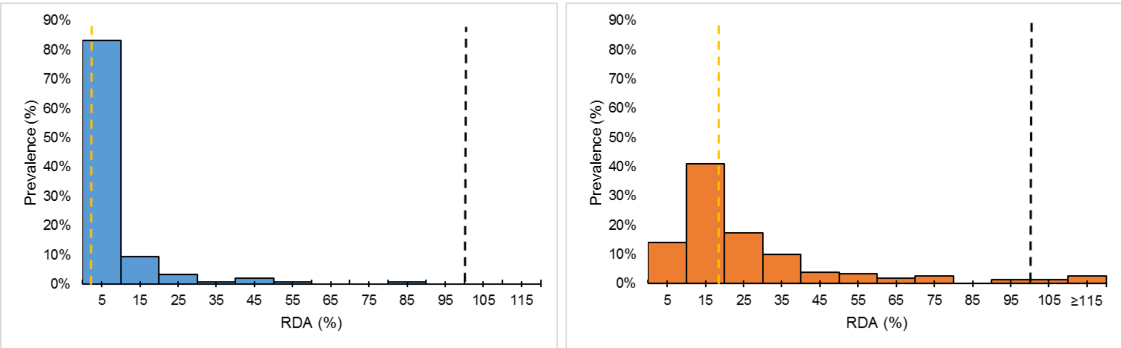
In Sokoto, fortified wheat flour, maize flour, and semolina flour combined were estimated to contribute on average 2% of the RDA for iron among children 6-11 months, 7.7% among children 12-23 months, 12.8% among children 24-59 months, and 19.5% among WRA. If all food vehicles were fortified in compliance with the standard, these fortified foods could potentially provide 5.8% of the RDA for iron among children 6-11 months, 18.9% among children 12-23 months, 22.7% among children 24-59 months, and 41.1% among WRA.

Figure 19 Actual and modelled iron contribution from consumption of fortified wheat flour, maize flour and semolina flour as a percentage of the recommended dietary allowance (RDA), Ebonyi, Nigeria, 2017

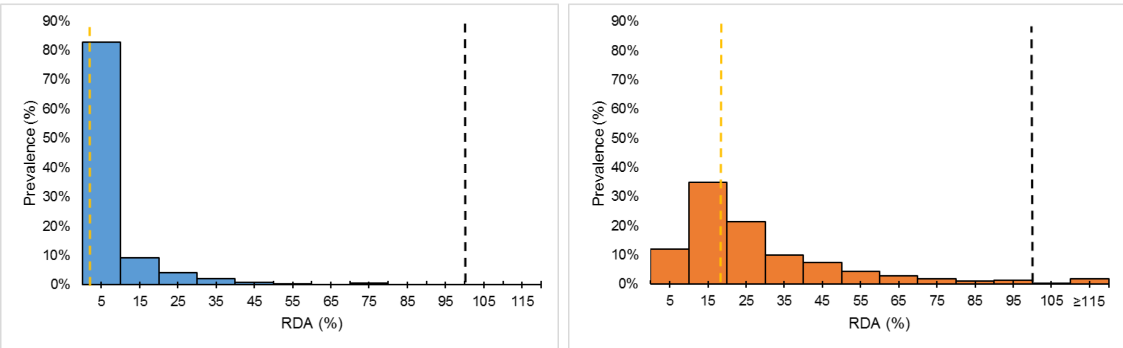
a. Children (6-11 months)



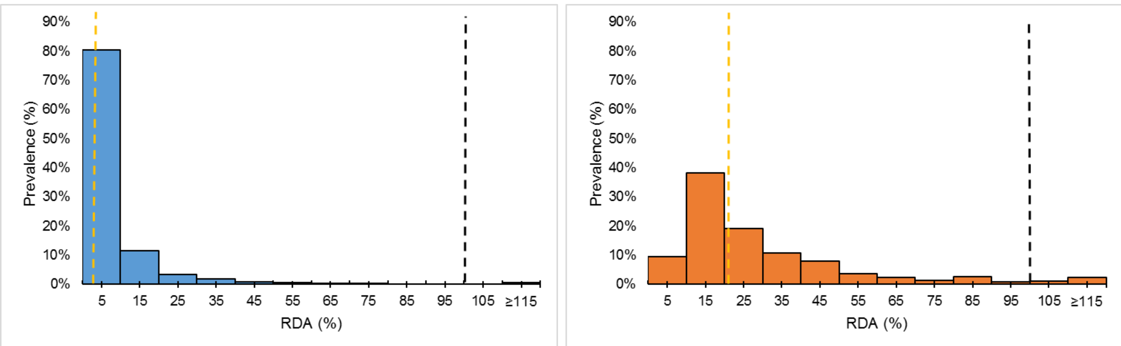
b. Children (12-23 months)



c. Children (24-59 months)



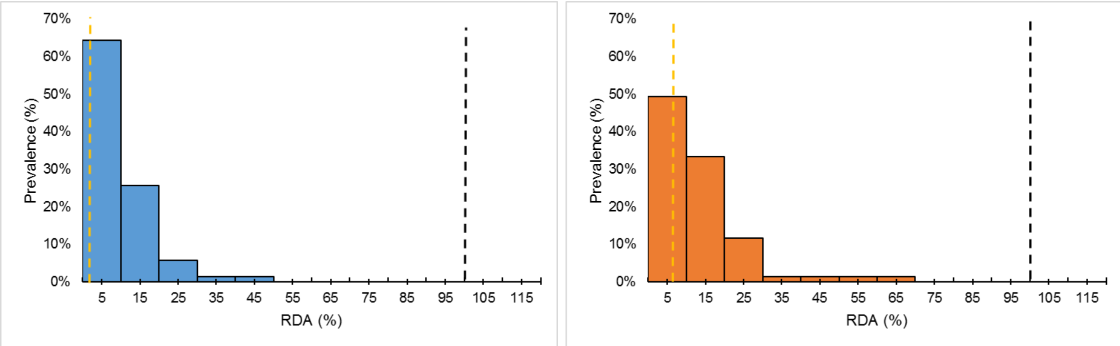
d. Women of reproductive age (15-49 years)



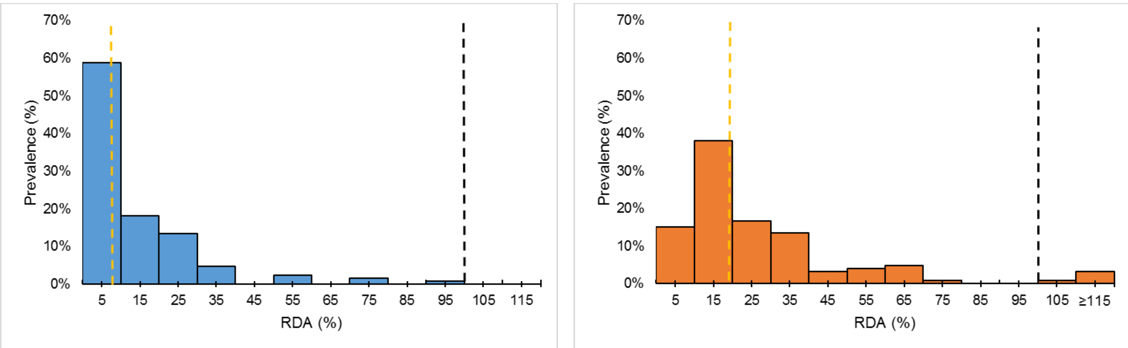
Blue and orange bars indicate actual and modelled estimates, respectively. Dotted black line is at 100%; dotted yellow line is at the median %.

Figure 20 Actual and modelled iron contribution from consumption of fortified wheat flour, maize flour and semolina flour as a percentage of the recommended dietary allowance (RDA), Sokoto, Nigeria, 2017

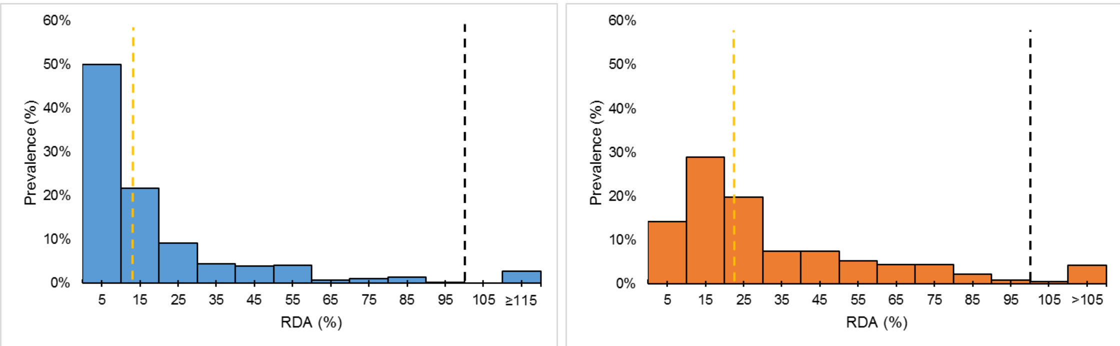
a. Children (6-11 months)



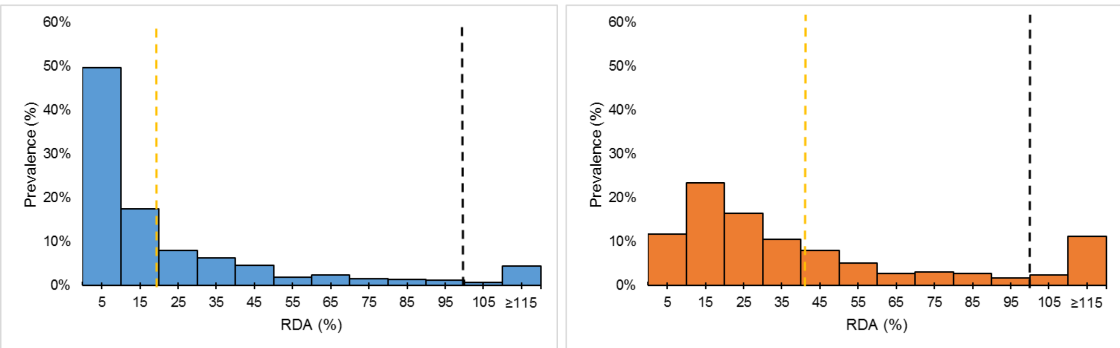
b. Children (12-23 months)



c. Children (24-59 months)



d. Women of reproductive age (15-49 years)



Blue and orange bars indicate actual and modelled estimates, respectively. Dotted black line is at 100%; dotted yellow line is at the median %.

6. Key findings and recommendations

6.1 Survey context

The survey results revealed that the likelihood of a household experiencing poverty was markedly higher in Sokoto (76%) compared to Ebonyi (33%). The higher poverty rates in Sokoto, as measured by the MPI, were driven by increased prevalence of poor access to health and education compared to Ebonyi. Differences in socio-economic status, as measured by the DHS wealth index, also highlighted that households in the bottom wealth quintiles were concentrated more heavily in Sokoto. Prevalence of other risk factors (low dietary diversity, poor infant and child feeding practices and food insecurity) were not found to be significantly different between states.

6.2 Key findings

The findings of this survey provide state level representative data on performance and coverage of Nigeria's national food fortification programme in Ebonyi and Sokoto as well as estimates of the current and potential contribution of these fortified foods to dietary intakes of iodine, vitamin A and iron among children under five and women of reproductive age. Additionally, the findings provide data on coverage of other food vehicles being considered for potential inclusion in the fortification programme.

In summary, there were a limited number of brands of each food vehicle, except for oil, available in marketplaces across the two surveyed states suggestive of a relatively small retail market for these foods; however, data are not currently available on the number of producers outside of the two surveyed states to verify this at a national level. Overall, there was low compliance with the national fortification standards for all food vehicles, except for salt, providing evidence to support the need for improved monitoring and enforcement to increase the availability of appropriately fortified foods. Some food vehicle brands, particularly oil, were found to be largely imported, indicating that improved monitoring and enforcement is necessary not only at local levels but also at customs/border levels. Furthermore, information on market share of the identified food vehicle brands was not available at the time of the survey thus inhibiting the ability to identify which of the identified brands are the major ones that should be targeted to ensure they are fortifying appropriately to increase availability of fortified foods in the market.

The fortification standards in Nigeria were found to be set as minimum values without a target or maximum value, which is a practice that deserves correction. While a minimum value gives some lens through which one can evaluate fortification performance, it does not consider the possibility of over fortification, which can have adverse effects depending on the nutrients that are being added, nor does it consider the natural variation of the nutrient being added by allowing for an acceptable range of fortification content around a target average.

The current contribution from fortified salt to dietary iodine requirements was high across all target populations providing evidence that the salt iodization programme is functioning well. The population is receiving sufficient iodine from fortified salt to fulfil nutrient requirements given there is high household coverage and consumption of fortifiable salt and most producers are fortifying to some extent. Furthermore, it is important to note that breastfed children are also benefiting from the iodization programme as breastmilk from mothers with good iodine intake is a good source of iodine.

On the other hand, the current contribution from fortified foods to dietary requirements for vitamin A (from fortifiable sugar and oil) and iron (from fortifiable wheat, maize and semolina flour) was generally low across all populations due to low compliance of producers of those food vehicles. The modelled results revealed that these foods have potential to make important contributions to vitamin A and iron intakes based on current consumption patterns of these food vehicles (including not only sugar and salt but also wheat, maize and semolina flour that are also mandated to be fortified with vitamin A); however, it would require significant improvements in the production and availability of appropriately fortified foods in markets. A meaningful improvement in monitoring and enforcement of fortified foods (both locally produced and imported) by regulatory authorities would be needed for the programme to reach its full potential.

That said, the prioritization of maize flour in the fortification programme warrants additional review given that household coverage and consumption of it in a fortifiable form was very low. In the current survey, only 11% of households in Ebonyi and 1% of households in Sokoto consumed fortifiable maize flour, which is consistent with results from the 2015 FACT where household coverage of fortifiable maize flour was 11% in Kano and 3% in Lagos (FFI, CDC, GAIN and OPM, 2017). Household coverage of fortifiable semolina flour was also relatively low in the current survey (<17% across both states) however amounts consumed daily were generally much higher than those for maize flour. Furthermore, the previous 2015 FACT survey revealed diverse food consumption patterns across the country with 83% of household consuming fortifiable semolina flour in Lagos compared to only 11% in Kano providing additional evidence that this food vehicle remains an important food vehicle for fortification in other areas of the country. Household coverage of fortifiable wheat flour in the current survey was also low in Ebonyi (9%) but higher in Sokoto (57%); however, wheat flour still remains an important food vehicle for fortification as consumption estimates (that accounted for wheat flour-containing foods from all sources not only those prepared in the household) revealed high amounts consumed daily which, if fortified to standard, could potentially make important contributions to intakes of vitamin A and iron as seen in the modelled micronutrient contribution estimates.

It was not possible to accurately estimate the household coverage of fortified food vehicles in the current survey because a large proportion of households were not able to report the brand of the food vehicle they consumed. This resulted in a high proportion of households with unknown fortification status for many food vehicles because the survey was designed to link the reported brand used in the household to a fortification status based on the laboratory analyses of food specimens collected by brand from markets. These results revealed that collecting and analysing food samples at market level cannot fully replace collecting and analysing food samples at household level. Future surveys should be designed according to the primary objectives they wish to achieve keeping in mind the trade-offs of each methodology.

Finally, regarding potential new food vehicles for inclusion in the fortification programme, high household coverage and consumption of fortifiable bouillon cubes in both states positions this food vehicle as a good potential candidate. However, before adding new food vehicle to the fortification programme further research is needed to assess the following three things. First, it is important to assess both the nutrient contribution from fortified foods as well as the total intake of the nutrient from all dietary sources to ascertain the extent to which the nutrient gap in the diet could be filled through current fortification efforts. Second, if these analyses reveal that the current program could meaningfully contribute towards filling the nutrient gaps then it may be worthwhile to consolidate efforts to improve the compliance of producers of those food vehicles rather than adding new food vehicles that could inherit the same compliance issues. Third, if the current food vehicles do not have the potential to fill the actual nutrient gap or the feasibility to significantly improve compliance among producers is limited then consideration of these new food vehicles may be warranted. In this case, additional research would be needed to confirm their coverage and utilization in other areas of the country as well as their market share, value chains, and, for bouillon cubes, possibilities of excessive salt consumption. It is important to underscore these formative steps to avoid inheriting current constraints with any new food vehicles for fortification.

6.3 Recommendations

Based on the findings described above, several priority recommendations can be made:

1. A meaningful improvement in monitoring and enforcement of fortified foods (both locally produced and imported) by regulatory authorities is needed to increase the availability of appropriately fortified foods in markets and allow the programme to reach its full potential;

2. Information on market share of available brands of fortified food vehicles should be compiled to identify which brands are the major ones that should be targeted to ensure they are fortifying appropriately to increase availability of appropriately fortified foods in the market;

3. Fortification standards should be revised to include a target and maximum limit to avoid over fortification while ensuring an appropriate range that takes into account the natural variation in the food vehicle; and

4. Further research is needed to assess the nutrient contribution from fortified foods as well as the total intake of the nutrient from all dietary sources to ascertain the extent to which the nutrient gap in the diet could be filled through current fortification efforts before adding new food vehicle to the fortification programme.

These results will be shared with nutrition stakeholders in the country to further guide programming efforts and nutrition policy recommendations.

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8. Annexes

1. SAMPLE SIZE CALCULATIONS

The sample aimed to be representative at the state level and to adhere to the minimal requirements for statistical precision. For the sample size determination, it was assumed that the survey would estimate proportions of 50% and assume a margin of error of 5 percentage points at the statistical significance level of 5% (based on 95% confidence intervals). Due to the two-stage sampling design, the statistical power was affected by the clustering effects inflating the variance. For the sampling size determination, historic information about clustering effects was therefore used. The Nigeria Demographic Health Survey (NDHS) 2013 survey was used as the source of the historic information and three key variables with available design effect estimates were used to act as proxies for the two key populations identified, i.e. children under 5 and WRA:

- Height for age (HFA);
- Weight for height (WFH);
- Proportion of women attending at least 1 antenatal care (ANC) visit during their last pregnancy.

The NDHS 2013 reported the 'design factor' (DEFT), which is the 'design effect' (DEFF) in its reduced form as the standard error multiplier instead of the variance multiplier; therefore, the reported DEFT had to be adjusted into a standard DEFF measure in order to be used in sample size calculations. The statistics for the selected indicators were reported at the national level as well as for each geographical zone. In order to approximate to the actual situation in each of the selected states, the zone estimates were used in the calculation. In order to transfer the sampling design effect estimates from a reference sample design to a new sampling design used for the FACT survey, a standardised measure of sampling design effects, the Intra Class Correlation (ICC), was calculated for each indicator. Table 16 summarises these calculations.

Table 16: Design effect estimates from NDHS 2013

Geographical zone	Indicator	DEFT	DEFF	ICC
National	HFA	1.8	3.24	5.1%
	WFH	2.2	4.84	8.7%
	ANC	3.5	12.25	25.6%
North West	HFA	1.8	3.24	5.1%
	WFH	2.3	5.29	9.8%
	ANC	3.8	14.44	30.5%
South East	HFA	1.5	2.25	2.8%
	WFH	1.3	1.69	1.6%
	ANC	1.9	3.61	5.9%

Table 16 shows considerable variation in DEFFs among the indicators as well as between the two zones of interest. To produce a more conservative estimate of the required sample size for the FACT survey, the mean of the indicators in the North West zone were used in calculations, which yielded an average ICC of 15.1% and a DEFF of 3.1. This process yielded a sample size of 1,230 households with equal numbers of children under 5 years of age and caregivers in each household (615 per state).

2. HOUSEHOLD QUESTIONNAIRE

NIGERIA FACT COVERAGE SURVEY 2017 **HOUSEHOLD QUESTIONNAIRE**					
start_date start_time end_date end_time	Date of interview ***CAPI Programmer:*** Take time stamp to signal beginning and end of interview	DD / MM / YY			☐☐ / ☐☐ / ☐☐
team_id	Team identifier	☐☐	interviewer_id	Interviewer identifier	☐☐
state_id	State identifier	01. Sokoto 02. Ebonyi			☐☐
lga_id	LGA	☐☐			
ea_id	Enumeration area	☐☐			
areaname	Area/village/town name	______________________			
structure_id	Structure identifier	☐☐			
household_id	Household identifier	☐☐			
longitude latitude	GPS coordinates ***CAPI Programmer:*** *Please collect GPS coordinates of the structure*	**DDD MM SS L** **Lon** |__|__|__|●|__|__|__|__|__|__|__| **Lat** |__|__|__|●|__|__|__|__|__|__|__|			

Good morning / Good evening Madam / Sir,

My name is [NAME OF INTERVIEWER] and I work for Oxford Policy Management (OPM). We are currently conducting a survey on the coverage of fortified foods and your household was randomly selected to participate in the survey.

The first part of the interview will be about the composition of the household, including all its members. Then, based on this information, I would like to interview the mother or caregiver of the child less than 5 years of age. If there is more than one child less than 5 years of age then I will select one at random. I will then ask the mother/caregiver of the child some questions about what she and the child ate yesterday and foods purchased and prepared in the household, like salt, sugar, and oil, as well as wheat, maize and semolina flours. At the end I will measure the mid-upper arm circumference of the woman and the child to assess their nutritional status.

The questions to you will take about 1 hour.

Do you agree to start with the first part of the interview?

Please make sure the respondent is at least 15 years of age

available_key_household	Most knowledgeable household member is available ….1 Another member of the household is around…………..…2 No one is around for the interview……………………..…...3	If 2 or 3, stop here.

consent_1	Oral consent to fill in the household roster obtained?	Yes…………1 No…………..2	If **yes**, start. If **no**, stop here.

HOUSEHOLD ROSTER

We would like some information about the people who usually live in your household. Please include all family and non-family members (such as domestic servants, lodgers, or friends) who usually live together in the same dwelling and eat from the same pot of food. A member of the household must have lived in the household for at least 6 of the past 12 months. Start with the head of the household.

Start by listing the head of the household, the spouse to the head of the household (if applicable), all of their children, any other adults, and any other children.

Line no. (*hh_pid*)	Name of household member (*hh_a*)	What is [name]'s relationship to the head? (*hh_rel*)	What is [name]'s gender? (*hh_b*)	How old is [name] in completed years? *Please indicate age in years* (*hh_ca*)	*ONLY for persons aged < 5 years*	*ONLY for persons aged ≥ 5 years*	*ONLY for persons aged ≥ 8 years*	*ONLY if hh_e=2*	*Only for persons aged < 5 years*
					How old is [name] in completed months? *Please indicate age in months* *(hh_cb)*	Is [name] currently attending school or university/ college? (*hh_d*)	Has [name] completed primary education? (hh_e)	What is the highest level of school [name] has completed? (*hh_f*)	Who is [name]'s caregiver? *Record line number of caregiver* (*hh_carg*)
01	Head of household	Head……..…………………..1 Spouse……………………..2 Son/daughter……………...3 Son/daughter in-law……...4 Grandchild.........................5 Parent……………………...6 Parent in-law………………7 Brother/sister………………8 Auntie/uncle……………….9 Nephew/ niece…………..10 Grandparent....................11 Brother/sister in-law…….12 Other relative of HH head or spouse of head...............13 Domestic help or related to domestic help……………14 Not related to HH head or spouse of the head……..15	Male…….1 Female....2			Yes………1 No……….2	Yes………1 No……….2	No formal education.……..1 Pre-primary/kindergarten...2 Primary 1…………………..3 Primary 2…..………………..4 Primary 3…..………………..5 Primary 4…..………………..6 Primary 5…..………………..7 Don't know…………………88	
02		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
03		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
04		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	

05		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
06		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
07		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
08		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
09		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
10		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
11		[see above options]	M….1 F…..2			Yes………1 No……….2	Yes………1 No……….2	[see above options]	
Note: Add a new page if more people in the household									

Check the roster for completion!

resp_roster_pid	*Please select the key respondent who answered the household roster* *(Record line number of respondent)*	☐☐

nb_cu5	Total number of children under 5 years old in the household	*(**CAPI** WILL AUTOMATICALLY COMPLETE THESE 3 ITEMS. FOR THE SELECTION OF THE CHILD, **CAPI** WILL USE THE KISH TABLE PRINCIPLES)*
child_sel	Line number of the randomly selected child	
carg_sel	Line number of the mother/caregiver of the randomly selected child	

CAPI: If selected caregiver < 15 years of age, stop here and end questionnaire.			
sel_careg_avail	Is [selected caregiver] available?	Yes…………1 No…………..2	If yes, proceed. If no, stop here and revisit household.
consent_2	Good morning / Good evening Madam / Sir, My name is [NAME OF INTERVIEWER] and I work for Oxford Policy Management (OPM). We are currently conducting a survey on the coverage of fortified foods and your household was randomly selected to participate in the survey. I would like to ask you some questions about the characteristics of your household, and what you and the child ate yesterday and foods purchased and prepared in the household, like salt, sugar, and oil, as well as wheat, maize and semolina flours. At the end I will measure your mid-upper arm circumference and that of the child to assess your nutritional status. The questions to you will take about 1 hour. *Has [selected caregiver]'s oral consent been obtained?*	Yes…………1 No…………..2	If **yes**, start. If **no**, stop here.

HOUSEHOLD CHARACTERISTICS AND ASSETS			
N°	QUESTIONS	ANSWERS	SKIPS
hc1	Does your household have electricity? *(CIRCLE ONLY* ***<u>ONE</u>*** *ANSWER)*	Yes…………………………………………………..1 No……………………………………………………2	
hc2	What fuel does your household mainly use for cooking? *(CIRCLE ONLY* ***<u>ONE</u>*** *ANSWER)*	Electricity..1 LPG/cylinder………………………………………..2 Natural Gas...3 Biogas…………………………………………………4 Kerosene stove...5 Coal / Lignite...6 Charcoal……………………………………………7 Firewood...8 Straw / Shrubs / Grass/ Sawdust...........................9 Agricultural crops……………………………………10 Animal dung...11 No food cooked in household................................12 Don’t know...88 Other (specify): _________________...................99	
hc3	*What is the main material of the floor of the dwelling?* *(OBSERVATION)* *(CIRCLE ONLY* ***<u>ONE</u>*** *ANSWER)*	Earth / sand...1 Dung..2 Wood planks..3 Palm / bamboo..4 Parquet / polished wood.......................................5 Vinyl / asphalt strips..6 Ceramic tiles..7 Cement..8 Carpet...9 Other (specify): _________________..................99	
hc4	*What is the main material of the roof of the dwelling?* *(OBSERVATION)* *(CIRCLE ONLY* ***<u>ONE</u>*** *ANSWER)*	No roofing...1 Thatch / palm leaves..2 Sod...3 Rustic mat...4 Palm / bamboo..5 Wood planks..6 Cardboard...7 Metal/zinc...8 Wood...9 Calamine / cement fiber.......................................10 Ceramic tiles...11 Cement...12 Roofing shingles..13 Other (specify): ___________________..............99	

hc5	*What is the main material of the exterior walls of the dwelling?* *(OBSERVATION.)* *(SELECT ONLY **ONE** ANSWER.)*	No walls……………………………………………1 Cane/palm/trunks…………………………………2 Dirt/Mud.. 3 Bamboo and mud……….…………………………4 Stone and mud……………………………………5 Uncovered adobe…………………………………6 Plywood……………………………………………7 Cardboard………………………….................…8 Reused wood………………………………………9 Cement………………………….................……10 Stone with lime/cement………………...............…11 Bricks…………………………..............………12 Cement blocks…………………………….........13 Wood planks/shingles…………………...............…14 Covered adobe……………………………………15 Other (specify)________________.......................99	
hc6	Now I'm going to ask if you or your household owns any of the following items. Do you or anyone in your household own a … ? ***(PROMPT FOR EACH ITEM**; RECORD ALL ITEMS OWNED BY HOUSEHOLD OR A MEMBER...)* *(CIRCLE ONLY **ONE** ANSWER FOR EACH ITEM.)*	*hc6_1* Radio Yes……….1 No………..2 *hc6_2* Television Yes……….1 No………..2 *hc6_3* Mobile Telephone Yes……….1 No………..2 *hc6_4* Non-mobile telephone Yes……….1 No………..2 *hc6_5* Wrist watch Yes……….1 No………..2 *hc6_6* Bicycle Yes……….1 No………..2 *hc6_7* Motorcycle, scooter, auto rickshaw Yes……….1 No………..2 *hc6_8* Car or truck Yes……….1 No………..2 *hc6_9* Computer Yes……….1 No………..2 *hc6_10* Animal-drawn cart Yes……….1 No………..2 *hc6_11* Boat with a motor Yes……….1 No………..2 *hc6_12* Fan Yes……….1 No………..2 *hc6_13* Electric iron Yes……….1 No………..2	

		hc6_14 Refrigerator Yes……….1 No………..2	
		hc6_15 Dish washer/washing machine Yes……….1 No………..2	
		hc6_16 Air conditioner Yes……….1 No………..2	
		hc6_17 Generating set Yes……….1 No………..2	
		hc6_18 Cable TV Yes……….1 No………..2	
hc7	Does any member of your household own any agricultural land?	Yes……………………………………………..………1 No……….……………………………………..…….2	
hc9	Does this household own any livestock, herds, other farm animals, or poultry?	Yes……………………………………………..………1 No……….……………………………………..…….2	If **2**, skip to **hc11**
hc10	How many [animal] does the household own? ***(PROMPT FOR EACH ANIMAL****; IF NONE, RECORD '00'; IF MORE THAN '95', ENTER '95'; IF UNKNOWN, ENTER '98')* *(IF THE HOUSEHOLD CAN'T SPECIFY THE NUMBER OF CHICKEN/ OTHER POULTRY, THEN ENTER 99, AND SELECT THE RANGE IN hc10f2)*	*hc10a* Cows/Bulls ……………………… ☐☐ *hc10b* Other cattle ……..................... ☐☐ *hc10c* Horses/Donkeys/Mules ……...... ☐☐ *hc10d* Goats ….…………………….... ☐☐ *hc10e* Sheep…….……………………..... ☐☐ *hc10f* Chickens/ other poultry ..………..... ☐☐ *hc10g* Other (specify) ______..…………... ☐☐ *hc10h* Other (specify) ________..……… ☐☐	If <'99' for chicken/ other poultry, skip to **hc11**.
hc10f2	Select the range of chicken/poultry that the household owns. *(ONLY COMPLETE IF HOUSEHOLD CAN'T SPECIFY EXACT NUMBER OF CHICKEN/ OTHER POULTRY)*	1-9…………………1 10-29………………2 30 or more………...3	
hc11	Does any member of this household have a bank account?	Yes……………………………………………..………1 No……….……………………………………..…….2 Don't know…………………………………….……88	
hc12	How many rooms are there in total in your household?	Number of rooms in household ………..…. ☐☐	
hc13	How many rooms are used for sleeping in your household?	Number of rooms for sleeping ………..…. ☐☐	

WATER, SANITATION, AND HYGIENE (WASH)			
N°	QUESTIONS	ANSWERS	SKIPS
w1	What is the main source of drinking water for the members of your household? *(CIRCLE ONLY **ONE** ANSWER)*	Water piped into dwelling..1 Water piped to yard / plot..2 Water piped to neighbor……………………………….3 Public tap / standpipe...4 Tube well / borehole...5 Protected dug well...6 Unprotected dug well..7 Protected spring...8 Unprotected spring...9 Rainwater...10 Tanker truck...11 Cart with small tank/drum.......................................12 Surface water (river / dam / lake / pond / stream / canal / irrigation channels)..................................13 Bottled water………..14 Sachet water……………………………………..……15 Don't know..88 Other (specify): ______________________.............99	If **1 or 2**, skip to **w4**
w2	Where is that water source located? *(CIRCLE ONLY **ONE** ANSWER)*	In own dwelling…………………………………………1 In own yard/plot…………………………………………2 Elsewhere……………………………………………3	If **1 or 2**, skip to **w4**
w3	How long does it take to go there, get water and come back? *(WRITE IN THE NUMBER.)* *(IF 'DON'T KNOW', RECORD 888)*	Minutes………………………. ☐☐☐	
w4	What kind of toilet facility do members of your household usually use? *(DO **NOT** PROMPT)* *(CIRCLE ONLY **ONE** ANSWER)*	Flush to septic tank……………..................................1 Flush to piped sewer……………………………………..2 Flush to pit latrine..3 Flush to somewhere else………………………………4 Flush, don't know where………………………………5 Ventilated improved pit latrine..................................6 Pit latrine with slab...7 Pit latrine without slab / open pit...............................8 Composting toilet/ecosan..9 Bucket toilet...10 Hanging toilet / hanging latrine................................11 No facilities / bush / field..12 Don't know...88 Other (specify): ______________________ 99	If 12, skip to **Short Birth History Module**
w5	Do you share this toilet facility with other households? *(CIRCLE ONLY **ONE** ANSWER.)*	Yes……………………..……………………………1 No……..………………………………………..……2	

SHORT BIRTH HISTORY			
N°	QUESTIONS	ANSWERS	SKIPS
bh1	Altogether, how many live births have there been in your household in the last 5 years? Please include any baby who cried or showed other signs of life at birth/delivery. *Include all the live births in this household in the last 5 years whether they are from the same mother or from different mothers.* *(WRITE IN THE NUMBER)* *(IF 'NONE', RECORD 00.* *IF 'DON'T KNOW', RECORD 88)*	☐☐	If **00** or **88**, skip to **household hunger scale** module.
bh2	Is this child / are these children still alive? *(CIRCLE ONLY **ONE** ANSWER)*	All alive...1 One or more has died in the past 5 years ....2 Don't know……………………………………88	

HOUSEHOLD HUNGER SCALE			
N°	QUESTIONS	ANSWERS	SKIPS
hh1	How many times in the last 30 days was there ever no food to eat of any kind in your house because of lack of resources to get food? *(WRITE IN THE NUMBER)* *(IF 'NONE,' RECORD 00.)*	Number of times ☐☐	
hh2	How many times in the last 30 days did you or any household member go to sleep at night hungry because there was not enough food? *(WRITE IN THE NUMBER)* *(IF 'NONE,' RECORD 00.)*	Number of times ☐☐	
hh3	How many times in the last 30 days did you or any household member go a whole day and night without eating anything at all because there was not enough food? *(WRITE IN THE NUMBER)* *(IF 'NONE,' RECORD 00.)*	Number of times ☐☐	

CHILD FEEDING PRACTICES			
N°	QUESTIONS	ANSWERS	SKIPS
cf1	Is [NAME OF CHILD] currently breastfed? *(CIRCLE ONLY **ONE** ANSWER)*	Yes……….......................1 No………..………………..2	If **2**, skip to **cf3**.
cf2	Does [NAME OF CHILD] take any food or drink other than breastmilk, including water? *(CIRCLE ONLY **ONE** ANSWER)*	Yes……….......................1 No…..……………………..2	If **2**, skip to **dietary diversity** module.
cf3	How many times was [NAME OF CHILD] fed mashed or pureed food or solid or semisolid foods other than liquids from the time [child] woke up yesterday to when [child] woke up today? *(WRITE IN THE NUMBER)* *(IF 'NONE,' RECORD 00.)* *(IF 'DON'T KNOW', RECORD 88)*	Number of times ☐☐	

DIETARY DIVERSITY			
SInce the time you woke up yesterday to when you woke up today, did you and [NAME OF CHILD] have any of the following things to eat or drink? I am interested in whether you had the item I mention, even if it was combined with other foods. For example, if you ate a millet porridge made with a mixed vegetable sauce, you should reply yes to any food I ask about that was an ingredient in the porridge or sauce. Please do not include any food used in a small amount for seasoning or condiments (like chilies, spices, herbs, or fish powder), I will ask you about those foods separately. *(READ **ALL** QUESTIONS. CIRCLE ONLY **ONE** ANSWER FOR EACH.)*			
N°	ITEMS	A. Caregiver	B. Child
dd01b	Water?		Yes………1 No……….2
dd02a	Tinned, powdered or fresh milk, or any other milk?	Yes………1 No……….2	
dd02b	Tinned, powdered or fresh milk, tinned or powdered infant formula such as Dano, Peak, Cerelac, Nido, Lactogen, or any other milk (excluding breast milk)?	Yes………1 No……….2	Yes………1 No……….2

dd03a dd03b	Any bread, rice, noodles, spaghetti, biscuits, or any other foods made from millet, sorghum, maize, rice, corn, rye, semolina or wheat flour?	Yes………1 No……….2	Yes………1 No……….2
dd04a dd04b	Any potatoes, yams, cocoyam, manioc, cassava or any other foods made from roots or tubers, or plantains?	Yes………1 No……….2	Yes………1 No……….2
dd05a dd05b	Any food made from vegetables or root crops with yellow or orange flesh such as carrots, squash, pumpkin, sweet potatoes?	Yes………1 No……….2	Yes………1 No……….2
dd06a dd06b	Any food made from dark green leafy vegetables such as kuka, spinach, ewedu leaves, ugwu leaves, cassava leaves, potato leaves, kale and other locally available dark green leafy vegetables?	Yes………1 No……….2	Yes………1 No……….2
dd07a dd07b	Any other vegetables, such as tomatoes, okra, cucumber?	Yes………1 No……….2	Yes………1 No……….2
dd08a dd08b	Any food made from fruits with yellow or orange flesh such as ripe mango, ripe papaya/pawpaw, ripe passion fruit, peaches or apricot?	Yes………1 No……….2	Yes………1 No……….2
dd09a dd09b	Any other fruits, such as bananas, apples, pineapple?	Yes………1 No……….2	Yes………1 No……….2
dd10a dd10b	Any beef, pork, lamb, goat, rabbit, wild game, chicken, turkey, guinea fowl, duck, or other birds?	Yes………1 No……….2	Yes………1 No……….2
dd11a dd11b	Any liver, kidney, heart, or other organ meats?	Yes………1 No……….2	Yes………1 No……….2
dd12a dd12b	Any eggs?	Yes………1 No……….2	Yes………1 No……….2
dd13a dd13b	Any fresh or dried fish or shellfish?	Yes………1 No……….2	Yes………1 No……….2
dd14a dd14b	Any cowpea, locust bean, pigeon pea, soya bean, or other foods made from beans, peas, lentils, or legumes?	Yes………1 No……….2	Yes………1 No……….2
dd15a dd15b	Any groundnut, cashew, walnut, kola nut, sesame, shea nut, almond, ogbono, egusi or other foods made from nuts or seeds, including nut/seed butters or pastes?	Yes………1 No……….2	Yes………1 No……….2
dd16a dd16b	Any cheese, yoghurt or other foods made from milk or other milk products?	Yes………1 No……….2	Yes………1 No……….2
dd17a dd17b	Any foods made with oil, fat, or butter?	Yes………1 No……….2	Yes………1 No……….2
dd18a dd18b	Any sugar or honey?	Yes………1 No……….2	Yes………1 No……….2
dd19a dd19b	Any other foods, such as condiments, coffee, tea, bouillon cubes, tomato paste, spices, herbs or any other food used in small amount for seasoning?	Yes………1 No……….2	Yes………1 No……….2
dd20a dd20b	Red palm oil	Yes………1 No……….2	Yes………1 No……….2

SALT FORTIFICATION COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
Now I'm going to ask you some questions about food items including salt, sugar, cooking oil, wheat flour, maize flour, semolina flour and whole wheat meal. If you have any of these food items in your household, could you please bring them out here now?			
si1	Now, I would like to talk with you about salt. Does your household use salt? *(CIRCLE ONLY **<u>ONE</u>** ANSWER)*	Yes…………..……………………………...1 No.........……… ……………………..……2	If **2**, skip to **sugar** module.
si2	The **<u>last time</u>** your household got salt, where did you get it from? *(CIRCLE ONLY **<u>ONE</u>** ANSWER)*	Purchased..1 Made it at home.....................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): _______________........99	If **4,** skip to **sugar** module.
si3	The **<u>last time</u>** your household got salt, how was it packaged? *(READ **<u>ALL</u>** RESPONSES)* *(CIRCLE ONLY **<u>ONE</u>** ANSWER)*	Original package..…………………………...1 Re-packaged…………..…………………......2 Don't know / Don't remember.................88 Other (specify): ________________......99	
si6	The **<u>last time</u>** your household got salt, what was the brand? *(CIRCLE ONLY **<u>ONE</u>** ANSWER)*	Cassava Salt (Jumbee Ltd)....................1 Dangote Salt..2 Mr. Chef Salt (Royal Salt Ltd)..................3 Uncle Palm Salt (Royal Salt Ltd).............4 Don't know ....88 Other(specify): _______________........99	
si7	The **<u>last time</u>** your household got salt, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	si7a. Quantity ☐☐☐☐ si7b. Unit Kg..1 g ………………………………………2 A. Spoon measure…………………..3 B. Gongoni I (small Derica)…….…..4 C. Milk tin/Gongo………..………..5 D. Quarter/Small Chakwal..………..6 E. Chakwal……………………..…..7 F. Gongoni II (Big Derica)..……..…..8 G. Dan Marafa/Mudu/Kwanu………....9 H. Tier/Baban Kwanu………………...10	

		I. Seven-up bottle/small bottle……..11 J. Big bottle/whiskey/Gin bottle…….12 K. Small jerrycan/2 litre…………..13 L. Medium jerrycan/4 litre………...14 M. Big jerrycan/10 litre……….…..15 N. Abakaliki cup…………………..16 O. Half paint……………..……….17 P. Paint bucket………….……….18 Q. Big Lude……………...……..19 R. Small Lude……………………..20 S. MPC bottle……………..……..21 T. Bushel…………………….…..22 Don't know……………………….88 Other (specify)________..……..99	
si8	The **last time** your household got that amount of salt, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if si2≠5
si9	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	si9a. Duration ☐☐ si9b. Unit Day(s)...1 Week(s)…………………………………2 Month(s)...3	
si10	Do you have this salt in your home now? *(CIRCLE ONLY **ONE** ANSWER)*	Yes………..……………………………...1 No……………..…………………..……2	If **2**, skip to **sugar** module.
si11	***ASK TO SEE THE SALT PACKAGE AND LOOK FOR FORTIFICATION LOGO OR WORDS SUCH AS IODIZED OR FORTIFIED*** *(CIRCLE ONLY **ONE** ANSWER)*	Package is in its original package and Logo or words were observed…............1 Package is in its original package and Logo or words were NOT observed….....2 Package is not in its original package....3	

SUGAR FORTIFICATION COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
sg1	Now, I would like to talk with you about sugar. Does your household use sugar? *(CIRCLE ONLY **ONE** ANSWER)*	Yes…………..……………………………...1 No..........……… ……………………..……2	If **2**, skip to **oil** module.
sg2	The **last time** your household got sugar, where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased..1 Made it at home......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): ________________........99	If **4,** skip to **oil** module.
sg3	The **last time** your household got sugar, how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..………………….……..1 Re-packaged…………..………………......2 Don't know / Don't remember.................88 Other (specify): _________________......99	
sg6	The **last time** your household got sugar, what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	BUA Sugar……..1 Crown cube sugar……..2 Dangote Sugar…...3 Family cube sugar (MC Nichols PLC).....................4 Family granulated sugar (MC Nichols PLC)………..5 Family granulated brown sugar (MC Nichols PLC)..6 Golden Penny cube sugar…………………….….…7 Golden Penny granulated sugar…………………….8 Linto Sugar Cubes ……………………………………9 Nagiko Sugar (Erisco Foods Ltd.)………………….10 St. Louis cube sugar……………………………….11 Tate & Lyle cube sugar………………….................12 UNILEVER sugar……………………………………13 Dogan…………………………………………………14 Brazil Sugar…………………………………………..15 Don't know ....88 Other(specify): ________________.......................99	
sg7	The **last time** your household got sugar, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	sg7a. Quantity ☐☐☐☐ sg7b. Unit Kg...1 g ……………………………………….2 A. Spoon measure…………………..3 B. Gongoni I (small Derica)………..4	

		C. Milk tin/Gongo……………………..5 D. Quarter/Small Chakwal..………..6 E. Chakwal………………………..…..7 F. Gongoni II (Big Derica)..……..…..8 G. Dan Marafa/Mudu/Kwanu……....9 H. Tier/Baban Kwanu……………....10 I. Seven-up bottle/small bottle.…….11 J. Big bottle/whiskey/Gin bottle…….12 K. Small jerrycan/2 litre…………..13 L. Medium jerrycan/4 litre………...14 M. Big jerrycan/10 litre………..…..15 N. Abakaliki cup…………………..16 O. Half paint…………………………17 P. Pain bucket……………..……..18 Q. Big Lude……………….....……..19 R. Small Lude…………………….20 S. MPC bottle…………....………..21 T. Bushel…………………………22 Don't know……………………….88 Other (specify)________...………..99	
sg8	The **last time** your household got that amount of sugar, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if sg2≠5
sg9	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	sg9a. Duration ☐☐ sg9b. Unit Day(s)...1 Week(s)…………………………………2 Month(s)..3	
sg10	Do you have this sugar in your home now? *(CIRCLE ONLY **ONE** ANSWER)*	Yes…………..……………………………..1 No………………..…………………..……2	If **2**, skip to **oil** module.
sg11	***ASK TO SEE THE SUGAR PACKAGE AND LOOK FOR FORTIFICATION LOGO OR WORDS SUCH AS FORTIFIED*** *(CIRCLE ONLY **ONE** ANSWER)*	Package is in its original package and Logo or words were observed…............1 Package is in its original package and Logo or words were NOT observed…....2 Package is not in its original package....3	

OIL FORTIFICATION COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
of1	Now, I would like to talk with you about cooking oil. Does your household use cooking oil to prepare food or add to food at home? *(CIRCLE ONLY **ONE** ANSWER)*	Yes…………..……………………………...1 No..........……… …………………….……2	If **2**, skip to **wheat flour** module.
of2	What is the **main** type of cooking oil that your household uses for most meals on most days? *(CIRCLE ONLY **ONE** ANSWER.)*	Groundnut oil………………..…………….1 Red palm oil………………..……………..2 Sunflower oil……………………………….3 Coconut oil…………………….…..…….4 Palm kernel oil……………………………5 Soya bean oil……...……………………..6 Rape seed oil………………...……………7 Cottonseed oil……………………………..8 Maize oil…………………………………….9 Sesame seed oil…………………….…...10 Vegetable oil………………….....………11 Don't know / Don't remember..................88 Other (specify): _________________.....99	
of3	The **last time** your household got [MAIN OIL TYPE], where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased..1 Made it at home......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): _______________........99	If **4,** skip to **wheat flour** module.
of4	The **last time** your household got [MAIN OIL TYPE], how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..………………….…...1 Re-packaged……….……………......2 Don't know / Don't remember.................88 Other (specify): ________________......99	
of7	The **last time** your household got [MAIN OIL TYPE], what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	1. 3 Stars Soya Oil 2. Amipego Pure Edible Groundnut Oil 3. Aniz First Choice Oil 4. Apple & Pears Soya Oil 5. Bagad Cottonseed Oil 6. Bagad Groundnut Oil 7. Bimoli Aroma 8. El-Mowala Cottonseed Oil 9. El-Mowala Groundnut Oil 10. El-Suffa Groundnut Oil 11. Envoy Palm Kernel Oil 12. Envoy Pure Refined Palm Olein	

		13. Eva Golden Vegetable Oil 14. Executive Clef Soya Oil (Jof Ideal) 15. Family Delight Groundnut Oil 16. First Oil Pure Vegetable Oil 17. Fortunes Pure Refined Soya Oil 18. Fresh Vegetable Oil 19. Gino Vegetable Oil 20. Golden Oil Refined Palm Olein Oil (BUA) 21. Golden Oil Refined Soya Oil (BUA) 22. Golden Penny Soya Oil 23. Golden Penny Vegetable Oil 24. Golden Soya Oil (Growrich Resorts Ltd) 25. Grand Pure Soya Oil 26. Grand Pure Groundnut Oil 27. Gumsullum Cottonseed Oil 28. Gumsullum Groundnut Oil 29. Herwa Cottonseed Oil 30. Herwa Groundnut Oil 31. Ideal Palm Kernel Oil 32. King's Vegetable Oil (PZ Wilmar Ltd) 33. Kitchen Vegetable Oil 34. Life Olein Oil 35. Mamador Vegetable Oil (PZ Wilmar) 36. New Era Vegetable Oil 37. Oki Blended Vegetable Oil 38. Oki Canola Oil 39. Oki Corn Oil 40. Oki Palm Oil 41. Oki Soybean Oil 42. Oki Sunflower Oil 43. Oxtrich Pure Vegetable Oil 44. Power Oil (Raffles) 45. Rosel Palm Stearin 46. Rosel Refined Pure Palm Oil 47. Rosel Refined Pure Palm Olein 48. Rosel Refined Soya Oil 49. Seraph Refined Soya Oil 50. Solive Vegetable Oil 51. Spark Pure Groundnut Oil 52. Star Arrival Refined Oil 53. Strive Vegetable Oil (Pioneer) 54. Sunchi Soya Oil 55. Sunola Oil 56. Sunseed Vegetable Oil 57. Turkey Canola Oil 58. Turkey Corn Oil 59. Turkey Palm Oil 60. Turkey Soybean Oil 61. Turkey Sunflower Oil 62. Ummul Khair Groundnut Oil 63. Vino Pure Refined Palm Kernel Olein (Envoy Ltd) 64. Vino Refined Palm Kernel Oil (Envoy Ltd) 65. Wesson Blended Oil	

		66. Wesson Canola Oil 67. Wesson Corn Oil 68. Wesson Vegetable Oil 69. Ziggush Vegetable Oil 70. Adan Groundnut Oil 71. Adan Soybean Oil 72. Chido 73. Emperor Pure Vegetable Oil 74. Hayat 75. Goddis 76. Gold Winner groundnut oil 77. Laziz Pure Vegetable Oil 78. Saji Oil 79. Soleir Vegetable Oil 80. Sunflower oil Luckline 81. Tropical Sun sunflower oil 82. Turkey pure vegetable cooking oil Don't know ....88 Other(specify): ________________........................99	
of8	The **last time** your household got [MAIN OIL TYPE], what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	of8a. Quantity ☐☐☐☐ of8b. Unit L...1 cl…………………………………………2 ml……………………………………...3 A. Spoon measure…………………….4 B. Gongoni I (small Derica)…………..5 C. Milk tin/Gongo………..……..….6 D. Quarter/Small Chakwal..………....7 E. Chakwal………………………..…..8 F. Gongoni II (Big Derica)..……..…...9 G. Dan Marafa/Mudu/Kwanu……....10 H. Tier/Baban Kwanu……………....11 I. Seven-up bottle/small bottle.…….12 J. Big bottle/whiskey/Gin bottle…….13 K. Small jerrycan/2 litre……………..14 L. Medium jerrycan/4 litre…………...15 M. Big jerrycan/10 litre…………..…..16 N. Abakaliki cup…………………..…..17 O. Half paint……………..………..18 P. Pain bucket…………..………..19 Q. Big Lude……………...……..…..20 R. Small Lude………………………..21 S. MPC bottle…………..………..22 Don't know…………………………..88 Other (specify)________..…………..99	

of9	The **last time** your household got that amount of [MAIN OIL TYPE], how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if of3≠5
of10	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	of10a. Duration ☐☐ of10b. Unit Day(s)..1 Week(s)…………………………………2 Month(s)..3	
of11	Do you have this [MAIN OIL TYPE] in your home now? *(CIRCLE ONLY **ONE** ANSWER)*	Yes………….……………………………...1 No……………….………………….……2	If **2**, skip to **wheat flour** module.
of12	***ASK TO SEE THE [MAIN OIL TYPE] PACKAGE AND LOOK FOR FORTIFICATION LOGO OR WORDS SUCH AS FORTIFIED*** *(CIRCLE ONLY **ONE** ANSWER)*	Package is in its original package and Logo or words were observed…............1 Package is in its original package and Logo or words were NOT observed…....2 Package is not in its original package....3	

WHEAT FLOUR FORTIFICATION COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
wf1	Now, I would like to talk with you about wheat flour. Does your household prepare foods using wheat flour (such as bread, chin-chin, puff-puff or other wheat flour products)? *(CIRCLE ONLY **ONE** ANSWER)*	Yes………….……………………………...1 No..........……… ……………………….……2	If **2**, skip to **maize flour** module.
wf2	The **last time** your household got wheat flour, where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased...1 Made it at home......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): _______________........99	If **4,** skip to **maize flour** module.

wf3	The **last time** your household got wheat flour, how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..…………………………...1 Re-packaged…………..……………….....2 Don't know / Don't remember.................88 Other (specify): _________________......99	
wf6	The **last time** your household got wheat flour, what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	1. BUA Premium Flour 2. Dangote Bread Flour 3. Dangote Flour 4. Dangote Wheat Flour 5. Deluxe Whole Wheat Flour 6. Eagle Wheat Bran 7. Eagle Wheat Flour 8. Golden Penny Flour 9. Golden Penny Prime Flour 10. Golden Penny Wheat Flour 11. Honeywell Whole Wheat Flour 12. Life Wheat Flour 13. Mix and Bake Superb Flour (Crown Flour Mills) 14. Prima Flour (Pure Flour Mill) 15. Standard Flour Mills Wheat Flour 16. Token Giant Whole Wheat Flour 17. Valleumbra Flour 18. Zahiran Industries Flour 19. Supreme 20. Bobs red mill Don't know ....88 Other(specify): ________________.......................99	
wf7	The **last time** your household got wheat flour, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	wf7a. Quantity ☐☐☐☐ wf7b. Unit Kg..1 g ………………………………………2 A. Spoon measure…………………..3 B. Gongoni I (small Derica)……..…..4 C. Milk tin/Gongo………..………….5 D. Quarter/Small Chakwal..………..6 E. Chakwal……………………..…..7 F. Gongoni II (Big Derica)..……..…..8 G. Dan Marafa/Mudu/Kwanu……....9 H. Tier/Baban Kwanu………….…...10 I. Seven-up bottle/small bottle……11 J. Big bottle/whiskey/Gin bottle……12 K. Small jerrycan/2 litre…………..13 L. Medium jerrycan/4 litre………...14 M. Big jerrycan/10 litre……..…..15 N. Abakaliki cup…………………..16	

		O. Half paint…………………..……..17 P. Pain bucket………………..……..18 Q. Big Lude…………………...……..19 R. Small Lude……………………..20 S. MPC bottle……………...……..21 T. Bushel…………………………22 Don't know………………………..88 Other (specify)________...……..99	
wf8	The **last time** your household got that amount of wheat flour, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if wf2≠5
wf9	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	wf9a. Duration ☐☐ wf9b. Unit Day(s)...1 Week(s)…………………………………2 Month(s)..3	
wf10	Do you have this wheat flour in your home now? *(CIRCLE ONLY **ONE** ANSWER)*	Yes……………..……………………………...1 No………………..…………………….…….2	If **2**, skip to **maize flour** module.
wf11	***ASK TO SEE THE WHEAT FLOUR PACKAGE AND LOOK FOR FORTIFICATION LOGO OR WORDS SUCH AS FORTIFIED*** *(CIRCLE ONLY **ONE** ANSWER)*	Package is in its original package and Logo or words were observed…............1 Package is in its original package and Logo or words were NOT observed….....2 Package is not in its original package....3	

MAIZE FLOUR FORTIFICATION COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
mf1	Now, I would like to talk with you about maize flour. Does your household prepare foods using maize flour (such as porridge, pap)? *(CIRCLE ONLY **ONE** ANSWER)*	Yes……………………………………………...1 No..........……… ………………………..……2	If **2**, skip to **semolina flour** module.
mf2	The **last time** your household got maize flour, where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased...1 Made it at home.......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): _______________........99	If **4,** skip to **semolina flour** module.
mf3	The **last time** your household got maize flour, how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..…………………………...1 Re-packaged……………..……………….....2 Don't know / Don't remember.................88 Other (specify): ________________......99	
mf6	The **last time** your household got maize flour, what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	1. Abdulmumini Sani & Sons Maize Flour 2. Abdulmumini Sani & Sons Maize Grits 3. Agudu Maize Flour 4. Golden Penny Masavita (Northern Nigeria Flour Mills) 5. Grand Maize Flour 6. Grand Maize Grits (Brabusco) 7. Nadabo Flour Mills Maize Flour 8. Nadabo Flour Mills Maize Grits 9. Siliki Maize Flour 10. Siliki Maize Grits Don't know ....88 Other(specify): ______________........................99	
mf7	The **last time** your household got maize flour, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	mf7a. Quantity ☐☐☐☐ mf7b. Unit Kg..1 g ……………………………………….2 A. Spoon measure…………………….3 B. Gongoni I (small Derica)…………..4 C. Milk tin/Gongo………..………….5 D. Quarter/Small Chakwal..………..6	

		E. Chakwal……………………..…..7 F. Gongoni II (Big Derica)..……..…..8 G. Dan Marafa/Mudu/Kwanu……....9 H. Tier/Baban Kwanu……………....10 I. Seven-up bottle/small bottle.…….11 J. Big bottle/whiskey/Gin bottle…….12 K. Small jerrycan/2 litre……….…..13 L. Medium jerrycan/4 litre………..14 M. Big jerrycan/10 litre……….…..15 N. Abakaliki cup………………….…..16 O. Half paint……………..……..17 P. Pain bucket…………..……..18 Q. Big Lude……………...……..19 R. Small Lude…………………….20 S. MPC bottle…………...……..21 T. Bushel…………………….….22 Don't know…………………….…..88 Other (specify)________...……..99	
mf8	The **last time** your household got that amount of maize flour, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if mf2≠5
mf9	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	mf9a. Duration ☐☐ mf9b. Unit Day(s)..1 Week(s)………………………………….2 Month(s)..3	
mf10	Do you have this maize flour in your home now? *(CIRCLE ONLY **ONE** ANSWER)*	Yes………..……………………………...1 No……………….…………………..……2	If **2**, skip to **semolina flour** module.
mf11	***ASK TO SEE THE MAIZE FLOUR PACKAGE AND LOOK FOR FORTIFICATION LOGO OR WORDS SUCH AS FORTIFIED*** *(CIRCLE ONLY **ONE** ANSWER)*	Package is in its original package and Logo or words were observed…............1 Package is in its original package and Logo or words were NOT observed…....2 Package is not in its original package....3	

SEMOLINA FLOUR AND WHOLE WHEAT MEAL FORTIFICATION COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
sf1	Now, I would like to talk with you about semolina flour and whole wheat meal. Does your household prepare foods using semolina flour or whole wheat meal (e.g. pasta, pudding)? *(CIRCLE ONLY **ONE** ANSWER)*	Yes…………..……………………………...1 No..........……… ……………………..……2	If **2**, skip to **boullion cubes** module.
sfb	Do you use semolina flour or whole wheat meal **more often** to prepare foods such as pudding? *(CIRCLE ONLY **ONE** ANSWER)*	Semolina Flour…..……………………………...1 Whole Wheat Meal… ……………………..……2	
sf2	The **last time** your household got [semolina flour/whole wheat meal], where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased..1 Made it at home......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): _______________........99	If **4,** skip to **boullion cubes** module.
sf3	The **last time** your household got [semolina flour/whole wheat meal], how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..…………………………...1 Re-packaged………….……………….......2 Don't know / Don't remember.................88 Other (specify): ________________......99	
sf6	The **last time** your household got [semolina flour/whole wheat meal], what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	Dangote Semovita ....1 Eagle Semolina ……..2 Golden Penny Semovita…..................................3 Standard Flour Mills Semolina...........................4 Supreme Semolina (Crown Flour Mills)………...5 Mama Gold semolina flour………………………6 Honeywell…………………………………………7 SamVita……………………………………………8 Don't know ....88 Other(specify): ______________.....................99	

sf7	The **last time** your household got [semolina flour/whole wheat meal], what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	sf7a. Quantity ☐☐☐☐ sf7b. Unit Kg...1 g ………………………………………2 A. Spoon measure…………………..3 B. Gongoni I (small Derica)……..…..4 C. Milk tin/Gongo…………..………..5 D. Quarter/Small Chakwal..………..6 E. Chakwal……………………..…..7 F. Gongoni II (Big Derica)..……..…..8 G. Dan Marafa/Mudu/Kwanu……....9 H. Tier/Baban Kwanu……………....10 I. Seven-up bottle/small bottle……..11 J. Big bottle/whiskey/Gin bottle…….12 K. Small jerrycan/2 litre…………..13 L. Medium jerrycan/4 litre………...14 M. Big jerrycan/10 litre……….…..15 N. Abakaliki cup…………………..16 O. Half paint……………..……..17 P. Pain bucket…………..……..18 Q. Big Lude……………...……..19 R. Small Lude……………………..20 S. MPC bottle…………..………..21 T. Bushel…………………….….22 Don't know………………………..88 Other (specify)________...……..99	
sf8	The **last time** your household got that amount of [semolina flour/whole wheat meal], how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if sf2≠5
sf9	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	sf9a. Duration ☐☐ sf9b. Unit Day(s)..1 Week(s)…………………………………2 Month(s)..3	
sf10	Do you have this [semolina flour/whole wheat meal] in your home now? *(CIRCLE ONLY **ONE** ANSWER)*	Yes………..……………………………..1 No…………….……………………..……2	If **2**, skip to **boullion cubes** module.

sf11	***ASK TO SEE THE [SEMOLINA FLOUR/WHOLE WHEAT MEAL] PACKAGE AND LOOK FOR FORTIFICATION LOGO OR WORDS SUCH AS FORTIFIED*** *(CIRCLE ONLY **ONE** ANSWER)*	Package is in its original package and Logo or words were observed…..............1 Package is in its original package and Logo or words were NOT observed…....2 Package is not in its original package....3	

BOUILLON CUBE COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
bcf1	Now, I would like to talk with you about bouillon cubes. Does your household prepare foods using bouillon cubes? *(CIRCLE ONLY **ONE** ANSWER)*	Yes…………..……………………………...1 No..........……… ……………………..……2	If **2**, skip to **tomato paste** module.
bcf2	The **last time** your household got bouillon cubes, where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased..1 Made it at home......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): ________________........99	If **4,** skip to **tomato paste** module.
bcf3	The **last time** your household got bouillon cubes, how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..………………………...1 Re-packaged…………..…………………....2 Don't know / Don't remember.................88 Other (specify): _________________......99	
bcf4	The **last time** your household got bouillon cubes, what was the brand? *(SELECT ALL THAT APPLY)*	1. Adja 2. Dan-Q 3. Delish 4. Doli 5. Doyin cube 6. Ducros Boeuf 7. Erisco 8. Fresco 9. Good Pepmamah 10. Haano 11. Jumbo	

		12. Knorr 13. Maggi 14. Mr Chef 15. Napa 16. Ninido 17. Onga 18. Prime 19. Redsarsa 20. Ric-giko 21. Royco 22. Sonia 23. Stingo 24. Suppy Don't know ....88 Other(specify): _______________........................99	
bcf5	The **last time** your household got bouillon cubes, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	bcf5a. Quantity ☐☐☐☐ bcf5b. Unit Kg..1 g ……………………………………….2 A. 60g sachet…………………………..3 B. 15g sachet…………………………..4 C. 6g sachet…..………………………..5 D. 6g sachet..…………………………..6 E. 5.5g sachet…………………………..7 F. Rectangle (12g)……………………..8 G. Rectangle (5g)..……………………..9 H. Double cube (8g)..…………………..10 I. Single cube (4g)…………………..…..11 Don't know…………………………….88 Other (specify)________...……………99	
bcf6	The **last time** your household got that amount of bouillon cubes, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if bcf2≠5
bcf7	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	bcf7a. Duration ☐☐ bcf7b. Unit Day(s)..1 Week(s)…………………………………2 Month(s)..3	

TOMATO PASTE COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
tpf1	Now, I would like to talk with you about tomato paste. Does your household prepare foods using tomato paste? *(CIRCLE ONLY **ONE** ANSWER)*	Yes…………..……………………………...1 No..........……… ……………………..……2	If **2**, skip to **rice** module.
tpf2	The **last time** your household got tomato paste, where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased...1 Made it at home.......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): ________________........99	If **4,** skip to **rice** module.
tpf3	The **last time** your household got tomato paste, how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..…………………………...1 Re-packaged……….…………………......2 Don't know / Don't remember.................88 Other (specify): _________________......99	
tpf4	The **last time** your household got tomato paste, what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	1. Bigo 2. Ciao 3. Clappa 4. Dangote 5. De Rica 6. Erisco 7. Evita 8. Fine tom 9. Gino 10. Haana 11. Heinz 12. Laser 13. Mama 14. Mega 15. Nagiko 16. Pomo 17. Ric-giko 18. Roma 19. Rosa 20. Salsa 21. Sonia 22. St. Rita 23. Star 24. Sun valley 25. Taima	

		26. Taima 27. Terra 28. TMT 29. Tomapep 30. Tomato Jos 31. TRS 32. Vego 33. Vitali 34. Yali Don't know ....88 Other(specify): _______________........................99	
tpf5	The **last time** your household got tomato paste, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	tpf5a. Quantity ☐☐☐☐ tpf5b. Unit Kg..1 g ……………………………………….2 A. 2200g……………………………….3 B. 400g………………………………4 C. 210g..………………………………5 D. 70g..………………………………6 E. 70g..………………………………..7 Don't know………………………….88 Other (specify)________...……….99	
tpf6	The **last time** your household got that amount of tomato paste, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if tpf2≠5
tpf7	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	tpf7a. Duration ☐☐ tpf7b. Unit Day(s)..1 Week(s)………………………………….2 Month(s)...3	

RICE COVERAGE			
N°	QUESTIONS	ANSWERS	SKIPS
rf1	Now, I would like to talk with you about rice. Does your household use rice? *(CIRCLE ONLY **ONE** ANSWER)*	Yes……………..……………………………...1 No..........……… ……………………..……2	If **2**, skip to **individual wheat flour consumption** module.
rf2	The **last time** your household got rice, where did you get it from? *(CIRCLE ONLY **ONE** ANSWER)*	Purchased..1 Made it at home.......................................4 Received from relative/friend or food aid..5 Don't know / Don't remember.................88 Other (specify): ________________........99	If **4,** skip to **individual wheat flour consumption** module.
rf3	The **last time** your household got rice, how was it packaged? *(READ **ALL** RESPONSES)* *(CIRCLE ONLY **ONE** ANSWER)*	Original package..…………………………...1 Re-packaged……………..…………………....2 Don't know / Don't remember.................88 Other (specify): _________________......99	
rf4	The **last time** your household got rice, what was the brand? *(CIRCLE ONLY **ONE** ANSWER)*	1. Anambra rice 2. Ebonyi rice 3. Igbemo rice 4. Labana rice 5. Mama Happy rice 6. Mas rice 7. Ofada rice 8. Olam rice 9. UMZA Gold Don't know ....88 Other(specify): _______________.......................99	
rf5	The **last time** your household got rice, what quantity did you get? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	rf5a. Quantity ☐☐☐☐ rf5b. Unit Kg...1 g ……………………………………….2 A. Spoon measure…………………….3 B. Gongoni I (small Derica)……..…..4 C. Milk tin/Gongo………..…………..5 D. Quarter/Small Chakwal..…………6 E. Chakwal…………………………..…..7 F. Gongoni II (Big Derica)..……..…..8	

		G. Dan Marafa/Mudu/Kwanu……....9 H. Tier/Baban Kwanu……………....10 I. Seven-up bottle/small bottle.…….11 J. Big bottle/whiskey/Gin bottle.……12 K. Small jerrycan/2 litre…………..13 L. Medium jerrycan/4 litre………...14 M. Big jerrycan/10 litre…………..…15 N. Abakaliki cup………………….…..16 O. Half paint………………..…..…..17 P. Pain bucket…………..……….18 Q. Big Lude……………...……….19 R. Small Lude…………………….20 S. MPC bottle…………..……….21 T. Bushel……………………….…22 Don't know……………………….…..88 Other (specify)________..……..99	
rf6	The **last time** your household got that amount of rice, how much did it cost? *(IF 'DON'T KNOW', RECORD 888888.88)*	NAIRA ☐☐☐☐☐☐.☐☐	Only if rf2≠5
rf7	How long does this amount usually last in your household? *(A. WRITE IN THE NUMBER)* *(B. CIRCLE THE UNIT)*	rf7a. Duration ☐☐ rf7b. Unit Day(s)..1 Week(s)…………………………………2 Month(s)..3	

INDIVIDUAL WHEAT AND SEMOLINA FLOUR CONSUMPTION FOR EBONYI

Now I would like to ask about how often and how much you and [NAME OF CHILD] consume specific foods made from wheat or semolina flours.

1. In the last 7 days, did you and [NAME OF CHILD] eat [FOOD ITEM]?

(REPEAT QUESTION FOR EACH FOOD ITEM LISTED BELOW)

2. In the last 7 days, how many times did you and [NAME OF CHILD] eat [FOOD ITEM]?

(REPEAT QUESTION FOR EACH FOOD ITEM LISTED BELOW. IF THEY DID NOT HAVE THE FOOD ITEM, DO NOT ASK FOR FREQUENCY)

3. Usually how much of [FOOD ITEM] did you and [NAME OF CHILD] eat at **one sitting**?

(SHOW PICTURES OF PORTIONS AND REPEAT QUESTION FOR EACH FOOD ITEM LISTED BELOW. IF THEY DID NOT HAVE THE FOOD ITEM, DO NOT ASK FOR PORTION SIZE)

N°	ITEMS	A. Caregiver			B. Child		
		Had the food item? (*iwfc1_cons_carg_N°*)	Frequency (*iwfc1_freq_carg_N°*)	Portion size (*iwfc1_port_carg_N°*)	Had the food item? (*iwfc1_cons_chld_N°*)	Frequency (*iwfc1_freq_chld_N°*)	Portion size (*iwfc1_port_chld_N°*)
01	Doughnut	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
02	Puff-puff	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
03	Buns	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
04	Biscuits	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
05	Cake	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
06	Chin-chin	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
07	Egg buns	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
08	Meat pie	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
09	Spring roll	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
10	Sausage roll	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
11	Fantasy roll	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐

12	Fish roll	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
13	Vegetable burger	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
14	Bread buns	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
15	Spiral bread	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
16	Slice bread	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
17	Whole wheat bread (long)	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
18	Semo meal	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
19	Wheat meal	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
20	Spaghetti	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐
21	Instant noodles	Yes…1 No…2	☐☐	☐☐	Yes…1 No…2	☐☐	☐☐

INDIVIDUAL WHEAT AND SEMOLINA FLOUR CONSUMPTION FOR SOKOTO
Now I would like to ask about how often and how much you and [NAME OF CHILD] consume specific foods made from wheat or semolina flours. 1. In the last 7 days, did you and [NAME OF CHILD] eat [FOOD ITEM]? *(REPEAT QUESTION FOR EACH FOOD ITEM LISTED BELOW)* **2. In the last 7 days**, how many times did you and [NAME OF CHILD] eat [FOOD ITEM]? *(REPEAT QUESTION FOR EACH FOOD ITEM LISTED BELOW. IF THEY DID NOT HAVE THE FOOD ITEM, DO NOT ASK FOR FREQUENCY)* 3. Usually how much of [FOOD ITEM] did you and [NAME OF CHILD] eat at **one sitting**? *(SHOW PICTURES OF PORTIONS AND REPEAT QUESTION FOR EACH FOOD ITEM LISTED BELOW. IF THEY DID NOT HAVE THE FOOD ITEM, DO NOT ASK FOR PORTION SIZE)*

N°	ITEMS	A. Caregiver			B. Child		
		Had the food item? (*iwfc2_cons_carg_N°*)	Frequency (*iwfc2_freq_carg_N°*)	Portion size (*iwfc2_port_carg_N°*)	Had the food item? (*iwfc2_cons_chld_N°*)	Frequency (*iwfc2_freq_chld_N°*)	Portion size (*iwfc2_port_chld_N°*)
01	Doughnut	Yes…1 No…2			Yes…1 No…2		
02	Puff-puff	Yes…1 No…2			Yes…1 No…2		
03	Muramuchi	Yes…1 No…2			Yes…1 No…2		
04	Chin-chin	Yes…1 No…2			Yes…1 No…2		
05	Fanke	Yes…1 No…2			Yes…1 No…2		
06	Masa	Yes…1 No…2			Yes…1 No…2		
07	Fruit cake	Yes…1 No…2			Yes…1 No…2		
08	Cake	Yes…1 No…2			Yes…1 No…2		
09	Egg buns	Yes…1 No…2			Yes…1 No…2		
10	Meat pie	Yes…1 No…2			Yes…1 No…2		
11	Spring roll	Yes…1 No…2			Yes…1 No…2		

12	Fish roll	Yes…1 No…2			Yes…1 No…2			
13	Roll Bread (Salana Stars)	Yes…1 No…2			Yes…1 No…2			
14	Spiral bread	Yes…1 No…2			Yes…1 No…2			
15	Coconut Bread	Yes…1 No…2			Yes…1 No…2			
16	Slice bread	Yes…1 No…2			Yes…1 No…2			
17	Whole wheat bread (small)	Yes…1 No…2			Yes…1 No…2			
18	Whole wheat bread (long)	Yes…1 No…2			Yes…1 No…2			
19	Semo meal	Yes…1 No…2			Yes…1 No…2			
20	Wheat meal	Yes…1 No…2			Yes…1 No…2			
21	Instant noodles	Yes…1 No…2			Yes…1 No…2			
22	Spaghetti	Yes…1 No…2			Yes…1 No…2			

FORTIFICATION LOGO KNOWLEDGE AND INFLUENCE			
lk1_1	*(SHOW **VITAMIN A** FORTIFICATION LOGO.)* Have you ever seen this logo? *(SELECT ONLY **ONE** ANSWER.)*	Yes……………………………………………….1 No……………………………………………..2	If **2**, skip to lk1_2.
lk2_1	What does this logo mean? *(DO NOT READ RESPONSES TO RESPONDENT.)* *(SELECT **ALL** RESPONSES THAT APPLY.)*	Fortified / enriched / added micronutrients …….1 Good for health……………………..……………..2 Better quality ……………,,.……………………3 Bad quality…………………………………………4 More expensive…………………………………..5 No meaning ………………………………………6 Don't know………………………,……………88 Other (specify): ____________________.........99	
lk3_1	Does this logo influence your decision to buy? *(DO NOT READ RESPONSES TO RESPONDENT.)* *(SELECT ONLY **ONE** ANSWER.)*	No, it does not influence my decision to buy.......1 Yes, it motivates me to buy the product.............2 Yes, it discourages me to buy the product..........3 Don't know...88 Other (specify): _____________________.......99	
lk1_2	*(SHOW **IODINE** FORTIFICATION LOGO.)* Have you ever seen this logo? *(SELECT ONLY **ONE** ANSWER.)*	Yes……………………………………………….1 No…………………………………….………..2	If **2**, skip to health and nutrition module.
lk2_2	What does this logo mean? *(DO NOT READ RESPONSES TO RESPONDENT.)* *(SELECT **ALL** RESPONSES THAT APPLY.)*	Fortified / enriched / added micronutrients …….1 Good for health…………………………………..2 Better quality ……………………………………..3 Bad quality…………………………………………4 More expensive…………………………………..5 No meaning ………………………………………6 Don't know…………….…………………………88 Other (specify): ___________________..........99	
lk3_2	Does this logo influence your decision to buy? *(DO NOT READ RESPONSES TO RESPONDENT.)* *(SELECT ONLY **ONE** ANSWER.)*	No, it does not influence my decision to buy......1 Yes, it motivates me to buy the product............2 Yes, it discourages me to buy the product.........3 Don't know...88 Other (specify): _____________________.......99	

HEALTH AND NUTRITION			
N°	QUESTIONS	ANSWERS	SKIPS
MOTHER / CAREGIVER			
hnd1	Are you currently pregnant? *(CIRCLE ONLY **ONE** ANSWER.)*	Yes………...............................1 No………..……………..………2 Don't know…………………….88	*Skip if selected caregiver=male*
hnd2	Are you currently breastfeeding any child? *(CIRCLE ONLY **ONE** ANSWER.)*	Yes………...............................1 No…......………………………...2	*Skip if selected caregiver=male*
muacm1	Now I would like to check you and [NAME OF CHILD]'s nutritional status. May I measure your arm circumference? *TAKE THE MUAC OF THE **MOTHER / CAREGIVER** ON HER LEFT ARM* *(IF 'REFUSED,' RECORD 666.)* *(IF ARM IS TOO BIG, RECORD 777.)*	mm ☐☐☐	*Skip if selected caregiver=male*
muacm2	*TAKE SECOND MEASUREMENT OF THE ARM CIRCUMFERENCE OF THE CAREGIVER* *TAKE THE MUAC OF THE **MOTHER / CAREGIVER** ON HER LEFT ARM*	mm ☐☐☐	Skip if muacm1 **≥195mm** If muacm2 **< 185mm** **→ Refer caregiver to hospital!**
muacm3	*TAKE THIRD MEASUREMENT OF THE ARM CIRCUMFERENCE OF THE CAREGIVER* *TAKE THE MUAC OF THE **MOTHER / CAREGIVER** ON HER LEFT ARM*	mm ☐☐☐	Skip if difference between muacm1 and muacm2 is ≤5mm If muacm3 **< 185mm** **→ Refer caregiver to hospital!**

CHILD			
muacc1	May I measure [NAME OF CHILD]'s arm circumference? *TAKE THE MUAC OF THE* ***CHILD*** *ON HIS / HER LEFT ARM* *(IF 'REFUSED,' RECORD 666.)* *(IF CHILD IS NOT AVAILABLE, 'RECORD 777.)*	mm ☐☐☐	
muacc2	*TAKE SECOND MEASUREMENT OF THE ARM CIRCUMFERENCE OF THE CHILD* *TAKE THE MUAC OF THE* ***CHILD*** *ON HIS / HER LEFT ARM*	mm ☐☐☐	Skip if muacc1 **≥125mm** If muacc2 **<110mm** and child <6 months → **Refer child to hospital!** OR If muacc2 **<115mm** and child ≥6 months → **Refer child to hospital!**
muacc3	*TAKE THIRD MEASUREMENT OF THE ARM CIRCUMFERENCE OF THE CHILD* *TAKE THE MUAC OF THE* ***CHILD*** *ON HIS / HER LEFT ARM*	mm ☐☐☐	Skip if difference between muacc1 and muacc2 is ≤5mm If muacc3 **<110mm** and child <6 months → **Refer child to hospital!** OR If muacc3 **<115mm** and child ≥6 months → **Refer child to hospital!**

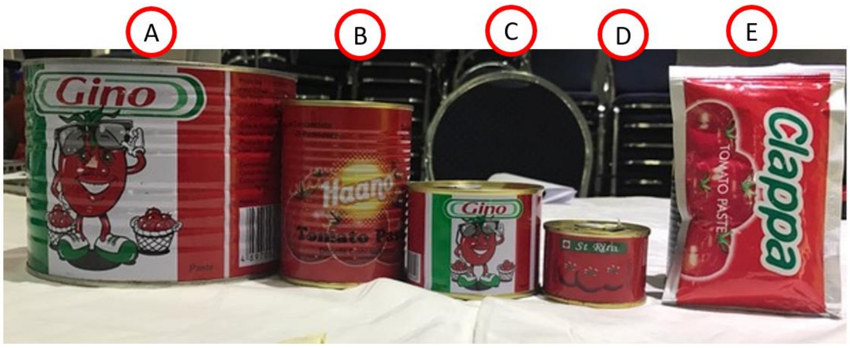
***** CHECK THE QUESTIONNAIRE & THANK THE RESPONDENT! *****

FILL IN AFTER COMPLETING QUESTIONNAIRE		
outcome	Outcome of the visit	Completed…………………………………………………………………….….1 Partially completed (revisit) ……………………………………………………………2 Partially completed (refused after starting the interview) ……………………………..3 Permission refused……………………………………………………………………...4 No eligible respondent available at time of visit (revisit)…………………………..…...5 Temporarily unable to be interviewed, e.g. illness or incapacitation (revisit)…………..6 Long term unavailable…………………………………………………………………..7 Dwelling not found………………………………………………………………………8 Dwelling not inhabited…………………………………………………………………..9 Household ineligible…………………………………………………………..…….10 Other (specify)…………………………………………………………..……..…..99

3. EXAMPLE SHOWCARDS

Example 1: Showcard for quantity

Quantity. Packaged Tomato paste



A	2200g
B	400g
C	210g
D	70g
E	70g

Example 2: Showcard for the food frequency questionnaire

6

Doughnut			
			
1. ¼ doughnut	2. ½ doughnut	3. 1 doughnut	4. 1 $^{1}/_{4}$ doughnut
			
5. 1 ½ doughnuts	6. 2 doughnuts	7. 3 doughnuts	8. 4 doughnuts

4. MARKET QUESTIONNAIRES

MARKETPLACES & RETAIL OUTLETS by market hub	**Date of market visit** (dd/mm/yyyy)	_____ / _____ / 2017	**1**

Instructions: Complete 1 sheet in a given market hub. There can be up to 5 marketplaces identified, or as few as 1. All retail outlets visited should be listed.

Team ID:		**Data Collector Name:**		**Retail Outlet Code:** Wholesaler = W Retail shop = R Supermarket = S

State code (see below)	**Market Hub Code** (see below)	**Marketplace visited**	**Marketplace Name**	**Neighborhood location**	**Retail outlet visited**	**Retail Outlet Name**	**Retail Outlet Address**	**Retail outlet type code** (see above)
		1			1			
State Sokoto = S Ebonyi = E	**Market Hub** Sokoto City = 1 Bunkari = 2 Sainyman Daji = 3 Numba Tureta = 4 Shinaka = 5 Illela = 6 Abakaliki = 7 Afikpo = 8 Ishiagu = 9				2			
					3			
					4			
					5			
					6			
					...			
		2			1			
					2			
					3			
					4			
					5			
					6			

BRAND REGISTRATION by market hub, retail outlet type, and food vehicle	**Date of visit** (dd/mm/yyyy)	_____ / _____ / 2017

Instructions: Complete 1 sheet per food vehicle per retail outlet type in a given market hub (i.e. 1 salt sheet, 1 sugar sheet, 1 oil sheet, 1 WF sheet, 1 MF sheet and 1 SF sheet per retail outlet type).
Per market hub, you should have 18 sheets.

Team ID	Data Collector Name	State Code	Market Hub Code	Retail outlet type Code

Retail Outlet Type Code:
Wholesaler = W   Retail shop = R
Supermarket = S

No	**Food Vehicle** Salt = Sa Sugar = Su Oil = O Wheat Flour = WF Maize Flour = MF Semolina Flour = SF	**Food Vehicle Type** (For oil and wheat flour - see codes)	**Brand Name**	**Producer**	**Production site (city, country)**	**Local vs. Imported** Local = L Imported = I Don't know = DK
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

State	**Market Hub**	**Food Vehicle Type**
Sokoto = S Ebonyi = E	Sokoto City = 1 Bunkari = 2 Sainyman Daji = 3 Numba Tureta = 4 Shinaka = 5 Illela = 6 Abakaliki = 7 Afikpo = 8 Ishiagu = 9	Groundnut Oil = OG Red Palm Oil = ORP Sunflower Oil = OS Coconut Oil = OC Palm kernel Oil = OPK Soybean Oil = OSB Rape Seed Oil = ORS Cottonseed Oil = OCS Maize Oil = OM Sesame seed Oil = OSS Vegetable Oil = OV Other = OOT White Wheat Flour = WHF Brown Wheat Flour = BWF Whole Wheat Meal = WWM Other = WOT

SPECIMEN REGISTRATION FORM

Date of visit (dd/mm/yyyy)	_____ / _____ / 2017	:Team ID		Data Collector Name:	

Instructions: Complete one sheet per food vehicle per market hub (i.e. 1 salt sheet, 1 sugar sheet, 1 oil sheet, 1 WF sheet, 1 MF sheet and 1 SF sheet). Per market hub, you should have 6 sheets.
Unique number sequencing should change depending on the food vehicle.

Specimen Label																State Sokoto = S Ebonyi = E	Market Hub Sokoto City = 1 Bunkari = 2 Sainyman Daji = 3 Numba Tureta = 4 Shinaka = 5 Illela = 6 Abakaliki = 7 Afikpo = 8 Ishiagu = 9	Food Vehicle Type Groundnut Oil = OG Red Palm Oil = ORP Sunflower Oil = OS Coconut Oil = OC Palm kernel Oil = OPK Soybean Oil = OSB Rape Seed Oil = ORS Cottonseed Oil = OCS Maize Oil = OM Sesame seed Oil = OSS Vegetable Oil = OV Other = OOT White Wheat Flour = WHF Brown Wheat Flour = BWF Whole Wheat Meal = WWM Other = WOT
Unique Number	State Code	Market hub code	Food vehicle Salt = Sa Sugar = Su Oil = O Wheat Flour = WF Maize Flour = MF Semolina Flour = SF	Food Vehicle Type (For oil and wheat flour - see codes)	Brand Name	Specimen number	Production date (dd/mm/yyyy)	Expiry date (dd/mm/yyyy)	Producer	Production site (city, country)	Original Packaging Type (Plastic bottle = PB Jerry can = JC Plastic bag = PB Tin can = TC Repackage = R Other = O)	Original Packaging Size (quantity)	Original Packaging Size (unit) (kg, g, l, ml)	Labeled as Fortified? (Statement only = FS Logo only = FL Statement & Logo = FSL Not labeled = N)	Cost of origial package in Naira			
1001																		
1002																		
1003																		
1004																		
1005																		
1006																		
1007																		
1008																		
etc.																		

5. SAMPLING WEIGHTS

In order to obtain results that are representative of households with children under 5 and children under 5, estimates in this report were weighted using survey weights that were normalised values of the inverse probabilities of selection into the sample for each unit of observation. The relevant probabilities of selection differed depending on whether analysis was carried out at household or child level therefore survey weights were calculated at both of these levels.

No weights were calculated for WRA because they were not sampled at the household level. Instead the primary caregiver of the randomly sampled child, who may or may not have been a WRA, was selected to be interviewed. As a result, child-level weights were applied to WRA estimates found in this report.

Household weights

As mentioned earlier, households were selected from the list of eligible households in an EA using a systematic random approach. Eligible households were identified from the listing exercise as those households with at least one child under 5. The probability of selection of each household was given as follows:

$$p_i^h = \frac{m}{M}$$

where p_i^h is the probability of household i to be selected into the sample, m is the number of households selected per EA (15 in the present case), and M is the total number of eligible households in an EAidentified from the listing exercise. Household-level weights were appropriately normalised inverses of these probabilities.

Child weights

Within each visited household, one child under 5 was randomly sampled using the Kish grid method. The probability of selection of each child was given as follows:

$$p_i^c = p_i^h \times \frac{b}{B_i}$$

where p_i^c is the probability of each child in household i to be selected, p_i^h is defined as above, b is the number of children selected per household (1 in the present case), and B_i is the total number of children under 5 in household i. Similarly, child-level weights were appropriately normalised inverses of these probabilities.

Estimation set-up

The survey weights were applied within a survey set up in Stata that takes into account clustered sampling, stratification and finite population corrections. EAs were the PSUs within each state; therefore, for household and child estimates, clustering was set at the EA level. Stratification during sampling was used at the primary sampling level, i.e., at the EA level. For the estimation set-up, strata for EAs were defined by state and urban/rural terciles based on population density. Finally, as large proportions of the total eligible population were sampled in many EAs, the estimation set-up also accounted for the finite population correction (FPC) factor. This factor was defined as follows:

$$FPC = \sqrt{\frac{N-n}{N-1}}$$

where N is the size of the population from which the sample is drawn and n is the size of the sample.

Introduction

Missing data from key variables may bias the point estimates and will reduce the accuracy of the estimate as it reduces the effective sample size on which the estimate is based. Therefore if the proportion of missing values on any key variable exceeds the 5% of all values it is worth considering that the missing values are imputed.

When an imputation method is considered it is important to firstly understand the nature of the missingness pattern and secondly choose the most appropriate imputation technique for the given variable of interest. It is also important to note that simpler imputation methods are often discouraged over the simple list-wise deletion approach as they can seriously bias both the point and variance estimates.

One of the key indicator of interest for the FACT surveys are fortification levels of the foods consumed in the sampled households. The indicator suffers from a severe measurement error due to the respondents no being able to remember the brand of the purchased and consumed foods. The root of the recall problem is due to the way the products are being sold, often not in the original containers and in non-standard units. The indicator is constructed by combining two data sources: the survey data in the brand of the consumed foods and the market survey on the micronutrient content of the available brands. The micronutrient content is thus attributed to the household based on the brand reported, which also acts as the primary key for merging of the two sources of information.

Initial analysis revealed that a large majority (for some food vehicles approximately 70%, while for some as little as 5%) of the respondents does not know the brand of the consumed foods. Thus it is imperative that some kind of imputation is attempted. Although it needs to be stressed that the informed imputation of 70% of the cases based on the information provided by the 30% is highly unreliable. However, even though the imputation may be deemed unreliable it is still preferable to full listwise deletion.

For the purpose of this analysis we are assuming that the brand names are in fact missing at random (MAR) and can be adjusted with an imputation model.

Recommended imputation model

Due to the policy for wide and simple use of the fact data even by the users less proficient in statistics it is recommended that a single imputation method is used as the users can use standard statistical methods on an imputed variable without resorting to specialised estimations.

Since the amount of available data does not support modelled imputation models, we recommend using a stratified **hotdeck imputation** using **Approximate Bayesian Bootstrap** (ABB).

The previous FACT surveys used a simpler imputation model, namely a stratified mean imputation where the strata were based on geographical units used in the household survey and as represented by the geographical delineation of the market survey. Such an imputation has numerous downsides in terms of estimates. It confines the strata level means heavily to the values reported in the market survey with very limited inputs from the actual household survey. Furthermore any mean imputation severely constricts the variances as the imputed values are have no variance per se. Furthermore, no measures to adjust for relative uncertainty of the imputation are integrated into the imputation model. Literature on the imputation methods widely discourages any use of mean imputations unless the data does not offer any other options.

The basic mechanic of the hotdeck imputation approach is a random draw from a known distribution of values and assigning the drawn values to the observed units with we want to assign information to. The source data for the random draw can be either part of the existing dataset or they can be from a secondary dataset. Hotdeck imputation can use various random draw techniques, however, in the literature it is most commonly associated with the ABB. The ABB as explained above is based on the sampling with replacements (i.e. bootstrap sample) from a known theoretical or empirical distribution.

For FACT surveys, the observed dataset where we want to impute information is a household survey, while the market survey is the imputation data source with a known distribution of fortification levels across brands of different food vehicles and across different market hubs in each country.

Hotdeck imputation can be improved, similarly to sampling methods, by using stratification. In stratified hotdeck imputations, the known distribution can be split into strata and matched to the strata in the observed data. In this case the hotdeck imputation would impute the missing values belonging to any given stratum only from the known distribution belonging to the same stratum. In the case of the fact surveys, when the brand is unknown, the fortification levels of a given food vehicle can be imputed from a known distribution of different brands obtained from a market survey. Stratified hotdeck imputation would thus be achieved by imputing missing fortification of a food vehicle within a certain geographical stratum (e.g. an LGA) by using only the brands available in the market associated with said geographical location instead from a distribution of all available brands state-wide.

When we are considering stratification as a possible improvement of the hotdeck imputation we need to be able to clearly identify the same strata in both the observed data and imputation source data. In the case of FACT surveys the feasibility of stratification is related to matching the market survey and household data in terms of stratification. As the market sample was drawn purposely the market data does not cover the whole spectrum of geographical strata represented in the household data. As we are only considering geographical stratification, a notion of geographical proximity can also be used instead of matched strata in both data sources. Previous FACT surveys have explored the use of proximity of markets to conceptually link the markets and the households.

In the case of the current FACT surveys it is recommended that the notion proximity is not used as it is deemed that it is not a valid concept given the purposeful nature of the market survey sampling. The notion of the “closest market” for a given community may not be geographically close due to the central nature of the selected market hubs. The aim of the market survey was to assess the overall availability of brands state-wide and to assess fortification levels of collected brands of food vehicles also state-wide. For this purpose, the purposeful sample of large central market hubs was the obvious choice. As the market hubs are meant to represent the state-wide availability of brands the hotdeck imputations would use the state-level fortification information without specific geographical stratification.

7. DESCRIPTION OF ANALYTICAL METHODS APPLIED TO FOOD SPECIMENS

Authors: Dr. Anna Zhenchuk and Dipl. Biochem. Katrin Steinbrenner, BioAnalyt GmbH
Date: 2017-09-07

1. Introduction

GAIN has collected samples of staple foods from markets and households in Nigeria to assess the coverage of fortified foods and the levels of micronutrients in these foods. The samples of salt, oil, sugar, semolina, wheat and maize flour were sent to BioAnalyt for the measurement of iodine, vitamin A and iron levels. The samples were analyzed for added or total micronutrient content using the iCheck technology and commercial accredited laboratory SGS Germany.. Students from the Universities of Potsdam and Berlin were trained in the use of the iCheck and performed the analysis under supervision from BioAnalyt.

2. Technology

iCheck is a test kit for the quantitative determination of micronutrients. It consists of two units, a portable photometer or fluorimeter (iCheck) and the disposable reagent vials in which the reaction is performed.

The validation protocol for each iCheck and matrix combines assessment of precision, trueness and a comparison to a reference method. iCheck and iCheck reagent vials are produced according to quality management system (DIN EN ISO 9001:2008) certified by TÜV Nord in Germany.

3. Methodology

For the hands on training for each iCheck analysis method, the student analysts read the user manuals and received a demonstration of the entire analysis procedure. Finally, they independently analyzed a sample 10 times to assess precision and repeatability. The analyst with the most consistent results was then selected to perform the analysis.

3.1 Analysis of Vitamin A in Edible Oil

iCheck Chroma 3 was used for the determination of vitamin A in cooking oil. The determination of vitamin A is based on a color reaction in which the reagents in the vial turn a brilliant blue (Carr-Price reaction), the intensity of which is dependent on retinol concentration. The device measures the absorption of the color in the reagent vial at 3 different wavelengths, over the course of 30 seconds. The device then calculates the vitamin A content through a sophisticated algorithm and displays the result in mg Retinol equivalents/kg. The linear range of the device is 3–30 mg retinol equivalents (RE)/kg of oil. This method has been validated against the reference method of HPLC (1-3).

Solidified oil samples were warmed to 40°C in an incubator and shaken for 5 minutes to ensure that they were homogeneous. All samples of one brand were pooled by mixing equal parts of all oils on a horizontal shaker at a shaking frequency of 100/ min for 15 minutes. The liquid composite oil samples were directly injected into the reagent vial and measured with iCheck Chroma 3 according to the user manual. Every 10th sample was analyzed in duplicate to assess precision.

As a quality control, the emitter and receptor of the iCheck Chroma 3 device were controlled by using a standard density glass filter (Chroma 3 Standard) at the beginning of each set of measurements. Additionally, a standard oil sample spiked with a known concentration of retinol palmitate was run every ten measurements as a control.

3.2 Analysis of Iodine in Salt

iCheck Iodine was used for the measurement of iodine in salt. The principle of this colorimetric method is based on the reaction of potassium iodate from a salt sample with potassium iodide in the reagent vial added in excess. Chemically, iodide (I–) forms iodine (I2) and triiodide (I3–), resulting in a blue-purple complex in a starch solution. The absorption of the blue color is dependent on the concentration of the solution and is measured at 565 nm in the iCheck device. The method has been validated against the reference method of iodometric titration (4-5).

Before weighing in, the salt samples were mixed thoroughly to ensure homogeneity. The salt samples of one brand were pooled before analyzing. Therefore, the target final weigh of 65g is composed of equal parts of the single salt samples of one brand. The composite salt samples were completely diluted with water to a final volume of 250 mL (dilution factor 1:3.8) to ensure that the iodine concentration of the final solution was within the linear range of iCheck Iodine (1.0 - 13.0 mg/L). The salt solutions were injected and analyzed according to iCheck Iodine user manual. Salt samples with concentration of iodine above iCheck Iodine linear range (>13.0 mg/L) were reanalyzed with higher dilution factor of 1:7.7. Every 10th sample was analyzed in duplicate to assess precision.

As a quality control, a standard density glass filter (Iodine Standard) was measured to control emitter and receptor before each set of measurements. Additionally, a standard iodized salt sample was analyzed to control the measurement process at regular intervals.

Please note, to calculate the iodine concentration in the salt samples the measured concentrations were adjusted with the dilution factor (DF).

3.3 Analysis of Vitamin A in Sugar

iCheck Fluoro was used for the measurement of vitamin A in sugar. iCheck Fluoro quantitatively determines the concentration of vitamin A in food based on the measurements of the auto-fluorescence of vitamin A (retinol). Results are displayed in the measuring device iCheck Fluoro in µg retinol equivalents/L. This method has been validated against the reference method of HPLC (6).

Before weighing in, the sugar samples were mixed thoroughly to ensure homogeneity. The sugar samples of one brand were pooled before analyzing. Therefor the target final weigh of 20g is composed of equal parts of the single sugar samples of one brand. The composite sugar samples were completely diluted with water to a final volume of 200 mL to ensure that the vitamin A concentration of the final solution was within the linear range of iCheck Fluoro (50 - 3000 µg RE/L). The sugar solutions were injected and analyzed according to iCheck Fluoro user manual. Every 10^{th} sample was analyzed in duplicate to assess precision.

As a quality control, a standard quinine sulfate (Fluoro Standard) was measured to control the iCheck Fluoro devices.

Please note, to calculate the vitamin A concentration in the sugar samples the measured concentrations were adjusted with the dilution factor (DF).

3.4 Analysis of Iron in Semolina, Wheat and Maize Flour

A spot test is used to estimate the iron content in Semolina, wheat and maize flour, which should contain added sodium iron EDTA. The modified qualitative method AACC Method 40-40 was used for all individual flour samples. Before weighing in, the flour samples were mixed thoroughly to ensure homogeneity. 5g of each sample were weighed in in hexagonal weighing dishes. The surface was made flat by pressing down with the bottom of a small beaker. Freshly mixed HCL/ thiocyanate reagent was sprayed on the surface to wet the whole surface. After 5 minutes, hydrogen peroxide was sprayed on the surface. The samples were left to stand for 2 more minutes. If added iron compounds were present they showed up as red spots on the surface.

If there is ferric iron (i.e. NaFeEDTA present) the spots would appear after HCl/thiocyanate reagent. If ferrous iron (ferrous fumarate or sulfate) is present new spots would appear after hydrogen peroxide addition. Photos were taken after each step.

Based on the results of the spot test, the flour samples were pooled by brand in positive or negative flour samples. Additionally the negative flours of all brand were pooled to estimate the intrinsic iron content of the food vehicle. Before weighing in, the flour samples were mixed thoroughly to ensure homogeneity. 50 g of each positive or negative declared flour samples was used to prepare the composite samples.

An external laboratory (SGS INSTITUT FRESENIUS GmbH) measured the iron content in all pooled semolina, wheat and maize flour samples. The external laboratory analyzed the flour samples according to DIN EN 15763 mod. ICP/MS method.

4. Results

All the measurement results were put into excel files and delivered to the customer.

Oil:
A total of 236 oil samples were pooled to 39 composite samples and analyzed. Samples with a measured vitamin A concentration of less than 10,000 IU/kg (below linear range of iCheck Chroma 3) were classified as non-fortified. However it is recommended to classify them as “vitamin A content below 10,000 IU/kg” for final reporting.

The coefficient of variation, as assessed by measuring 2 composite oil samples in duplicates, and controls 4 times is 1.3-4.8%. The trueness, as assessed by the mean recovery with spiked control oil sample, is 98%±5%.

The addition of vitamin A to oil as per Nigerian Standard, is 20,000 IU/kg. Samples with 20,000 IU/kg were classified as adequately fortified.

Salt:
A total of 51 salt samples were pooled to 6 composite samples and analyzed. Samples with measured iodine concentration below 5 ppm were classified as non-iodized, but it is recommended to classify them as “iodine content of below 5 ppm”.

The coefficient of variation, as assessed by measuring 1 composite salt sample in duplicate is 0.2%. The trueness, as assessed by the recovery with iodized salt control sample, is 98%±1%.

The addition of iodine to salt as per Nigerian Standard, is 50 ppm. However market levels is minimum 30 ppm. Samples with 30 ppm and above were classified as adequately iodized.

Sugar:
A total of 75 sugar samples were pooled to 9 composite samples and analyzed for vitamin A content. Samples with measured vitamin A concentration below 1 650 IU/kg were classified as unfortified (below linear range of iCheck Fluoro), but it is recommended to classify them as “vitamin A content of below 1 650 IU/kg”. This is the limit of quantitation when applying 1:10 dilution factor.

The coefficient of variation, as assessed by measuring 1 sugar sample and control sample in duplicate is 2%. The trueness, as assessed by the recovery of standard control sample, is 92%±2%.

The addition of vitamin A to sugar as per Nigerian Standard, is 25,000 IU/kg. Samples with 25,000 IU/kg and above were classified as adequately fortified.

Wheat Flour:
A total of 96 wheat flour samples were analyzed by spot test for added iron content. 12 composite samples (2 declared negative, 10 samples declared positive) were analyzed by DIN EN 15763 mod. ICP/MS method. The average measured intrinsic iron content of the flour is 26.9 ppm (mg Fe/kg). This value was obtained by a composite sample including all negative declared wheat flour samples at equal parts.

Spot test results indicate a very variable intrinsic iron content in wheat flour. Therefore it is not recommended to use one value of 26.9 ppm as it may deem samples that a clearly fortified with spot test as unfortified by quantitative method. Two intrinsic factors were introduced: 10 ppm for very white flour and 40 ppm for whole wheat, the latter was based on in-house quantitative ICP analysis of whole wheat flour. 10 ppm is a theoretical level based on common definition of lower intrinsic iron level in various national standards.

The addition of iron as NaFeEDTA to wheat flour as per Nigerian Standard is 40ppm. Samples with 40 ppm and above were classified as adequately fortified.

The coefficient of variation, as assessed by measuring 2 composite wheat flour samples in duplicates is 3.9-5.8%. The trueness for iron analysis, as assessed by the recovery with spiked wheat flour sample, is 97%±0.5% (taking into account that the specific spiked flour has intrinsic iron content of 19 ppm).

Semolina Flour:
A total of 57 semolina flour samples were analyzed by spot test for added iron content. 5 composite samples (1 declared negative, 4 samples declared positive) were analyzed by DIN EN 15763 mod ICP/MS method. The measured intrinsic iron content of the semolina flour is 11.0 ppm (mg Fe/kg). This value was obtained by a composite sample including all negative declared semolina flour samples at equal parts. Samples with iron content above 11ppm were classified as fortified.

The addition of iron as NaFeEDTA to semolina as per Nigerian Standard, is 40ppm. Samples with 40 ppm and above were classified as adequately fortified.

No spiked samples were prepared for semolina. The coefficient of variation, as assessed by measuring 2 composite wheat flour samples in triplicates is 2.3-7.2%.

Maize Flour:
A total of 24 maize flour samples were analyzed by spot test for added iron content. 8 composite samples (4 declared negative, 4 samples declared positive) were analyzed by DIN EN 15763 mod ICP/MS method. ICP/MS results were very high (170 ppm) for samples declared as negative with spot test. While spot test positive samples gave ICP/MS results of 57 ppm. Therefore it was recommended to only interpret the results as positive and negative by the spot test.

The coefficient of variation, as assessed by measuring 3 composite maize flour samples in duplicates is 0.2-25.2%. The trueness for iron analysis, as assessed by the recovery with spiked maize flour sample, is 99-121% (taking into account that the specific spiked flour has intrinsic iron content of 10 ppm).

References

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2. Rohner et al. "Quantification of Vitamin A in Palm Oil Using a Fast and Simple Portable Device: Method Validation and Comparison to High-Performance Liquid Chromatography." International Journal for Vitamin and Nutrition Research, vol. 81, no. 5, 2011.
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8. FOOD SPECIMEN LABORATORY ANALYSIS RESULTS BY BRAND

Food vehicle	Brand ID	Number of samples in composite	Nutrient analysed	Mean iodine (ppm)	Nigeria fortification standard (ppm)			
Salt	1	5	Iodine as Potassium Iodate	0	≥30			
	2	5		0				
	3	12		38				
	4	5		47				
	5	12		63				
	6	12		98				
Food vehicle	**Brand ID**	**Number of samples in composite**	**Nutrient analysed**	**Mean vitamin A (IU/kg)**	**Nigeria fortification standard (IU/kg)**			
Sugar	1	2	Vitamin A Palmitate	0	≥25,000			
	2	12		3,663				
	3	4		6,402				
	4	8		6,996				
	5	1		10,098				
	6	12		20,031				
	7	12		20,955				
	8	12		24,321				
	9	12		57,255				
Food vehicle	**Brand ID**	**Number of samples in composite**	**Nutrient analysed**	**Mean vitamin A (IU/kg)**	**Nigeria fortification standard (IU/kg)**			
Oil	1	1	Vitamin A Palmitate	0	≥20,000			
	2	12		0				
	3	1		0				
	4	2		0				
	5	12		0				
	6	2		0				
	7	1		0				
	8	10		0				
	9	5		0				
	10	3		0				
	11	6		0				
	12	6		0				
	13	2		0				
	14	7		0				
	15	1		0				
	16	1		0				
	17	7		0				
	18	1		0				
	19	5		0				
	20	4		0				
	21	1		0				
	22	7		10,989				
	23	12		12,556.5				

Food vehicle	Brand ID	Number of samples in composite	Nutrient analysed	Mean total iron (ppm)	Nigeria fortification standard (ppm)	Spot test	Intrinsic iron estimate	Mean added iron (total less intrinsic) (ppm)
	24	7		12,870				
	25	1		13,035				
	26	9		13,167				
	27	9		13,464				
	28	8		16,797				
	29	12		16,830				
	30	11		17,721				
	31	1		19,272				
	32	12		26,499				
	33	12		28,842				
	34	12		29,535				
	35	6		32,868				
	36	12		40,210.5				
	37	10		60,621				
	38	5		68,970				
	39	2		91,113				
Food vehicle	**Brand ID**	**Number of samples in composite**	**Nutrient analysed**	**Mean total iron (ppm)**	**Nigeria fortification standard (ppm)**	**Spot test**	**Intrinsic iron estimate**	**Mean added iron (total less intrinsic) (ppm)**
Wheat flour	1	12	Iron as NaFeDTA	26.90	≥40	negative	NA	0
	2	1		20.30		positive	10	10.3
	3	10		41.00		positive	10	31.0
	4	12		45.30		positive	10	35.3
	5	10		52.30		positive	10	42.3
	6	3		68.70		positive	10	58.7
	7	8		111.00		positive	10	101.0
Food vehicle	**Brand ID**	**Number of samples in composite**	**Nutrient analysed**	**Mean total iron (ppm)**	**Nigeria fortification standard (ppm)**	**Spot test**	**Intrinsic iron estimate**	**Mean added iron (total less intrinsic) (ppm)**
Semolina flour	1	12	Iron as NaFeDTA	10.97	≥40	Negative	NA	0
	2	12		28.20		Positive	11	17.2
	3	11		35.80		Positive	11	24.8
	4	10		41.40		Positive	11	30.4
	5	12		46.00		Positive	11	35
Food vehicle	**Brand ID**	**Number of samples in composite**	**Nutrient analysed**	**Mean total iron (ppm)**	**Nigeria fortification standard (ppm)**	**Spot test**	**Intrinsic iron estimate**	**Mean added iron (total less intrinsic) (ppm)**
Maize flour	1	3	Iron as NaFeDTA	2.7	≥40	negative	NA[3]	0
	2	12		39		negative		0
	3	4		63		negative		0
	4	4		109		mixed		Inconclusive
	5	1		70		positive		Inconclusive

[3] This value could not be estimated by the lab due to inconsistencies in the sample.

9. HOUSEHOLD COVERAGE RESULTS (FIGURES 6 TO 14 IN TABLE FORMAT)

Table 17 Household coverage of food vehicles, Sokoto and Ebonyi, Nigeria, 2017

	Ebonyi					Sokoto				
Indicator name	Estimate	Lower CI	Upper CI	s.e	N	Estimate	Lower CI	Upper CI	s.e	N
Household consumes salt	100.0	NA	NA	NA	610	99.5	98.7	99.8	0.2	614
Household consumes sugar	79.6	74.8	83.6	2.2	610	91.3	85.9	94.8	2.2	614
Household consumes oil	98.2	95.3	99.3	0.9	610	97.8	95.6	98.9	0.8	614
Household consumes wheat flour	9.6	7.4	12.4	1.3	610	58.5	49.4	67.1	4.5	614
Household consumes maize flour	23.7	19.2	28.9	2.4	610	88.4	83.5	92.0	2.1	614
Household consumes semolina flour	18.6	14.7	23.2	2.1	610	15.1	10.1	21.9	3.0	614
Household consumes bouillon cubes	100.0	NA	NA	NA	610	99.1	96.5	99.8	0.6	614
Household consumes tomato paste	94.7	91.9	96.5	1.1	610	65.3	57.7	72.2	3.7	614
Household consumes rice	99.8	98.7	100.0	0.2	610	93.4	89.3	96.1	1.7	614

Table 18 Household coverage of fortifiable food vehicles, Sokoto and Ebonyi, Nigeria, 2017

	Ebonyi					Sokoto				
Indicator name	Estimate	Lower CI	Upper CI	s.e	N	Estimate	Lower CI	Upper CI	s.e	N
Household consumes fortifiable salt	99.4	98.4	99.8	0.3	610	99.4	98.5	99.7	0.3	614
Household consumes fortifiable sugar	79.6	74.8	83.6	2.2	610	90.8	85.4	94.4	2.2	614
Household consumes fortifiable oil	29.8	22.8	37.9	3.8	610	64.0	55.3	71.9	4.2	614
Household consumes fortifiable wheat flour	8.8	6.6	11.6	1.2	610	56.7	47.7	65.4	4.5	614
Household consumes fortifiable maize flour	11.0	7.5	15.8	2.0	610	1.1	0.3	3.9	0.7	614
Household consumes fortifiable semolina flour	17.2	13.6	21.5	2.0	610	10.3	6.0	17.1	2.7	614
Household consumes fortifiable bouillon cubes	100.0	NA	NA	NA	610	98.9	96.5	99.7	0.6	614
Household consumes fortifiable tomato paste	94.5	91.8	96.4	1.1	610	44.9	39.1	50.8	3.0	614
Household consumes fortifiable rice	82.6	75.3	88.0	3.2	610	40.3	33.5	47.4	3.5	614

Table 19 Household coverage of fortified food vehicles, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi					Sokoto				
	Estimate	Lower CI	Upper CI	s.e	N	Estimate	Lower CI	Upper CI	s.e	N
Household consumes salt confirmed to be fortified	85	79.5	89.2	2.4	610	11.8	8.5	16	1.9	614
Household consumes sugar confirmed to be fortified	19.4	15.3	24.2	2.2	610	8	5.7	11	1.3	614
Household consumes oil confirmed to be fortified	0.7	0.3	2.1	0.4	610	1.7	0.7	3.8	0.7	614
Household consumes wheat flour confirmed to be fortified	2.5	1.4	4.4	0.7	610	7.3	5.1	10.2	1.3	614
Household consumes semolona flour confirmed to be fortified	10	7.2	13.6	1.6	610	8.7	4.6	15.8	2.7	614

Table 20 Household coverage of foods by poverty risk, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Poor				Non-poor				Difference	Poor				Non-poor				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes salt	100.0	95.6	99.9	192	100.0	97.8	99.9	418	0	99.6	98.3	99.9	448	99.4	95.8	99.9	166	0.2
Household consumes sugar	76.3	67.7	83.2	192	81.1	75.3	85.9	418	-4.8	89.5	82.9	93.7	448	97.1	92.4	98.9	166	-7.6***
Household consumes oil	95.7	88.6	98.4	192	99.4	97.6	99.9	418	-3.8*	97.3	94.5	98.7	448	99.2	94.3	99.9	166	-1.9
Household consumes wheat flour	5.0	2.4	10.5	192	11.9	8.9	15.7	418	-6.8**	54.9	44.4	65.0	448	69.7	59.4	78.4	166	-14.8**
Household consumes maize flour	21.5	16.2	28.0	192	24.8	19.5	31.0	418	-3.3	90.6	85.3	94.1	448	81.4	71.4	88.5	166	9.2**
Household consumes semolina flour	13.9	9.1	20.7	192	20.9	15.7	27.2	418	-6.9*	8.7	5.7	13.0	448	35.2	22.7	50.2	166	-26.5***
Household consumes bouillon cubes	100.0	NA	NA	192	100.0	NA	NA	418	0.0	99.1	96.8	99.7	448	99.2	93.5	99.9	166	-0.1
Household consumes tomato paste	92.3	86.9	95.6	192	95.8	92.3	97.8	418	-3.5	62.3	53.5	70.3	448	74.8	64.0	83.1	166	-12.5**
Household consumes rice	100.0	NA	NA	192	99.7	98.0	100.0	418	0.3	92.7	87.5	95.8	448	95.8	90.5	98.2	166	-3.1

Table 21 Household coverage of fortifiable foods by poverty risk, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Poor				Non-poor				Difference	Poor				Non-poor				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes fortifiable salt	99.4	95.6	99.9	192	99.4	97.8	99.9	418	0.0	99.6	98.3	99.9	448	98.7	95.4	99.7	166	0.9
Household consumes fortifiable sugar	76.3	67.7	83.2	192	81.1	75.3	85.9	418	-4.8	88.9	82.3	93.2	448	97.1	92.4	98.9	166	-8.2***
Household consumes fortifiable oil	23.8	15.7	34.5	192	32.7	24.8	41.7	418	-8.9*	58.9	49.6	67.5	448	80.3	66.9	89.1	166	-21.4***
Household consumes fortifiable wheat flour	3.9	2.0	7.5	192	11.2	8.2	15.1	418	-7.3***	53.6	43.4	63.6	448	66.6	54.9	76.6	166	-13*
Household consumes fortifiable maize flour	13.5	9.0	19.7	192	9.8	6.2	15.1	418	3.7	1.2	0.4	4.0	448	0.7	0.1	5.1	166	0.5
Household consumes fortifiable semolina flour	12.7	8.4	19.0	192	19.4	14.8	25.1	418	-6.7*	3.8	2.3	6.3	448	30.7	18.1	47.1	166	-26.9***
Household consumes fortifiable bouillon cubes	100.0			192	100.0			418	0.0	98.9	96.7	99.6	448	99.2	93.5	99.9	166	-0.3
Household consumes fortifiable tomato paste	92.3	86.9	95.6	192	95.6	92.1	97.6	418	-3.3	43.2	36.7	49.9	448	50.3	39.5	61.1	166	-7.1
Household consumes fortifiable rice	80.0	67.9	88.3	192	83.8	76.9	89.0	418	-3.8	36.1	28.7	44.2	448	53.5	43.3	63.4	166	-17.4***

Table 22 Household coverage of foods by socio-economic statues, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Low SES				High SES				Difference	Low SES				High SES				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes salt	100.0	NA	NA	293	100.0	NA	NA	317	0.0	100.0	NA	NA	427	98.3	95.5	99.4	187	1.7**
Household consumes sugar	73.1	65.0	79.9	293	86.1	81.4	89.8	317	-13.0***	89.9	83.0	94.2	427	95	90.2	97.5	187	-5.0*
Household consumes oil	97.9	94.6	99.2	293	98.5	94.9	99.6	317	-0.6	97.2	94.4	98.7	427	99.3	94.9	99.9	187	-2.1*
Household consumes wheat flour	4.4	2.5	7.7	293	14.9	11.2	19.5	317	-10.5***	53.5	42.9	63.7	427	72	60.6	81.2	187	-18.6***
Household consumes maize flour	19.8	14.5	26.6	293	27.7	21.6	34.7	317	-7.8*	91.7	86.3	95.1	427	79.4	68.6	87.1	187	12.4**
Household consumes semolina flour	11.7	7.7	17.5	293	25.5	20.1	31.9	317	-13.8***	7.1	4.2	11.5	427	36.8	23.4	52.6	187	-29.7***
Household consumes bouillon cubes	100.0	NA	NA	293	100.0	NA	NA	317	0.0	98.7	95.2	99.7	427	100.0	NA	NA	187	-1.3
Household consumes tomato paste	91.7	87.5	94.6	293	97.6	94.2	99	317	-5.9***	59.6	50.7	67.8	427	80.7	72.3	87.1	187	-21.2***
Household consumes rice	100	NA	NA	293	99.6	97.4	100.0	317	0.4	92.4	87.2	95.6	427	96.2	90.6	98.5	187	-3.8

Table 23 Household coverage of fortifiable foods by socio-economic status, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Low SES				High SES				Difference	Low SES				High SES				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes salt	99.2	96.9	99.8	293	99.6	97.4	100	317	-0.5	100.0	NA	NA	427	97.7	94.9	99.0	187	2.3**
Household consumes sugar	73.1	65.0	79.9	293	86.1	81.4	89.8	317	-13.0***	89.7	82.9	94.0	427	93.8	88.3	96.8	187	-4.1
Household consumes oil	23.4	15.3	34.0	293	36.3	27.2	46.5	317	-13.0**	57.3	48.1	66.0	427	82.2	68.5	90.8	187	-24.9***
Household consumes wheat flour	3.8	2.1	6.8	293	13.9	10.2	18.7	317	-10.2***	52	41.7	62.2	427	69.5	57.6	79.2	187	-17.4**
Household consumes maize flour	8.7	6	12.4	293	13.3	8.0	21.4	317	-4.6	1.3	0.4	4.2	427	0.6	0.1	4.6	187	0.7*
Household consumes semolina flour	10.6	6.7	16.3	293	24.0	18.8	29.9	317	-13.4***	1.9	1.0	3.5	427	33.0	20.4	48.6	187	-31.1***
Household consumes bouillon cubes	100.0	NA	NA	293	100.0	NA	NA	317	0.0	98.5	95.3	99.6	427	100.0	NA	NA	187	-1.5*
Household consumes tomato paste	91.7	87.5	94.6	293	97.3	94.0	98.8	317	-5.5***	40.7	34.3	47.4	427	56.2	46.3	65.7	187	-15.6**
Household consumes rice	80.4	69.6	88.1	293	84.7	77.0	90.2	317	-4.3	36.7	29.3	44.9	427	49.9	38.7	61.1	187	-13.2**

Table 24 Household coverage of foods by women's dietary diversity score, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Poor				Non-poor				Difference	Poor				Non-poor				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes salt	99.4	95.6	99.9	192	99.4	97.8	99.9	418	0.0	99.6	98.3	99.9	448	98.7	95.4	99.7	166	0.9
Household consumes sugar	76.3	67.7	83.2	192	81.1	75.3	85.9	418	-4.8	88.9	82.3	93.2	448	97.1	92.4	98.9	166	-8.2***
Household consumes oil	23.8	15.7	34.5	192	32.7	24.8	41.7	418	-8.9*	58.9	49.6	67.5	448	80.3	66.9	89.1	166	-21.4***
Household consumes wheat flour	3.9	2.0	7.5	192	11.2	8.2	15.1	418	-7.3***	53.6	43.4	63.6	448	66.6	54.9	76.6	166	-13*
Household consumes maize flour	13.5	9.0	19.7	192	9.8	6.2	15.1	418	3.7	1.2	0.4	4.0	448	0.7	0.1	5.1	166	0.5
Household consumes semolina flour	12.7	8.4	19.0	192	19.4	14.8	25.1	418	-6.7*	3.8	2.3	6.3	448	30.7	18.1	47.1	166	-26.9***
Household consumes bouillon cubes	100.0	NA	NA	192	100.0	NA	NA	418	0.0	98.9	96.7	99.6	448	99.2	93.5	99.9	166	-0.3
Household consumes tomato paste	92.3	86.9	95.6	192	95.6	92.1	97.6	418	-3.3	43.2	36.7	49.9	448	50.3	39.5	61.1	166	-7.1
Household consumes rice	80.0	67.9	88.3	192	83.8	76.9	89.0	418	-3.8	36.1	28.7	44.2	448	53.5	43.3	63.4	166	-17.4***

Table 25 Household coverage of fortifiable foods by women's dietary diversity score, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Low MDDW				High MDDW				Difference	Low MDDW				High MDDW				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes fortifiable salt	98.7	94.6	99.7	163	99.6	97.3	99.9	351	-1.0	98.8	95.5	99.7	149	99.5	98.2	99.9	443	-0.7
Household consumes fortifiable sugar	73.1	64.9	80.0	163	85.9	80.4	90.1	351	-12.8***	85.3	75.0	91.8	149	92.6	87.6	95.6	443	-7.3**
Household consumes fortifiable oil	36.9	27.0	47.9	163	25.7	18.6	34.3	351	11.2**	54.4	43.0	65.4	149	67.0	57.5	75.4	443	-12.7**
Household consumes fortifiable wheat flour	5.3	2.8	10.0	163	12.0	8.4	16.8	351	-6.7**	41.6	31.7	52.2	149	61.1	51.4	69.9	443	-19.5***
Household consumes fortifiable maize flour	5.6	2.8	10.9	163	14.3	9.6	20.7	351	-8.7***	0.7	0.1	4.7	149	1.3	0.4	4.3	443	-0.1
Household consumes fortifiable semolina flour	13.4	7.2	23.5	163	21.0	16.3	26.6	351	-7.6	6.0	2.3	14.4	149	11.5	6.9	18.5	443	-5.5**
Household consumes fortifiable bouillon cubes	100.0	NA	NA	163	100.0	NA	NA	351	0.0	98.0	93.7	99.4	149	99.2	96.5	99.8	443	-1.2
Household consumes fortifiable tomato paste	90.8	84.6	94.7	163	97.0	94.3	98.4	351	-6.2***	32.8	24.4	42.4	149	49.8	43.6	56.0	443	-17.0***
Household consumes fortifiable rice	83.3	72.7	90.4	163	82.9	73.9	89.2	351	0.4	40.3	29.9	51.7	149	40.9	33.8	48.3	443	-0.5

Table 26 Household coverage of foods by IYCF practices, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Poor IYCF practices				Good IYCF practices				Difference	Poor IYCF practices				Good IYCF practices				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes salt	100.0	97.9	99.7	482	100.0	NA	NA	128	0.0	99.2	97.6	99.7	346	100.0	NA	NA	268	-0.8*
Household consumes sugar	78.0	72.4	82.7	482	85.5	76.3	91.5	128	-7.5*	88.1	80.4	93.0	346	95.5	91.5	97.7	268	-7.4***
Household consumes oil	97.9	94.0	99.3	482	99.3	94.8	99.9	128	-1.4	96.4	92.6	98.3	346	99.6	97.0	99.9	268	-3.2**
Household consumes wheat flour	7.8	5.3	11.4	482	16.6	11.4	23.5	128	-8.8**	52.5	42.0	62.7	346	66.3	58.2	73.6	268	-13.8***
Household consumes maize flour	20.6	15.8	26.3	482	35.6	27.1	45.1	128	-15***	86.5	80.2	91.0	346	90.9	85.0	94.6	268	-4.4
Household consumes semolina flour	15.2	11.3	20.2	482	31.4	23.5	40.5	128	-16.1***	14.5	9.4	21.6	346	15.8	9.8	24.6	268	-1.3
Household consumes bouillon cubes	100.0	NA	NA	482	100.0	NA	NA	128	0.0	98.7	93.3	99.8	346	99.6	97.2	99.9	268	-0.9
Household consumes tomato paste	94.1	91.3	96.1	482	96.7	89.0	99.1	128	-2.6	59.3	49.6	68.3	346	73.0	65.0	79.8	268	-13.7***
Household consumes rice	99.8	98.3	100.0	482	100.0	NA	NA	128	-0.2	89.9	83.6	93.9	346	98.0	94.5	99.3	268	-8.2***

Table 27 Household coverage of fortifiable foods by IYCF practices, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Poor IYCF practices				Good IYCF practices				Difference	Poor IYCF practices				Good IYCF practices				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes fortifiable salt	99.3	97.9	99.7	482	100.0	NA	NA	128	-0.7*	98.9	97.3	99.6	346	100.0	NA	NA	268	-1.1**
Household consumes fortifiable sugar	78.0	72.4	82.7	482	85.5	76.3	91.5	128	-7.5*	88.1	80.4	93.0	346	94.4	89.9	97.0	268	-6.3**
Household consumes fortifiable oil	31.1	23.5	39.8	482	24.9	15.8	36.9	128	6.2	64.1	54.7	72.5	346	63.9	53.1	73.5	268	0.1
Household consumes fortifiable wheat flour	7.2	4.8	10.5	482	15.1	10.3	21.5	128	-7.9**	49.9	39.8	60.1	346	65.6	57.5	72.9	268	-15.7***
Household consumes fortifiable maize flour	9.2	5.7	14.6	482	17.7	12.3	24.9	128	-8.5***	0.8	0.2	3.9	346	1.4	0.4	5.1	268	-0.6
Household consumes fortifiable semolina flour	14.2	10.4	18.9	482	28.9	21.1	38.3	128	-14.8***	8.9	4.8	16.0	346	12.0	7.0	20.0	268	-3.1
Household consumes fortifiable bouillon cubes	100.0	NA	NA	482	100.0	NA	NA	128	0.0	98.4	93.6	99.6	346	99.6	97.2	99.9	268	-1.2
Household consumes fortifiable tomato paste	93.9	91.1	95.9	482	96.7	89.0	99.1	128	-2.8	39.3	32.7	46.3	346	52.2	44.4	59.8	268	-12.9***
Household consumes fortifiable rice	82.2	74.6	88.0	482	83.9	73.7	90.6	128	-1.7	42.0	34.1	50.3	346	38.1	30.7	46.2	268	3.8

Table 28 Household coverage of foods by household food insecurity, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Food insecure				Food secure				Difference	Food insecure				Food secure				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes salt	100.0	97.9	99.7	482	100.0	NA	NA	128	0.0	99.2	97.6	99.7	346	100.0	NA	NA	268	-.8*
Household consumes sugar	78.0	72.4	82.7	482	85.5	76.3	91.5	128	-7.5*	88.1	80.4	93.0	346	95.5	91.5	97.7	268	-7.4***
Household consumes oil	97.9	94.0	99.3	482	99.3	94.8	99.9	128	-1.4	96.4	92.6	98.3	346	99.6	97.0	99.9	268	-3.2**
Household consumes wheat flour	7.8	5.3	11.4	482	16.6	11.4	23.5	128	-8.8**	52.5	42.0	62.7	346	66.3	58.2	73.6	268	-13.8***
Household consumes maize flour	20.6	15.8	26.3	482	35.6	27.1	45.1	128	-15***	86.5	80.2	91.0	346	90.9	85.0	94.6	268	-4.4
Household consumes semolina flour	15.2	11.3	20.2	482	31.4	23.5	40.5	128	-16.1***	14.5	9.4	21.6	346	15.8	9.8	24.6	268	-1.3
Household consumes bouillon cubes	100.0	NA	NA	482	100.0	NA	NA	128	0.0	98.7	93.3	99.8	346	99.6	97.2	99.9	268	-0.9
Household consumes tomato paste	94.1	91.3	96.1	482	96.7	89.0	99.1	128	-2.6	59.3	49.6	68.3	346	73.0	65.0	79.8	268	-13.7***
Household consumes rice	99.8	98.3	100.0	482	100.0	NA	NA	128	-0.2	89.9	83.6	93.9	346	98.0	94.5	99.3	268	-8.2***

Table 29 Household coverage of fortifiable foods by household food insecurity, Sokoto and Ebonyi, Nigeria, 2017

Indicator name	Ebonyi									Sokoto								
	Food insecure				Food secure				Difference	Food insecure				Food secure				Difference
	Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N		Estimate	Lower CI	Upper CI	N	Estimate	Lower CI	Upper CI	N	
Household consumes fortifiable salt	98.5	94.3	99.6	146	99.7	98.0	100.0	464	-1.3	100.0	NA	NA	73	99.3	98.2	99.7	541	0.7**
Household consumes fortifiable sugar	73.4	63.1	81.6	146	81.6	76.3	86.0	464	-8.3	94.2	84.4	98.0	73	90.4	84.7	94.1	541	3.8
Household consumes fortifiable oil	33.7	22.7	46.9	146	28.5	21.5	36.6	464	5.3	65.5	52.2	76.7	73	63.8	54.8	71.9	541	1.7
Household consumes fortifiable wheat flour	6.0	3.2	11.1	146	9.8	7.0	13.5	464	-3.7	52.6	40.3	64.7	73	57.3	47.5	66.5	541	-4.7
Household consumes fortifiable maize flour	6.8	3.7	12.1	146	12.4	8.1	18.5	464	-5.6*	0.0	NA	NA	73	1.2	0.3	4.4	541	-1.2
Household consumes fortifiable semolina flour	8.6	4.9	14.5	146	20.1	15.9	25.2	464	-11.6***	6.0	2.0	16.8	73	10.9	6.3	18.2	541	-4.9
Household consumes fortifiable bouillon cubes	100.0	NA	NA	146	100.0	NA	NA	464	0.0	95.1	72.2	99.3	73	99.5	98.4	99.8	541	-4.3
Household consumes fortifiable tomato paste	87.2	79.7	92.1	146	97.0	94.9	98.2	464	-9.8***	41.8	31.0	53.5	73	45.3	39.2	51.6	541	-3.5
Household consumes fortifiable rice	81.6	69.4	89.6	146	82.9	75.7	88.3	464	-1.3	34.9	22.3	50.0	73	41.0	34.2	48.2	541	-6.2

10. MICRONUTRIENT CONTRIBUTION RESULTS (FIGURES 15-20 IN TABLE FORMAT)

Table 30 Actual and modelled iodine contribution from consumption of fortified salt as a percentage of estimated average requirements (EAR), Ebonyi and Sokoto, Nigeria, 2017

	Ebonyi								Sokoto							
Indicator name	Median	Lower CI	Upper CI	s.e	p25	p50	p75	N	Median	Lower CI	Upper CI	s.e	p25	p50	p75	N
WRA																
Actual iodine contribution from salt as a % of EAR	212.9	193.2	232.6	9.9	97.3	163.1	243.8	498	244.5	219.9	269.1	12.3	80.3	178.2	320.9	558
Modelled iodine contribution from salt as a % of EAR	193.8	178.7	208.9	7.6	95.5	155.4	237.4	498	245.5	227.9	263.2	8.9	112.6	189.3	312.7	558
Children 12-23 months																
Actual iodine contribution from salt as a % of EAR	167.9	NA	NA	NA	80.9	132.5	221.8	142	225.0	NA	NA	NA	92.6	183.1	288.2	122
Modelled iodine contribution from salt as a % of EAR	155.4	NA	NA	NA	86.3	124.5	202.6	142	237.2	NA	NA	NA	119.0	201.5	296.3	122
Children 24-59 months																
Actual iodine contribution from salt as a % of EAR	231.6	200.9	262.2	15.4	110.6	166.4	283.9	324	290.1	249.8	330.5	20.3	103.0	221.0	426.2	335
Modelled iodine contribution from salt as a % of EAR	207.0	185.6	228.4	10.7	109.6	167.4	258.0	324	284.1	255.6	312.6	14.3	142.0	237.2	388.9	335

Table 31 Actual and modelled vitamin A contribution from consumption of fortified sugar, oil, wheat flour, maize flour and semolina flour as a percentage of estimated average requirements (EAR), Ebonyi and Sokoto, Nigeria, 2017

	Ebonyi								Sokoto							
Indicator name	Median	Lower CI	Upper CI	s.e	p25	p50	p75	N	Median	Lower CI	Upper CI	s.e	p25	p50	p75	N
WRA																
Actual vitamin A contribution from sugar and oil as a % of EAR	9.6	7.7	11.4	0.9	0.8	3.2	10.8	514	9.3	7.8	10.9	0.8	1.0	3.8	11.0	592
Modelled vitamin A contribution from sugar, oil and flours as a % of EAR	15.7	13.5	18.0	1.1	4.2	11.0	20.1	514	24.8	22.0	27.6	1.4	9.7	18.2	32.4	592
Children 12-23 months																
Actual vitamin A contribution from sugar and oil as a % of EAR	8.4	NA	NA	NA	1.0	2.8	9.8	149	13.0	NA	NA	NA	0.9	4.2	15.5	126
Modelled vitamin A contribution from sugar, oil and flours as a % of EAR	17.7	NA	NA	NA	5.9	12.2	21.6	149	30.4	NA	NA	NA	13.5	24.2	40.5	126
Children 24-59 months																
Actual vitamin A contribution from sugar and oil as a % of EAR	14.5	11.0	18.0	1.8	1.1	5.8	16.6	338	14.1	11.4	16.7	1.3	1.9	6.0	18.0	359
Modelled vitamin A contribution from sugar, oil and flours as a % of EAR	21.2	18.3	24.0	1.4	7.1	15.2	28.1	338	35.4	31.5	39.3	2.0	15.8	29.8	49.1	359

Table 32 Actual and modelled iron contribution from consumption of fortified wheat flour, maize flour and semolina flour as a percentage of recommended dietary allowance (RDA), Ebonyi and Sokoto, Nigeria, 2017

	Ebonyi								Sokoto							
Indicator name	**Median**	**Lower CI**	**Upper CI**	**s.e**	**p25**	**p50**	**p75**	**N**	**Median**	**Lower CI**	**Upper CI**	**s.e**	**p25**	**p50**	**p75**	**N**
WRA																
Actual iron contribution from flours as % of RDA	3.4	1.7	5.0	0.8	0.0	0.0	0.0	514	19.5	13.6	25.4	3.0	0.0	0.2	19.2	592
Modelled iron contribution from flours as % of RDA	21.8	18.3	25.3	1.8	3.0	11.7	29.8	514	41.1	33.3	49.0	3.9	4.5	17.6	51.7	592
Children 6-11 months																
Actual iron contribution from flours as % of RDA	0.2	NA	NA	NA	0.0	0.0	0.0	71	2.0	NA	NA	NA	0.0	0.0	2.0	69
Modelled iron contribution from flours as % of RDA	3.0	NA	NA	NA	0.0	0.6	2.9	71	5.8	NA	NA	NA	0.0	0.4	5.3	69
Children 12-23 months																
Actual iron contribution from flours as % of RDA	2.2	NA	NA	NA	0.0	0.0	0.0	149	7.7	NA	NA	NA	0.0	0.0	9.4	126
Modelled iron contribution from flours as % of RDA	18.4	NA	NA	NA	1.7	7.2	19.8	149	18.9	NA	NA	NA	3.0	10.7	25.8	126
Children 24-59 months																
Actual iron contribution from flours as % of RDA	2.3	1.3	3.2	0.5	0.0	0.0	0.0	338	12.8	7.9	17.7	2.4	0.0	0.0	10.3	359
Modelled iron contribution from flours as % of RDA	18.8	16.0	21.7	1.4	2.9	10.6	27.6	338	22.7	18.1	27.3	2.3	2.3	10.6	30.1	359