Trends in Child Health in Nigeria, 2003-2013

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Rebecca Winter[1]

Ambrose Akinlo[2,3]

Lia Florey[1]

ICF International

Rockville, Maryland, USA

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[1] The DHS Program, International Health and Development, ICF International
[2] Department of Demography and Social Statistics, Obafemi Awolowo University, Nigeria
[3] School of Research and PG Studies, FHSS, North West University (MC), South Africa

Corresponding author: Rebecca Winter, International Health and Development, ICF International, 530 Gaither Road, Suite 500, Rockville, MD 20850, USA; telephone: +1 301–572–0541; fax: +1 301-572-0999; email: Rebecca.Winter@icfi.com

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Abstract

The study examines trends in key child health indicators in Nigeria, using data from three Demographic and Health surveys (DHS) conducted in 2003, 2008, and 2013. The indicators are in three broad health areas: child nutrition, prevention of childhood illness (immunization and coverage of insecticide-treated mosquito nets), and care seeking for childhood illness. The report assesses changes in the child health indicators between the three surveys, as a whole and by children's background characteristics. Overall, the results show a substantial need for further improvements in children's health status in Nigeria. While significant improvements were observed over the ten-year period for child immunization coverage (positive trends), significant declines were observed with respect to most child nutrition indicators (negative trends). For other child nutrition and child illness indicators—such as early initiation of breastfeeding, exclusive breastfeeding for the first six months, and care seeking from a health provider or facility for fever and for symptoms of ARI—coverage did not change over the decade and remains low. The findings also point to extensive geographic disparities in child health, with children in the Northern zones fairing worse than children in the Southern zones, and with persistent socioeconomic disparities across nearly all child health indicators. In conclusion, Nigeria's efforts to promote child health and achieve health equity for all parts of the country are still far from satisfactory on nearly all indicators.

KEY WORDS: child health, Nigeria, nutrition, immunization, childhood illness

Executive Summary

The study examines trends in key child health indicators in Nigeria, using data from three Demographic and Health surveys (DHS) conducted in 2003, 2008, and 2013. The indicators cover three broad health areas: child nutrition, prevention of childhood illness, and care seeking for childhood illness. The report assesses changes in the indicators between the three surveys, as a whole and by children's background characteristics. The report's main findings and recommendations follow:

Child Nutrition

- Early initiation of breastfeeding
  - Overall, no change in coverage was observed between the 2003 and 2013 surveys. Coverage remains low, with just one-third of (most recent born) children under age 5 breastfed within an hour of birth in 2013.
  - The observed decrease in coverage in the South East is of particular concern.

- Exclusive breastfeeding up to age 6 months
  - Coverage remains low nationally and across all geopolitical zones. Exclusive breastfeeding is lowest in the North West zone, at 4% in 2013, and highest in the South West, at 42% in 2013.
  - Exclusive breastfeeding varies widely across socio-demographic characteristics such as mother's education, place of residence, and household wealth quintile.
  - Campaigns to promote exclusive breastfeeding could target disadvantaged groups (mothers with no education, households in the lowest wealth quintile, and rural areas).

- Dietary diversity
  - A significant decline in dietary diversity, from 39% in 2008 to 19% in 2013, was observed nationally and in every subgroup.
  - Dietary diversity is significantly associated with household wealth, mother's education, geopolitical zone, and place of residence (rural or urban), with the lowest dietary diversity found in rural areas, among children whose mothers have no education, children in the lowest wealth quintile, and children in the North West.
  - The decline in dietary diversity between 2008 and 2013 could possibly point to increasing levels of poverty and/or food insecurity.

- Micronutrient supplementation
  - Results were mixed, with gains in vitamin A supplementation coverage but declines in iron supplementation coverage, and no change in the provision of deworming medication for children age 6-59 months.
  - Trends in micronutrient supplementation vary widely by geopolitical zone, with gains in the Northern zones and declines in the Southern zones.

- Stunting and wasting
  - Results were mixed. Stunting—a measure of long-term malnutrition—declined among children under age 5, while wasting—a measure of short-term malnutrition—increased between 2003, 2008, and 2013.
  - This pattern could signal worsening economic conditions and growing food insecurity in recent times, since increasing poverty and food insecurity could explain the increase in short-term malnutrition. Additional study is needed to investigate this issue.
  - Malnutrition varies widely across children's background characteristics. Stunting is highest in rural areas, in the Northern zones, among children whose mothers have no education, and among children in the poorest wealth quintile. Wasting also varies across mother's education, wealth, and geopolitical zone, but is strikingly similar in urban and rural areas.

Prevention of Childhood Illness: Immunization and Insecticide-treated Nets (ITNs)

- Polio immunization
  - Complete polio immunization coverage nearly doubled, from 29% in 2003 to 54% in 2013.
  - The increase in coverage was most dramatic in the North West zone, where many of the polio cases were reported recently, and where more resources were channeled following the end of an 11-month immunization boycott in three of the zone's states.
  - The improvement in polio immunization coverage in the North coincided with Nigeria's removal from the WHO polio endemic countries list. However, care should be taken to ensure that no new cases emerge, especially in the North East, where Boko Haram's insurgency has created a threat to security and presents serious challenges.

- Measles immunization
  - Measles immunization coverage increased from 36% in 2003 to 41% in 2008 and 42% in 2013.
  - Coverage is twice as high in urban areas (62%) compared with rural areas (31%), is higher in the Northern zones compared with the South, and is strongly associated with mother's education and household wealth.

- Full vaccination coverage
  - Although full vaccination coverage doubled between 2003 and 2013, from 13% to 25%, coverage remains low compared with the need.
  - The Northern zones continue to have the lowest coverage, and socioeconomic disparities (by place of residence, mother's education, and household wealth status) remain pronounced.
  - In the short term, immunization campaigns could be scaled up with special emphasis on rural areas, the Northern zones, and poorer neighborhoods. For the longer term, efforts should continue to promote women's education.

- Household ownership of insecticide-treated nets (ITNs) and ITN use by children under age 5
  - Although household ITN ownership and use of ITNs by children under age 5 increased tremendously (ITN use increased from 1% in 2003 to 17% in 2013), coverage falls far short of universal coverage targets.
  - Policymakers may want to review the current strategy of distributing ITNs to children through EPI, since vaccination rates remain low.

Care Seeking for Childhood Illnesses

- Care seeking for diarrhea, symptoms of ARI, and fever
  - Levels of care seeking for children's diarrhea increased significantly between 2003 and 2013 but remain low. Only about one-third of children received care for diarrhea from a medical facility or provider in 2013.
  - Similarly, in 2013 care was sought from a medical provider or facility for about one-third of children with recent symptoms of ARI and fever, and no improvements in coverage were observed across the decade.

1. Introduction and Rationale

With an estimated 183.5 million people, Nigeria is Africa's most populous country and the world's seventh most populous (United Nations 2013). Each year, an estimated 7.4 million children are born in Nigeria. Improving child health outcomes is a goal relentlessly pursued in the country since the return to democratic governance in 1999. The Nigerian government has invested heavily in child health intervention programs, including the Midwives Service Scheme (MSS); the Subsidy Reinvestment and Empowerment Program, Maternal and Child Health (SURE-P-MCH); and systematic primary health care infrastructure upgrades through the Ward Health System (NPC and ICF International, 2014). Other key child health programs include the Expanded Program on Immunization, the Polio Eradication Initiative and National Emergency Action Plan, Integrated Community Case Management of Childhood Illnesses in Nigeria, and the Integrated Maternal Newborn and Child Health Strategy (NPHCDA 2012a).

In light of these recent programs, there is a need to assess whether child health outcomes are improving, identify child health areas that might require further improvement, and see whether recent improvements have been equitable for all children. In order to assess the child health situation in the country over the last decade, this report analyzes data from the last three Nigerian Demographic and Health Surveys (NDHS), conducted in 2003, 2008, and 2013. The NDHS are nationally representative surveys with extensive coverage of maternal and child health. The report focuses on three broad areas of child health: (1) child nutrition (breastfeeding and nutritional outcomes); (2) prevention of childhood illnesses (immunization and use of ITNs); and (3) care seeking for childhood illnesses (diarrhea, acute respiratory infections (ARI), and fever). The analysis examines child health indicators in these areas both nationally and by children's background characteristics, including child's age, mother's education, household wealth, place of residence (rural or urban), and geopolitical zone.

1.1. Literature Review

1.1.1. Context of Child Health and Survival

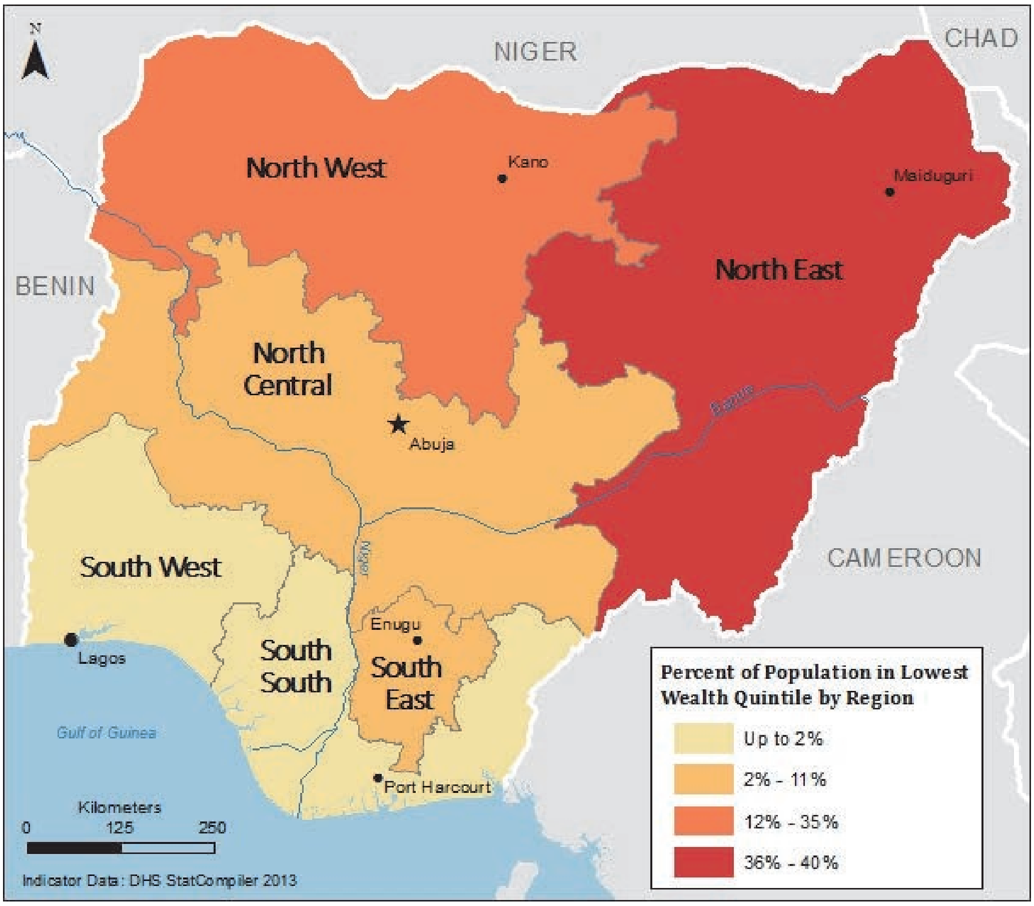
Childhood mortality in Nigeria remains high. Every year, an estimated one million Nigerian children die before their fifth birthday. Almost a quarter of these deaths are among newborns (Federal Ministry of Health 2011). Nigeria is one of five countries in the world with the highest number of under-five deaths. A recent study identified the leading causes of death in Nigeria for children age 1 month to 5 years in 2013 as malaria (31%), pneumonia (19%), and diarrhea (14%). Among neonates the leading causes of death are preterm birth complications (33%), intrapartum-related events (29%), and sepsis/meningitis/tetanus (20%). Collectively, malaria, pneumonia, and diarrhea account for 45% of all under-five deaths in Nigeria (Liu et al. 2015). Each of these three diseases is preventable and treatable.

Looking at child survival in Nigeria nationally clouds the wide variation in indicators by regions of the country. In 2013, under-five mortality was 128 deaths per 1,000 live births, according to the 2013 NDHS. When disaggregated by geopolitical zone, however, the rates in the North West and North East zones were 185 and 160, respectively, while rates in the South West and South South zones were 90 and 91, respectively (NPC and ICF International 2014). The rates in the North Central and South East zones were intermediate, at 100 and 131, respectively. Indicators of childhood illnesses and nutritional status show a similar pattern when disaggregated by geopolitical zone. The Northern zones of the country are the epicenter of child illnesses and mortality.

The poor health indicators in the North of Nigeria relative to the South could be attributed to the low levels of development and high levels of poverty in the North relative to the South. The ten poorest states in Nigeria are all located in the North West and North East zones. Figure 1 shows the percentage of households that are in the lowest DHS wealth quintile, by zone, across the country. While less than

2% of households in the South South and South West are in the lowest wealth quintile, more than 35% of households in the North East are in the lowest wealth quintile. The multi-dimensional poverty index (MPI) by the Oxford Poverty and Human Development Initiative shows a similar pattern: the North West and North East are the poorest zones, with 81% and 77% of their populations, respectively, living in multi-dimensional poverty, while none of the three zones in the Southern part of the country has more than 27% of the population living in multi-dimensional poverty (Oxford Poverty and Human Development Initiative 2015).

Figure 1. Map of Nigeria



1.1.2. Recent Child Health Intervention Programs

Most child morbidity and mortality are rooted in either malnutrition, common childhood illnesses, or diseases that could be prevented with vaccination (Ibe 2002). This section provides an overview of recent health programs and interventions to address these areas of child health in Nigeria. For simplicity, the health programs are presented separately for each health area, but the determinants of child survival are often interwoven and thus interventions can address these problems together. For instance, the recommended interventions against pneumonia include exclusive breastfeeding for the first six months of life and zinc supplementation, and these same interventions also address nutritional deficiencies in children (WHO/UNICEF 2009).

Child Nutritional Status

Children's nutritional status is an important measure of child health. Nigeria's first nutrition policy, the National Food and Nutrition Policy (NFNP), was formulated by the National Council on Nutrition in 1995, approved by the Federal Government in 1998, and launched in November 2002. The main goal of the policy was to improve the nutritional status of Nigerians, especially women of reproductive age and children under age 5. Some of the specific objectives of the policy included reducing severe and moderate malnutrition among children under age 5 by 30% and cutting micronutrient deficiencies (principally of vitamin A, iodine, and iron) by 50% by 2010. The objective for micronutrients resulted in interventions such as vitamin A fortification of sugar, wheat flour, and vegetable oil. Wheat flour was fortified with iron, thereby helping to protect children and mother's physical and mental health. In September 2005 the Federal Government under the coordination of the Federal Ministry of Education launched the Home-Grown School Feeding and Health Program, which aimed at providing a nutritionally adequate meal during the school day. In addition, Nigeria embarked on management of severe acute malnutrition (SAM) and has established more than 495 community management of acute malnutrition (CMAM) sites across Northern Nigeria. The school feeding program has been reproduced by many of the 36 state governments and is still being implemented as of March 2016.

The National Strategic Plan of Action for Nutrition (NSPAN) for the period 2014-2019 includes a national recommendation on breastfeeding. In line with international standards and based on the NFNP goals, the NSPAN recommends that breastfeeding commence within 30 minutes of delivery. It also recommends that infants should be exclusively breastfed for the first six months of life, and thereafter breastfeeding should continue up to at least two years while safe complementary foods are introduced at age six months. The NSPAN sets a target of increasing the exclusive breastfeeding rate to at least 50% by 2018. Similarly, the 2018 targets include the reduction of stunting in children under age 5 by 20%, reducing childhood wasting to less than 10% and low birthweight by 15% by 2018 (Federal Ministry of Health 2014).

Immunization

Immunization is a cost-effective public health strategy to reduce under-five mortality and to prevent childhood illness (NPC and ICF International 2014; Odusanya et al. 2008). It is estimated that more than two million deaths globally are avoided each year through immunization (Odusanya et al. 2008). Nigeria has invested heavily in immunization; the annual expenditure on routine immunization vaccine is projected to rise to $426 million in 2020, more than double the current $150 million (Chukwu 2015). However, while about 7.2 million children in Nigeria are immunized annually, with a yearly increase of 2.5% (Chukwu 2015), just a quarter of children age 12-23 months were fully vaccinated, according to the 2013 Nigeria DHS, suggesting that further gains are needed (NPC and ICF International 2014).

For years, Nigeria was a focus of international vaccination interventions as it was a hotspot in the global effort to eradicate polio. It has been estimated that, as of 2012, more than half of all polio cases in the world occurred in Nigeria. Efforts to eradicate polio from Nigeria have received more support from successive Nigerian presidents than any other child health program in the country. This was arguably one of the main reasons for the major breakthrough in the country's polio eradication program when the World Health Organization (WHO) removed Nigeria from the list of polio endemic countries in late 2015. Polio will be declared eradicated from Africa in 2017 if Nigeria has not recorded any new cases by then. This polio success story follows years of commitment to various intervention programs, including the Expanded Program on Immunization (EPI), the National Polio Eradication Emergency Program (NPEEP), and the Presidential Task Force on Polio Eradication (PTFPE). The launch of NPEEP effectively declared polio to be a national emergency for Nigeria, and its eradication became a health priority for all tiers of government.

One of the recent improvements in routine immunization in Nigeria was the introduction of new vaccines. The pentavalent vaccine—a combination vaccine that protects infants against diphtheria, pertussis, tetanus, hepatitis B and Haemophilus influenzae type b (Hib) pneumonia, and meningitis—was introduced in 2012 as a replacement for the traditional vaccines, BCG, OPV, DPT, and measles and yellow fever vaccines (Mohammed 2015). Other newly introduced vaccines include the Pneumococcal Conjugate Vaccine (PCV), the Inactivated Polio Vaccine (IPV), and the rotavirus vaccine. The rotavirus vaccine is an oral vaccine against rotavirus infection, which is a common cause of diarrhea and sickness, typically striking babies and young children (Mohammed 2015; Zoho 2015).

Childhood Illnesses

Globally, malaria ranks third as a leading cause of death for children under age 5, behind pneumonia and diarrheal diseases. In Nigeria, however, malaria ranks first, as of 2013 (Liu et al. 2015). According to the National Malaria Strategic Plan 2014-2020, 97% of Nigerians are at risk of malaria and about 300,000 deaths per year are due to the disease. A huge amount of national and international funding has been channeled towards fighting malaria in Nigeria. For instance, the World Bank committed more than $280 million to the Malaria Booster Program that supported seven states and some national-level activities in 2009. The UK Department for International Development (DFID) initiated the Support to Nigeria Malaria Program (SuNMaP), a $100 million five-year program to control malaria, while the Global Fund provided a $500 million Round 8 Malaria grant for 2009-2014. Additionally, the Malaria Action Program for States (MAPS) program was implemented in six states between 2010 and 2015, funded first by USAID and then by the President's Malaria Initiative (PMI), a core component of the United States' Global Health Initiative (GHI) (United States 2011) of USAID. Between 2011 and 2015, Nigeria received more than $300 million from PMI to fight malaria in PMI-focus states (USAID 2015).

Several intervention programs in Nigeria have aimed to address other preventable childhood illnesses, including pneumonia, diarrhea, and measles. These programs include the Integrated Management of Childhood Illness (IMCI), first implemented in 1997, and the Integrated Community Case Management (iCCM) of childhood illnesses. However, compared with intervention programs for polio and malaria, programs to address pneumonia and diarrhea have not received the same focus, despite the many deaths associated with these illnesses. A publication of the Global Coalition Against Pneumonia (GCAP) on Nigeria described pneumonia as the "forgotten killer" (Erchick, Wonodi, and Privor-Dumm 2012).

1.1.3. Child Health Challenges

Several political and cultural challenges have hampered efforts to achieve child health goals in Nigeria. The deteriorating security situation in the Northern part of the country is a major challenge faced by the health sector. Maternal and child health indicators fare worst in the North East. Boko Haram extremists have a strong grip on three of the six states in this zone, Yobe, Borno, and Adamawa, which constitute an area the size of Belgium.

Another problem that has slowed Nigeria's effort to improve child health is the politicization of intervention programs. For example, in 2003 three states in Northern Nigeria—Kano, Kaduna, and Zamfara—announced a boycott of immunization out of unwarranted fear that the vaccines were contaminated with anti-fertility and cancerous agents and with HIV (Jegede 2007). The boycott lasted 11 months, and it has taken time to rebuild parents' trust in immunization for their children.

Public concerns about childhood illnesses and caregivers' concerns about the safety of some programs is another challenge. For instance, a school feeding program introduced in Ekiti State ran into a crisis when parents in one community accused the government of using charms (or juju) to feed the children (Suleiman 2008). This prompted some parents to discourage their children from eating 'government foods' at school, with violence erupting in one school over the program. Mothers' perceptions of the etiology of diseases are rooted in cultural beliefs and these influence their decisions on whether, when, and how to treat childhood diseases (Feyisetan, Asa, and Ebigbola 1997). In a situation where some parents accept the inevitability of death for children whom they believe are 'abikus' or 'ogbanjes'—children of the spirit world (Ogunjuyigbe 2004)—the will to seek health care for such children when they are ailing will be lacking.

In summary, the Nigerian government is heavily invested in improving child health throughout the country, yet numerous political and socio-cultural challenges persist. This study will examine recent trends in child health in Nigeria, in order to identify areas in need of further effort and to help guide child health programming efforts.

2. Data and Methods

2.1. Data

This study uses data from the 2003, 2008, and 2013 Nigeria Demographic and Health surveys (NDHS). These are nationally representative, population-based household surveys that monitor demographic trends, reproductive health behaviors, attitudes, and outcomes, child health, and socio-demographic characteristics of women and men of reproductive age. A standard core questionnaire was used in each survey, enabling comparisons over time and across countries. Like all DHS surveys, those in Nigeria had a stratified multi-stage cluster sampling design. In the first stage, primary sampling units (clusters) were defined based on the most recent national census and sampled using probability proportional to estimated population size. In the second stage, approximately 40 households per cluster were randomly selected. Height and weight were measured for all children present in the household on the day of the interview. All women age 15-49 in selected households were eligible for interview. Interviewed women were asked questions about the health and well-being of children under age 5. In total, information was collected for about 5,345 children under age 5 in the 2003 survey, 24,975 children under age 5 in the 2008 survey, and 28,950 children under age 5 in the 2013 survey.

2.2. Methods

2.1.1. Indicators

Table 1 provides information on the child health indicators examined in this study, including the population that was used to calculate each indicator, the weighted sample size, and the definition of the indicator. The indicators are examined across the following characteristics: children's current age (<6 months, 6-11 months, 1 year, 2 years, 3 years, 4 years), child's sex (male, female), place of residence (urban, rural), geopolitical zone (North Central, North East, North West, South East, South South, South West), mother's education (none, primary, secondary or higher), and household wealth quintile (lowest, second, middle, fourth, highest).

Trends in the indicators are presented graphically in figures throughout the report. For indicators that are calculated for births in the five years preceding the survey (such as stunting and wasting), an argument could be made for using the mid-point of this time period as the time point for the indicator (i.e. 2.5 years preceding the survey). For the sake of simplicity, however, all indicators are graphed using the year fieldwork was conducted—2003 DHS, 2008 DHS, or 2013 DHS.

Table 1. Child health indicators included in the study

Indicator	Definition	Population base	Sample size 2003 DHS	2008 DHS	2013 DHS
Early initiation of breastfeeding	Percentage of most-recent born children under age 5 who were breastfed within one hour of birth	Most-recent children born in the five years preceding the survey	3,911	17,635	20,467
Exclusive breastfeeding up to six months	Percentage of children under age 6 months that are exclusively breastfed	Children born in the six months preceding the survey	658	2,832	2,926
Dietary diversity	Percentage of children age 6-23 months who consumed four or more food groups during the day and night preceding the survey	Children born 6-23 months preceding the survey	n/a	7,393	8,786
Dietary supplementation	Percentage of children age 6-59 months who received recommended dietary supplementation in the seven days (iron) and six months (Vitamin A and deworming medication) preceding the survey[1]	Children born 6-59 months preceding the survey	4,682	22,100	25,960
Nutritional status: Stunting	Percentage of children under age 5 who are at least two standard deviations below the median for the reference population for height-for-age	Children born in the five years preceding the survey	4,770	19,896	26,190
Nutritional status: Wasting	Percentage of children under age 5 who are at least two standard deviations below the median for the reference population for weight-for-height	Children born in the five years preceding the survey	4,770	19,896	26,190
Full immunization	Percentage of children age 12-23 months who received all recommended immunizations (Polio1-3, DPT 1-3, BCG, measles)	Children born 12-23 months preceding the survey	999	4,945	5,900
Polio immunization	Percentage of children age 12-23 months who received all recommended Polio1-3 immunizations	Children born 12-23 months preceding the survey	999	4,945	5,900
Measles immunization	Percentage of children age 12-23 months who received one dose of measles immunization	Children born 12-23 months preceding the survey	999	4,945	5,900
Household ITN ownership	Percentage of households that own at least one ITN	Interviewed households	7,225	34,070	38,522
ITN use by children under age 5	Percentage of children under age 5 who used an ITN the night before the survey	Children under age 5 who slept in interviewed households the night before the survey	5,861	25,782	30,327
Prevalence of diarrhea, symptoms of ARI, and fever	Percentage of children under age 5 with diarrhea, symptoms of ARI, or fever in the two weeks preceding the survey	Children born in the five years preceding the survey	5,345	24,975	28,950

Continues

Table 1. – *Continued*

Indicator	Definition	Population base	Sample size 2003 DHS	Sample size 2008 DHS	Sample size 2013 DHS
Care seeking for children's diarrhea from a health facility or provider[2]	Among children under age 5 with recent diarrhea, the percentage for whom care was sought from a health facility or provider	Children under age 5 with diarrhea in the two weeks preceding the survey	1,006	2,530	2,966
Treatment with ORS for children's diarrhea	Among children under age 5 with recent diarrhea, the percentage that were treated with ORS	Children under age 5 with diarrhea in the two weeks preceding the survey	1,006	2,530	2,966
Care seeking for children's symptoms of ARI from a health facility or provider[2]	Among children under age 5 with recent symptoms of ARI, the percentage for whom care was sought from a health facility or provider	Children under age 5 with symptoms of ARI in the two weeks preceding the survey	550	690	565
Care seeking for children's fever from a health facility or provider[2]	Among children under age 5 with recent fever, the percentage for whom care was sought from a health facility or provider	Children under age 5 with fever in the two weeks preceding the survey	1,659	3,968	3,632

[1] Of the three indicators of dietary supplementation, only Vitamin A supplementation is available in the 2003 survey.
[2] Health facility or provider includes all public sources of care (i.e. hospitals, health centers, mobile clinics, community health workers, government health posts, and other public sources) and most private sources (i.e. hospitals or clinics, doctors, mobile clinics, community health workers, and other private sources). Pharmacies, chemists/PMS, shops, traditional practitioners, markets, and other sources are excluded.

2.1.2. Analysis

In order to describe recent trends in child health in Nigeria, the report uses data from the 2003, 2008, and 2013 DHS surveys. Statistical testing of differences in proportions determined whether differences in indicators between surveys (both nationally and within subgroups) were statistically significant. In addition, tests of association were conducted to determine the statistical significance of differences across socioeconomic characteristics in each survey. All statistical testing was adjusted for the DHS sample design and weights. Stata 14 was used to make all calculations.

3. Results and Discussion

3.1. Description of Children under Age 5

The study includes 5,345 children under age 5 whose mothers were interviewed in the 2003 DHS, 24,975 children under age 5 in the 2008 DHS, and 28,950 children under age 5 in the 2013 DHS. Appendix Table 1 shows the distribution of these children across background characteristics. According to the 2013 survey, nearly two-thirds of children live in rural households (64%), down from about 70% in the 2003 and 2008 surveys. The distribution of most other background characteristics is similar in the three surveys. According to the 2013 survey, nearly half of the children's mothers have no education (48%), while 19% have a primary education, and 33% have a secondary or higher education. In the 2013 survey the children are evenly distributed by age, with about 20% of children at each year of age; in the 2003 survey, a larger percentage of children were under age 1 (25%). Children are fairly equally distributed across the five household wealth quintiles, with a slightly larger percentage in the bottom two quintiles (23% and 22%, respectively, in 2013). The child population is concentrated in the North West (36%, compared with 10-20% in all other zones in 2013). The North West has the highest total fertility rate (TFR), at 6.7, compared with 4.7 or lower in all Southern zones (TFR data not shown, available in NPC and ICF International 2014).

3.2. Child Nutrition

3.2.1. Early Initiation of Breastfeeding

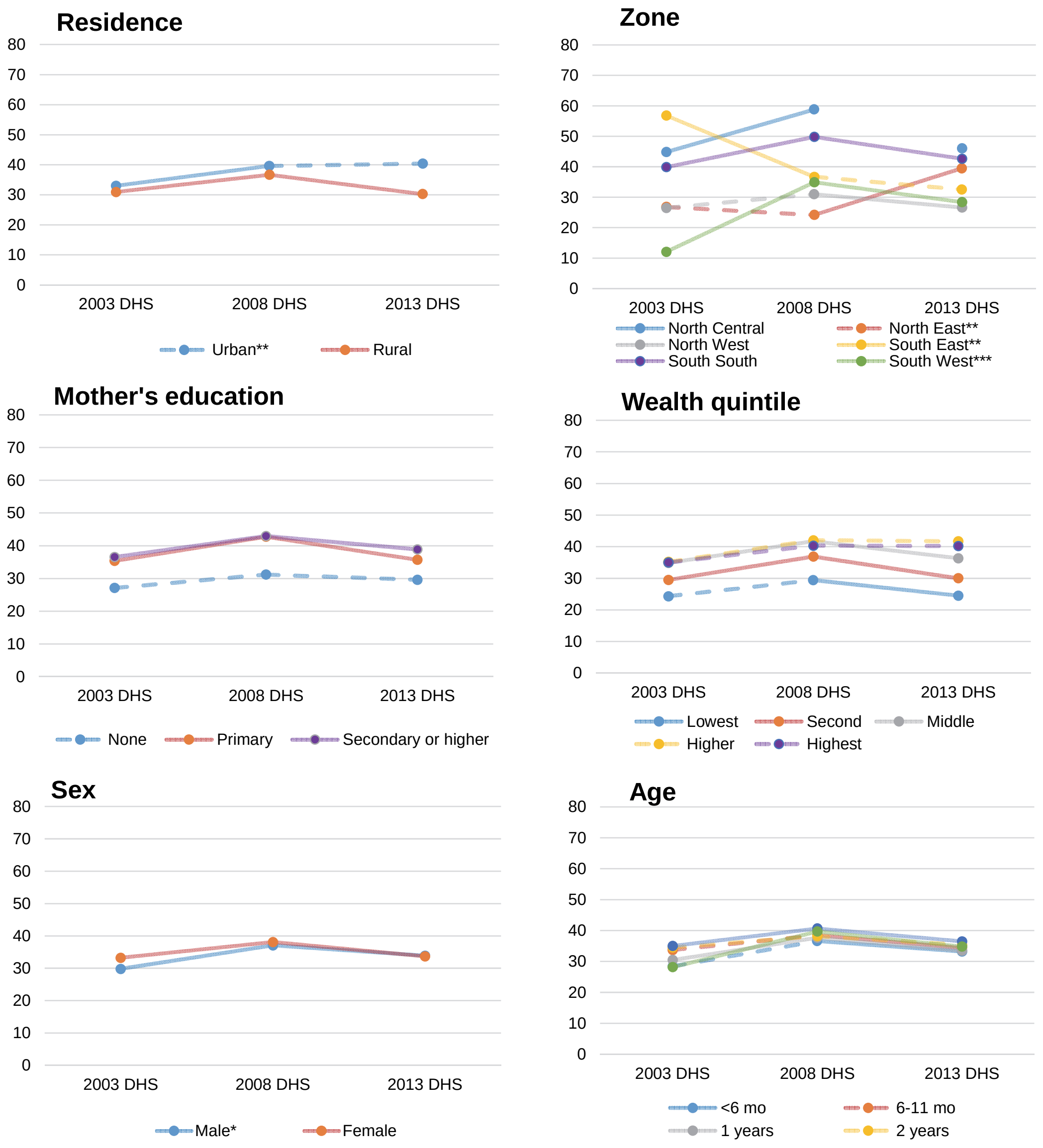
The World Health Organization (WHO) recommends that mothers initiate breastfeeding within one hour of birth. This ensures that the newborn receives the mother's colostrum or "first milk", which is highly nourishing and rich in protective antibodies (WHO n.d). While the percentage of children who were breastfed within one hour after birth increased significantly from 32% in 2003 to 38% in 2008, there was no significant change between 2008 and 2013 and coverage of the indicator remains low. According to the 2013 survey, just a third of children under age 5 (34%) were breastfed within the first hour after birth. Further increases would be required to achieve the goals set for improving child health in Nigeria.

As Appendix Table 2 shows, in all three surveys the distribution of early initiation of breastfeeding varied by place of residence, geopolitical zone, mother's education, and household wealth quintile. According to the 2013 survey, early initiation of breastfeeding was least common for children whose mother had no education, children in the lowest wealth quintile, and children in rural areas and in the North Central, North East, and South South zones.

Figure 2 shows that many subgroups experienced an increase in early initiation of breastfeeding between the 2003 and 2008 surveys and then a decrease in coverage between the 2008 and 2013 surveys, so that there was little net improvement between 2003 and 2013. A significant increase in early breastfeeding coverage between 2003 and 2013 was found only among urban children, boys, and children in the North East and South West zones. By contrast, there was a significant decrease in coverage across the decade for children in the South East, from 57% in 2003 to 43% in 2013 (see Appendix Table 2).

The gap in coverage of this indicator between subgroups does not appear to have narrowed over the decade. Instead, the urban-rural gap widened between 2003 and 2013, due to a recent decrease in coverage among rural children (see Figure 2). The gap in coverage between children in the poorer and wealthier households also widened somewhat.

Figure 2. Percentage of children under age 5 put to the breast within one hour of delivery, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

3.2.2. Exclusive Breastfeeding up to Six Months

Exclusive breastfeeding for the first six months of life is known to improve the health, growth, and survival status of newborns (WHO 2003). Among its benefits, exclusive breastfeeding is associated with a lower risk for many early-life illnesses, including diarrhea and respiratory infections (Ip et al. 2007). Nigeria, in tandem with international best practices, recommends exclusive breastfeeding for the first six months of life (Federal Ministry of Health 2005, 2014). According to the 2013 DHS, however, only 17% of children under age 6 months in Nigeria were breastfed exclusively. Coverage of exclusive breastfeeding fluctuated between the 2003, 2008, and 2013 surveys, with no net improvement across the decade.

Coverage differed by place of residence, geopolitical zone, mother’s education, and household wealth quintile in all three survey years (see Appendix Table 3). In 2013, exclusive breastfeeding was most common for urban children, children in the South West zone, children whose mothers had secondary or higher education, and children in households in the highest wealth quintile. Exclusive breastfeeding was least common (under 10%) for children in the North West, children whose mothers had no education, and children in households in the lowest wealth quintile. As Figure 3 shows, the gaps in coverage of this indicator between subgroups appear not to have narrowed over the decade.

While no subgroup experienced a net increase in exclusive breastfeeding coverage between the 2003 and 2013 surveys, certain subgroups did experience an increase between the 2008 and 2013 surveys, including girls, children in the South West and North East zones, urban children, children whose mothers have some education, and children in the wealthiest quintile. These recent increases are encouraging, but additional increases are needed within these groups as well as among less advantaged groups, including children in the poorest wealth quintile and children whose mothers have no education, in order to meet national goals for exclusive breastfeeding and better child health.

Figure 3. Percentage of children under age 6 months exclusively breastfed, Nigeria 2003, 2008, and 2013

Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Exclusive breastfeeding estimates for the South East zone in the 2003 survey are based on 25-49 unweighted cases and should be interpreted with caution.

3.2.3. Dietary Diversity among Children Age 6-23 Months

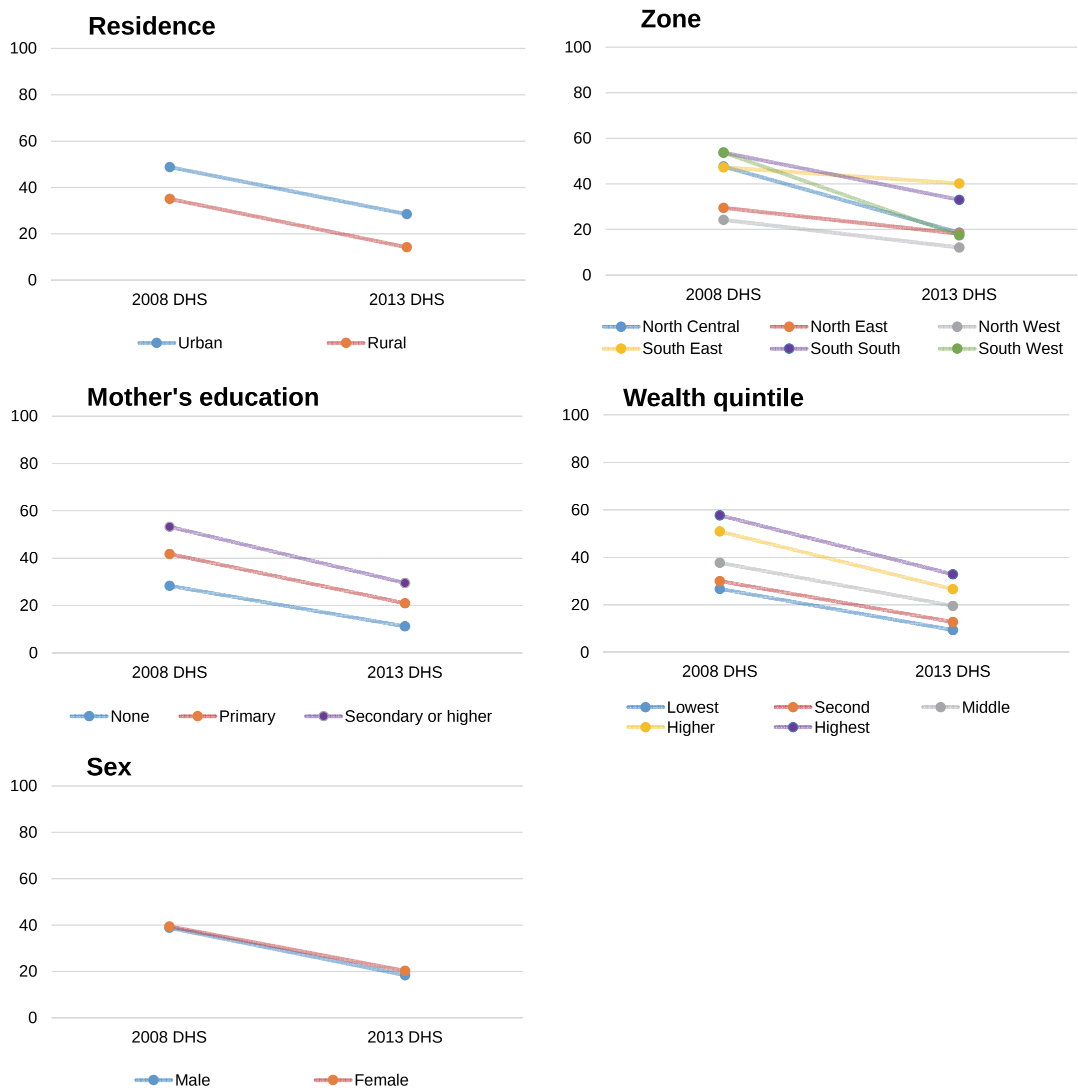
Appropriate infant and young child feeding practices include the timely initiation of feeding solid or semisolid foods at age 6 months and increasing the amount and variety of foods and frequency of feeding as the child gets older, along with continued frequent breastfeeding (UNICEF 2011). Dietary diversity, defined as the number of different foods or food groups consumed within a specified interval of time, is important for children at this age to develop and thrive. To assess children's dietary diversity, we examine the percentage of children age 6-23 months who consumed at least four of seven key food groups, as recommended by WHO, during the day or night preceding the interview with the mother. Since the 2003 NDHS did not collect comparable information on whether children had consumed foods in these seven food groups, results are shown for 2008 and 2013 only. The food groups include grains, roots, and tubers; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, fish, poultry, liver/organ meat); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

According to the 2013 DHS, only 19% of children consumed four or more of the seven food groups in the day or night preceding the survey, significantly down from 39% in the 2008 DHS. This decline in dietary diversity resulted from a decline in consumption of each individual food group. For example, the percentage of breastfeeding children age 6-23 months who had consumed fruits and vegetables rich in vitamin A the day or night preceding the interview decreased from 42% in 2008 to 31% in 2013; the percent who had consumed other fruits and vegetables decreased from 20% to 12%; the percent who had eaten meat, fish, poultry, or eggs decreased from 46% to 23%; and the percent who had consumed foods made from legumes and nuts decreased from 30% to 20% (data not shown, available in NPC and ICF International 2009 and NPC and ICF International 2014).

In both surveys, dietary diversity differed by the child's place of residence, zone, mother's education, and household wealth quintile. Children in urban areas, the South East and South West, those whose mothers have a secondary or higher education, and those in the highest two wealth quintiles are most likely to have a diverse diet.

Between the 2008 and 2013 surveys, dietary diversity decreased significantly in every subgroup. By place of residence, mother's education, and household wealth, the changes were similar in magnitude across subgroups, so that the gaps between subgroups did not change between survey years. While all zones experienced a significant decline in children's dietary diversity, the decrease was greatest in the North Central and South West. Given the importance of dietary diversity for children's development and health, more attention and resources should be focused on household food security, food availability, and public health messaging on the recommended dietary practices for children.

Figure 4. Percentage of youngest children age 6-23 months living with their mother who consumed four or more food groups during the day and night preceding the survey, Nigeria 2008 and 2013

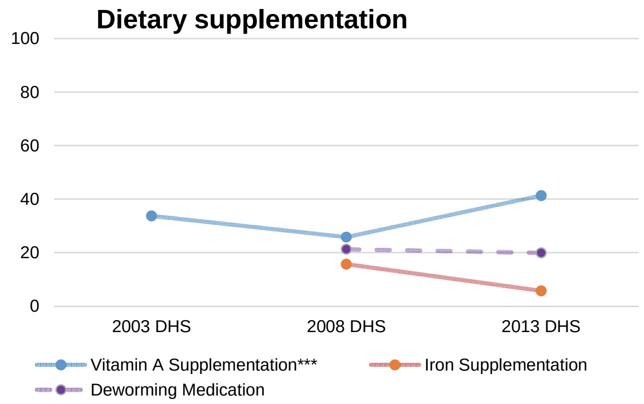


Note: The 2003 NDHS did not collect comparable information on whether children had consumed foods in the seven food groups. A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change.

3.2.4. Provision of Micronutrients

Micronutrient deficiency impairs the overall development of a child and can lead to illnesses and even to death. The Federal Ministry of Health (2014) noted that iron deficiency, anemia, and vitamin A deficiency can impair learning ability by reducing school performance and retention rates, impair speech and hearing, reduce immunity against disease, and, in severe cases, lead to partial or total loss of sight. In addition to receiving micronutrients directly from foods, children can receive them in the form of supplements. The 2008 and 2013 NDHS collected information on whether children had received vitamin A capsules, iron supplements, and deworming medication during national campaigns, while the 2003 survey collected information about vitamin A supplementation only. As Figure 5 shows, coverage of all three indicators remains low, at well under 50% in the most recent survey.

Figure 5. Percentage of children age 6-59 months who received recommended dietary supplementation, Nigeria 2003, 2008, and 2013



Note: The 2003 NDHS did not collect information on iron supplementation or deworming medication. A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. For Vitamin A Supplementation, Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

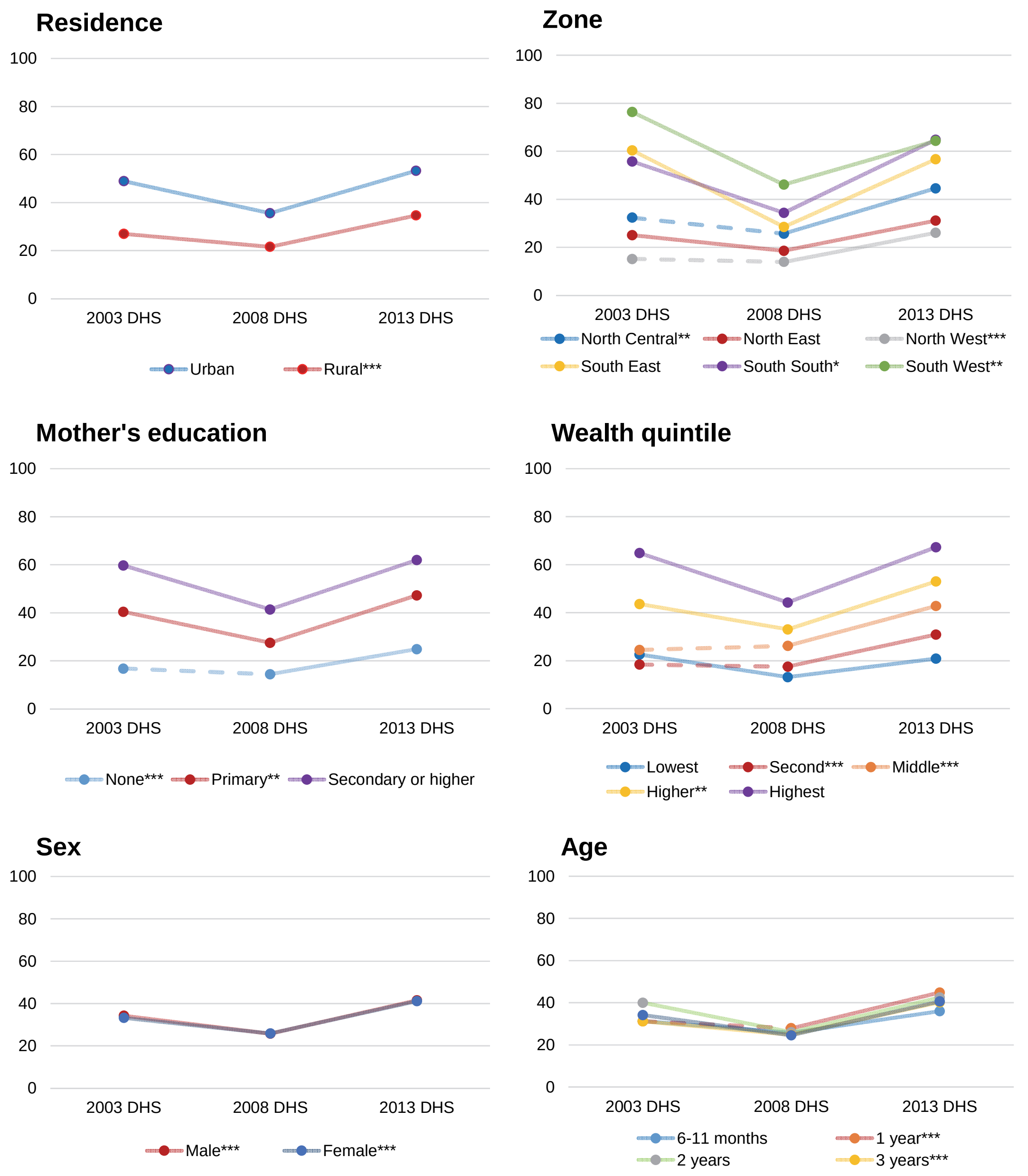
<u>Vitamin A</u>

Nationally, coverage of vitamin A supplementation for children age 6-59 months decreased significantly between the 2003 and 2008 surveys, from 34% to 26%, but then increased to 41% in the 2013 survey, with a significant net increase between 2003 and 2013 (see Figure 5). Vitamin A coverage differed significantly by child's age, place of residence, zone, mother's education, and household wealth in all three surveys (see Figure 6). In 2013, Vitamin A coverage was approximately three times greater for children in the highest wealth quintile compared with children in the lowest quintile (67% versus 21%), and coverage increased incrementally with mother's education, from 25% for children whose mothers had no education, 47% for children whose mothers had primary education, to 62% for children whose mothers had secondary or higher education. By geopolitical zone, coverage was lowest in the North West and North East (26% and 31%, respectively), and highest in the South South and South West (65% and 64%, respectively).

The increased coverage of vitamin A supplementation between the 2008 and 2013 surveys could be due in part to Nigeria's membership in the Scaling Up Nutrition (SUN) movement in 2011, since Vitamin A supplementation was a key objective of this initiative. Furthermore, since Immunization Days have been identified as a highly effective means to deliver vitamin A supplementation in developing countries, the considerable immunization push during 2008–2013 relative to 2003–2008, including massive nationwide polio immunization campaigns, could also have contributed to the scale-up in Vitamin A coverage (UNICEF 2007).

In all subgroups, the trend in coverage across the decade followed the same general pattern as nationally, with decreasing coverage between 2003 and 2008 and then increasing coverage between 2008 and 2013. The geographic disparity in coverage of this indicator decreased somewhat between the 2003 and 2013 surveys, largely due to the significant increase in Vitamin A supplementation coverage in the North Central and North West zones between 2008 and 2013. With the exception of geopolitical zone, the improvements in coverage were essentially similar in size across subgroups, so that the gaps in coverage between subgroups changed little across the three surveys (see Figure 6).

Figure 6. Percentage of children age 6-59 months who received Vitamin A supplementation in the last six months, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Iron

In contrast to the trend in Vitamin A coverage, coverage of iron supplementation for children age 6-59 months decreased nationally between the 2008 and 2013 surveys, from 16% to 6% (see Figure 5). Decreases were statistically significant in nearly every subgroup, except for four subgroups whose coverage was already quite low in 2008 (children in the lowest wealth quintile, children whose mothers have no education, and children in the North East and South East zones) (see Appendix Table 6). The National Policy on Infant and Young Child Feeding in Nigeria recommends the "commencement of iron supplementation from age 1 month" only for low birth weight infants (Federal Ministry of Health 2005). Unlike vitamin A supplementation, there were no sustained campaigns or programs on iron supplementation during the study period. The existing policy focuses on pregnant women receiving iron (through folic acid tablets) rather than on children receiving the supplement. In order to ensure that children have adequate iron levels, additional attention should be given to promoting iron supplementation across Nigeria.

Deworming

Deworming for intestinal parasites can improve children's micronutrient status, and is commonly done for helminthes and schistosomiasis, which can stunt children's growth and cognitive development and cause anemia. Nationally, there was no change in the coverage of deworming medication for children age 6-59 months between the 2008 and 2013 surveys; in both surveys about one in five children age 6-59 months were given deworming medication in the six months preceding the survey (see Figure 5).

By background characteristics, there was a significant decline in coverage between 2008 and 2013 in urban areas (from 34% to 28%), alongside no change in rural areas. Coverage increased in the three Northern zones, but decreased significantly in the South West (see Appendix Table 7).

3.2.5. Stunting and Wasting among Children under Age 5

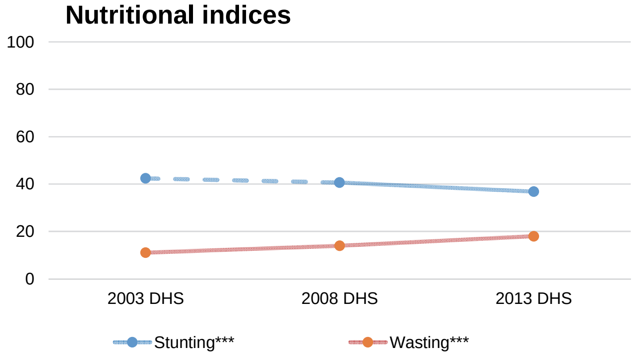
Nutritional status is an important factor that contributes to a child's risk of faltered growth, diseases, impaired mental development, and early death. The height-for-age index measures linear growth retardation and cumulative growth deficits. Low height-for age, also called stunting, results from a lack of adequate nutrition over a long period; it can also be affected by recurrent or chronic illnesses. This measure is not sensitive to recent, short-term changes in dietary intake. The weight-for-height index, in contrast, measures current nutritional status. Children with low weight-for-height index values are considered wasted, or acutely malnourished. Wasting can be caused by inadequate food intake in the period immediately preceding the survey or by a recent episode of illness causing weight loss.

The 2003, 2008 and 2013 NDHS collected information on nutritional status by measuring height and weight of all children under age 5. Digital scales were used for weight measurements, and height measurements were taken using a Shorr Productions measuring board. Children under age 24 months were measured lying down on the board; standing height was measured for older children. Height-for-age and weight-for-height indices were calculated using the 2006 WHO growth standards[1]. Stunting is defined as height-for-age more than 2 standard deviations below the median of the WHO reference population, and wasting as weight-for-height more than 2 standard deviations below the median.

As Figure 7 shows, the percentage of children under age 5 who are stunted (low height-for-age) decreased from 42% to 37% between 2003 and 2013, with significant declines between 2008 and 2013. In contrast, the percentage of children under age 5 who are wasted (low weight-for-height) increased significantly between 2003 and 2013, from 11% to 18%.

[1] The 2003 data were recalculated using the new 2006 standards for comparability purposes.

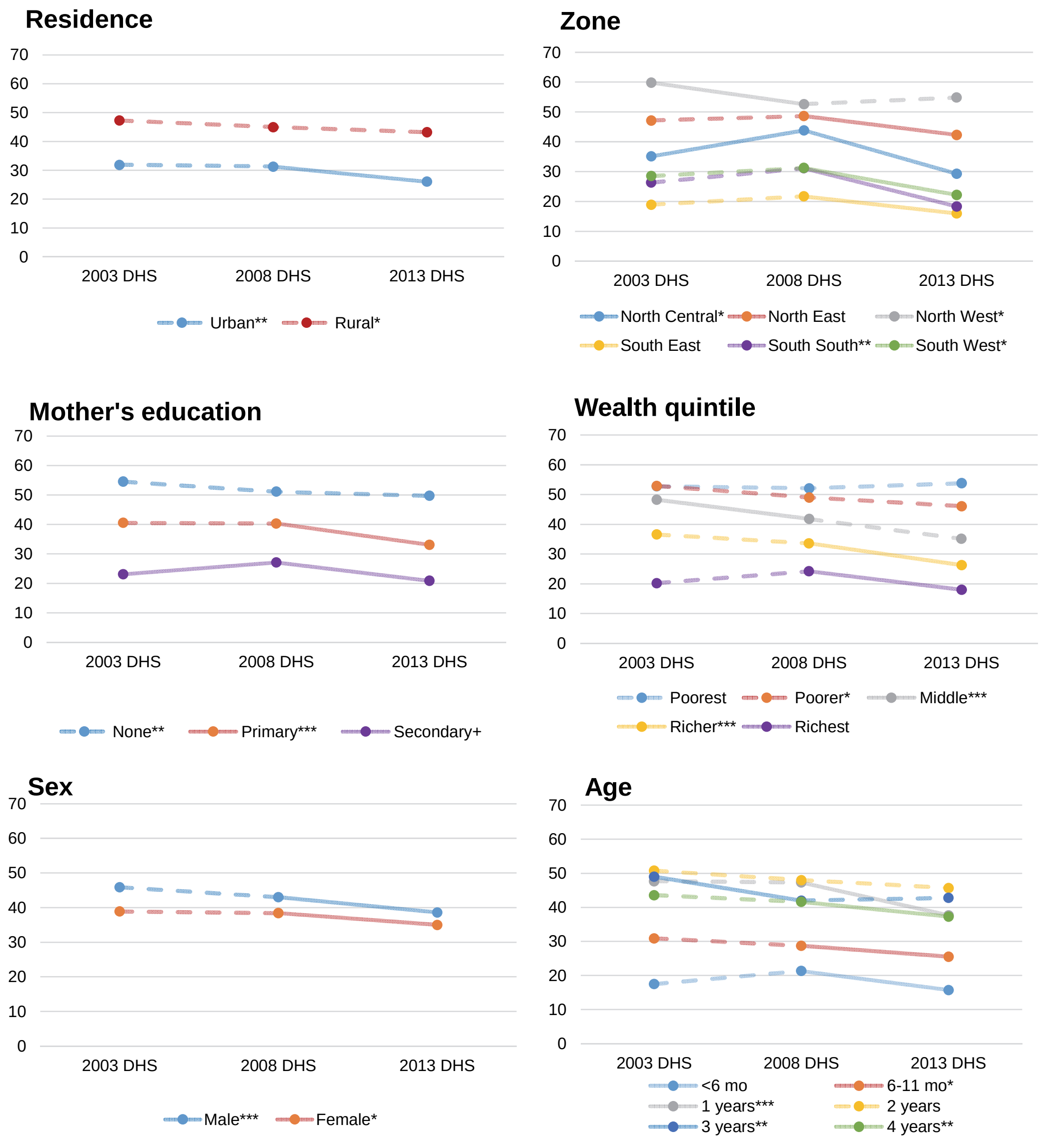
Figure 7. Percentage of children under age 5 with height for age and weight for age less than 2 standard deviations below the WHO mean, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

The declines in stunting between 2008 and 2013 were not uniform across the population; decreases in stunting were greater among children from wealthier households and children whose mothers had some education. Significant declines in stunting occurred between 2008 and 2013 in all zones except the North West (see Figure 8 and Appendix Table 8).

Figure 8. Percentage of children under age 5 who are stunted, Nigeria 2003, 2008, and 2013

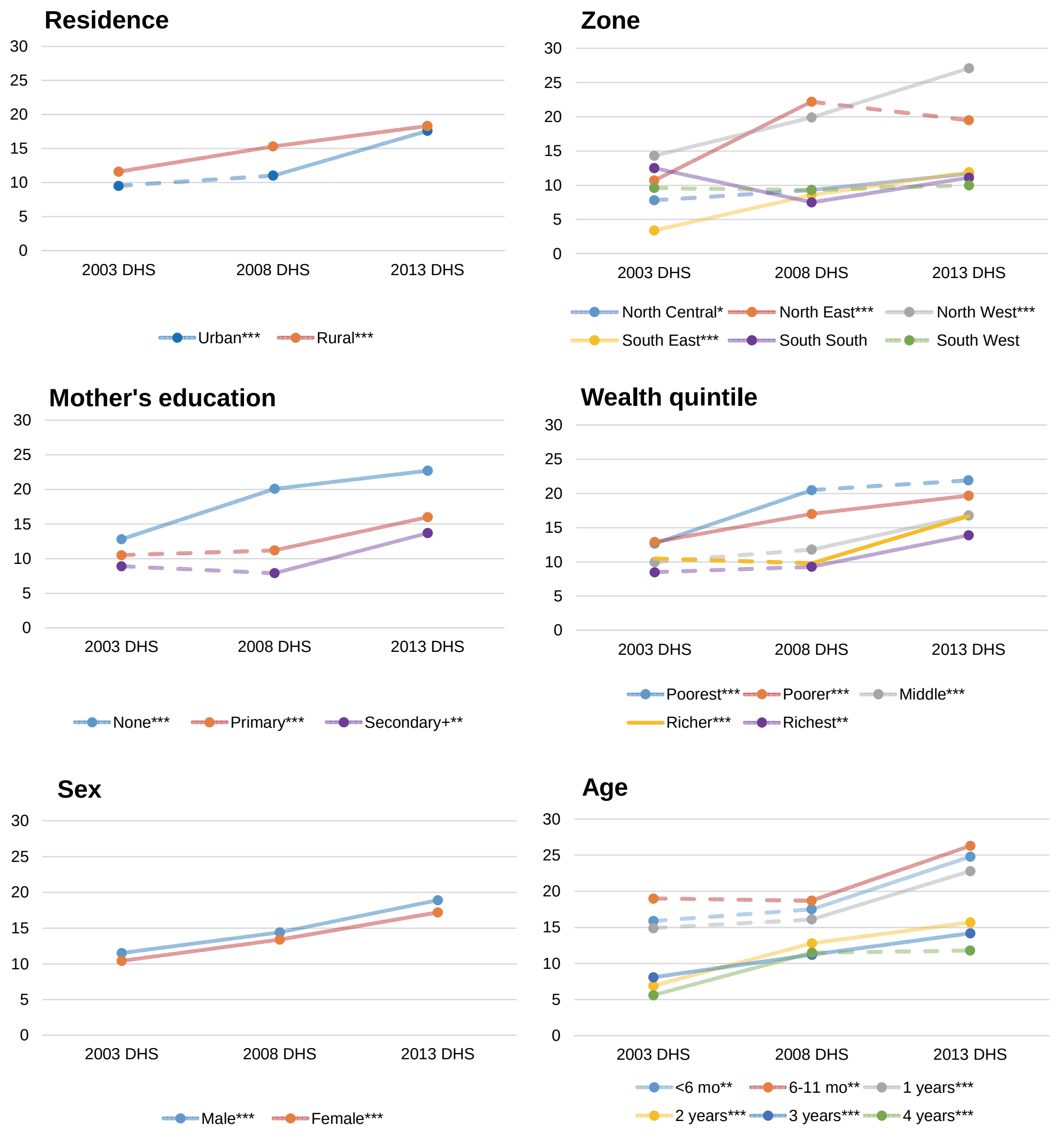


Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Similarly, the increases in wasting were not uniform across the surveys or across the population. Between 2003 and 2008, increases in wasting were greatest among the most disadvantaged children, that is, those from poorer, rural households, and those whose mothers had no education (see Figure 9 and Appendix Table 9). Increases were significant among older children (age 2-4) but not younger children (age less than 2) over this period. Significant increases in wasting were seen in North East, North West and South East but not in other zones. In South South the prevalence of wasting declined significantly. The patterns changed between 2008 and 2013 such that the increases in wasting observed in most subgroups were statistically significant.

The decline in stunting—a measure of long-term malnutrition—alongside the increase in wasting—a measure of short-term or recent malnutrition—raises concern that the food security situation may be gradually deteriorating and/or that the prevalence of poverty has worsened in recent years. Thus the decreases in stunting could indicate a lower level of poverty and better food security in the past, while the increases in wasting could suggest that conditions are currently worsening.

Figure 9. Percentage of children under age 5 who are wasted, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

3.3. Prevention of Childhood Illnesses: Immunization and ITNs

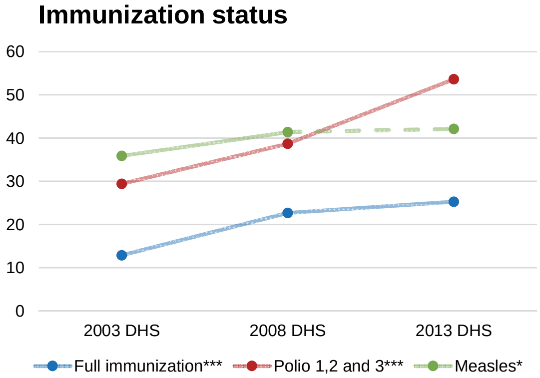
3.3.1. Immunization

Immunization against common childhood illnesses has been shown to be a cost-effective intervention, preventing under-five deaths and reducing the duration and severity of childhood illnesses. Nigeria is currently implementing many such immunization-centered interventions, including the Expanded Program on Immunization, the Polio Eradication Initiative and the National Emergency Action Plan. Nigeria's Expanded Program on Immunization adopts the WHO recommendations; specifically, a child is considered fully vaccinated if she or he has received BCG vaccination against tuberculosis, three doses of vaccine to prevent diphtheria, pertussis, and tetanus, at least three doses of polio vaccine, and one dose of measles vaccine. These vaccines should be received during the first year of life. Coverage is measured for children age 12-23 months (the second year of life), since children should have received all basic vaccinations by age 12 months.

In the past decade, Nigeria has introduced several supplemental vaccination campaigns to rapidly increase the coverage of specific vaccines and to preempt or respond to disease outbreaks. These have included campaigns targeting maternal and newborn tetanus, measles, yellow fever, and cerebrospinal meningitis. In May 2006, Nigeria began to implement polio vaccination campaigns (Immunization Plus Days). In 2012 alone, for example, Nigeria conducted two national polio immunization campaigns and five subnational campaigns (NPHCDA 2012a, 2012b). This analysis will not consider coverage of the pentavalent vaccine (containing DPT, Haemophilus influenzae type B, and hepatitis B) that has replaced the diphtheria, pertussis, and tetanus (DPT) vaccine, because roll-out was not complete by the time of data collection for the 2013 DHS. Immunization data in the 2003, 2008, and 2013 DHS were collected by review of children's vaccination cards whenever possible, and by mother's recall when cards were not available.

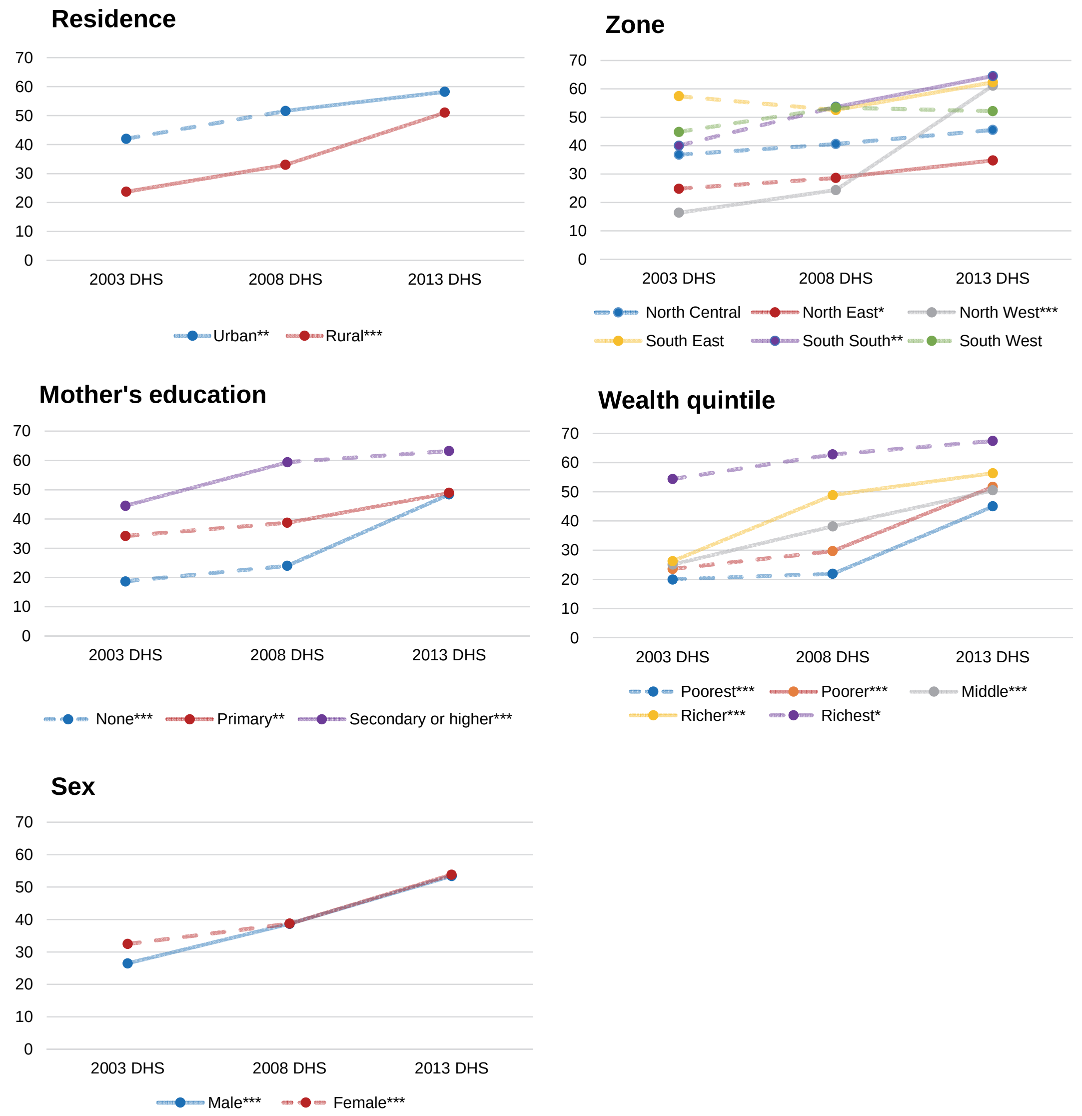
The percentage of children age 12-23 months with complete polio immunizations increased significantly between 2003 and 2013, from 29% to 54% (see Figure 10). As Appendix Table 10 shows, full polio immunization coverage varies significantly by place of residence, zone, mother's education, and household wealth status, but does not vary by child's gender. The degree of disparity in coverage decreased over the survey period. Striking improvement in polio immunization coverage occurred in the North West zone between 2008 and 2013, from 24% to 62% (see Figure 11). This is not surprising given that three major states in the North West—Kaduna, Kano, and Zamfara—controversially banned polio vaccines in 2003, resulting in a setback for the country's polio eradication effort (Jegede 2007; Kaufmann and Feldbaum 2009; Pipes 2007). Following successful negotiations with these states involving the Nigerian Federal Government and, crucially, the intervention of the United Nations, the North West became the focal point of polio immunization coverage in the country to recover lost ground and to stem the increasing rate of new infections in the three states following the boycott.

Figure 10. Percentage of children 12-23 months with specific immunizations, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Figure 11. Percentage of children age 12-23 months with full polio immunizations (polio 1, 2 and 3), Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

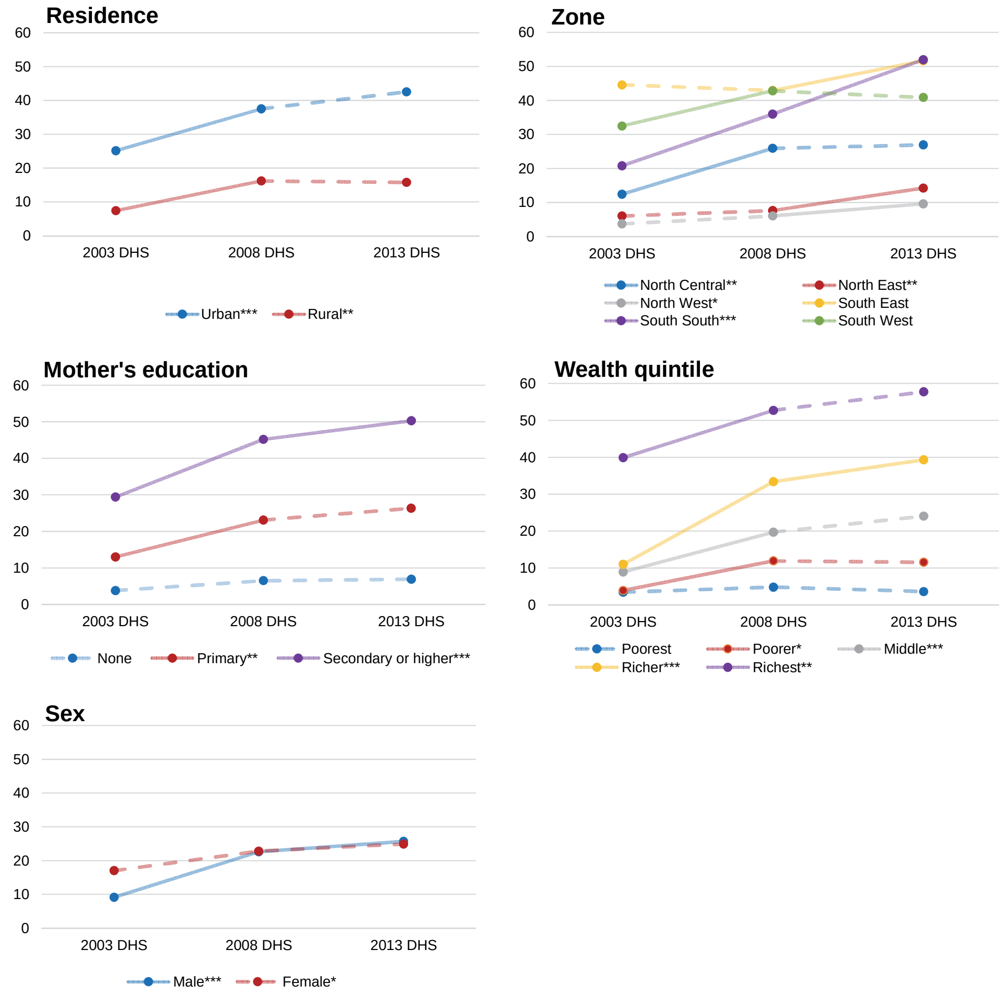
The percentage of children age 12-23 months with measles immunization increased by a small but significant amount between 2003 and 2008, from 36% to 41%, and then stagnated between 2008 and 2013, at 41% to 42% (see Figure 10). As Figure 12 shows, large disparities exist in measles immunization coverage between the Southern and Northern zones, with higher coverage in the South (a range of 63% to 74% in the South compared with 22% to 48% in the North in 2013). A significant increase in measles immunization coverage occurred in the South South zone between 2008 and 2013, from 56% to 74%. Large disparities can be seen in measles immunization coverage among children by place of residence, mother's education, and household wealth (see Appendix Table 11).

Figure 12. Percentage of children age 12-23 months with measles immunization, Nigeria 2003, 2008, and 2013

Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

The percentage of children age 12-23 months with complete vaccinations increased significantly from 13% in 2003 to 25% in 2013 (see Figure 10). Greater progress in immunization coverage was achieved between 2003 and 2008 (13% to 23%) than between 2008 and 2013, and overall coverage in 2013 was low, with only one in four children age 12-23 months fully vaccinated. The percentage of children with full immunization coverage varies significantly by place of residence, zone, mother's education, and household wealth (see Figure 13 and Appendix Table 12). Urban children, children whose mothers have more education, and children from wealthier households are more likely to be fully vaccinated. Coverage is highest in the Southern zones and lowest in the Northern zones.

Figure 13. Percentage of children age 12-23 months with full immunizations (BCG, DPT 1-3, Polio 1-3, Measles), Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys.
* p<0.05, ** p<0.01, *** p<0.001

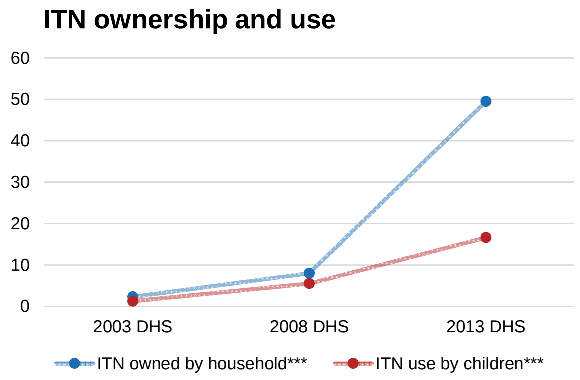
3.3.2. Insecticide-treated Nets (ITNs)

Malaria is an important cause of morbidity and mortality in Nigeria. An estimated 97% of the country's population are at risk of malaria. This at-risk population accounted for 32% of the global estimate of 655,000 malaria deaths in 2010 (World Health Organization, 2012). Children under age 5 and pregnant women are most vulnerable to illness and death from malaria infection.

Use of ITNs is one of the most cost-effective methods of malaria prevention in highly endemic areas. ITNs or long-lasting insecticidal nets (LLINs) are the main methods of malaria prevention employed in Nigeria. Free LLINs are distributed through mass campaigns, public health facilities, faith-based organizations, nongovernmental organizations (NGOs), retail commercial outlets, and during maternal and child health weeks, with the goal of achieving universal access. Nets are distributed through stand-alone campaigns and through integration with other interventions, such as measles vaccination. Nigeria implements a nationwide, routine LLIN distribution system through health is modeled on the modified ITN Massive Promotion and Awareness Campaign (IMPAC) system. Under this system, pregnant women attending antenatal clinics receive an LLIN at first attendance, and children receive an LLIN on completion of their third dose of the diphtheria, pertussis, and tetanus vaccine (DPT3).

As Figure 14 shows, the percentage of households owning at least one ITN increased dramatically over the study period, from 2.3% in 2003 to 8% in 2008 and to 50% in 2013. Despite the increases, the most recent estimate falls far short of the goal for universal access to ITNs (that is, 100% of the population at risk using ITNs, assuming that one net can cover two people). Furthermore, while use of ITNs by children under age 5 increased significantly from 1% in 2003 to 6% in 2008 and to 17% in 2013, national and international ITN targets are far from being met. Figure 14 also highlights the large gap between household ITN ownership and ITN use by children (50% vs. 17% in 2013). It is important to note that owning one ITN does not mean that there are sufficient nets to protect everyone in the household.

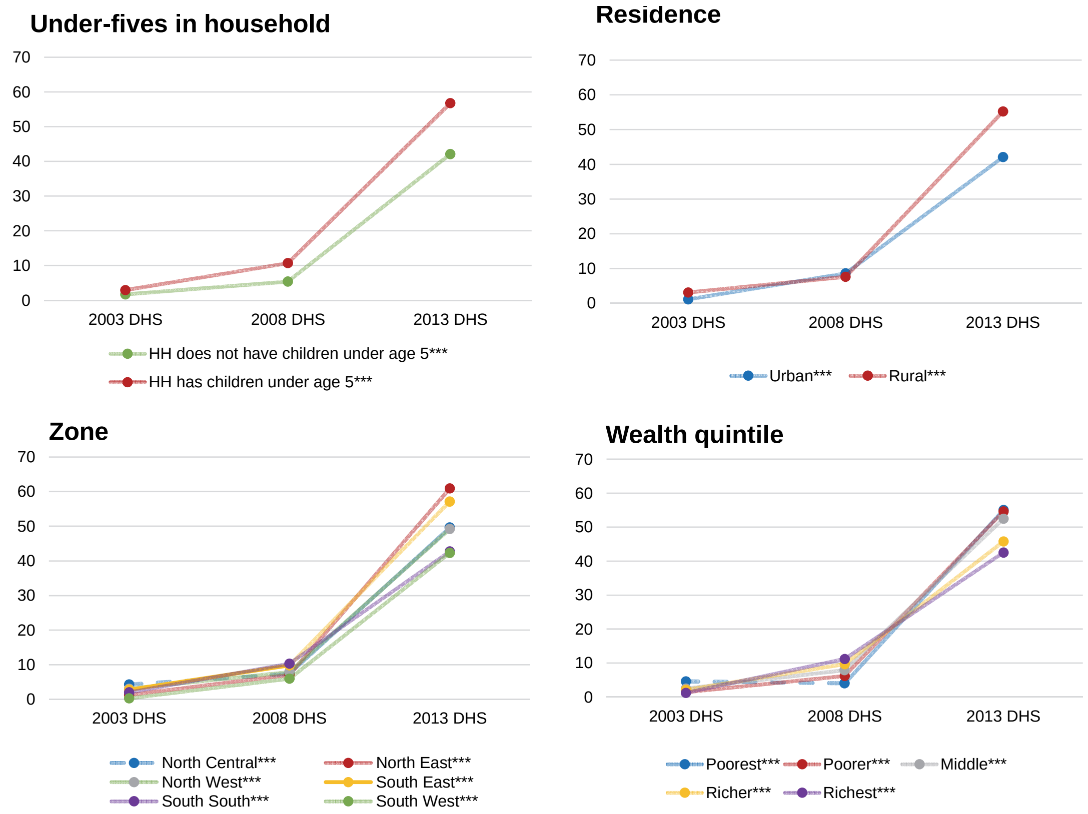
Figure 14. Percentage of households owning at least one ITN and percentage of children under age 5 who slept under an ITN the previous night, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

As the percentage of households owning ITNs has increased, the distribution of ownership has changed so that there is greater variation in ownership by place of residence, zone, wealth, and presence of children under age 5 in the household in 2013 compared with previous survey years (see Figure 15 and Appendix Table 13). In 2008, richer households were more likely to own ITNs while the reverse is true in 2013.

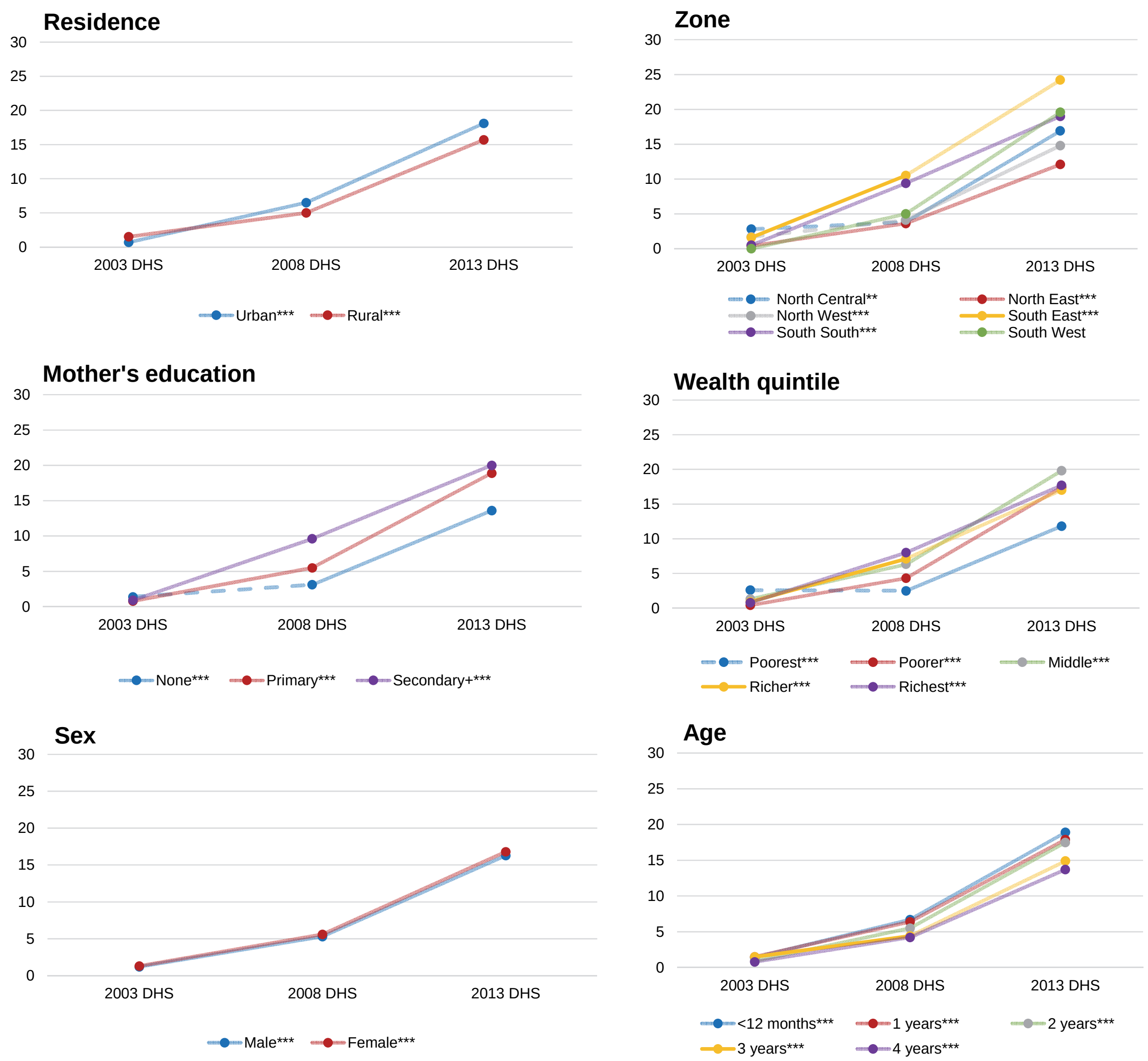
Figure 15. Percentage of households owning at least one ITN, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Similarly, as ITN use by children under age 5 has increased, the disparity in use across children of different ages, by place of residence, zone, mother's education, and household wealth has also increased (see Figure 16 and Appendix Table 16). Younger children are more likely than older children to use an ITN, as are urban children compared with rural children, and children from the Southern zones compared with children from Northern zones. Children of more educated mothers are most likely to use ITNs, and children from the poorest households are least likely to use them.

Figure 16. Percentage of children under age 5 who slept under an ITN the previous night, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

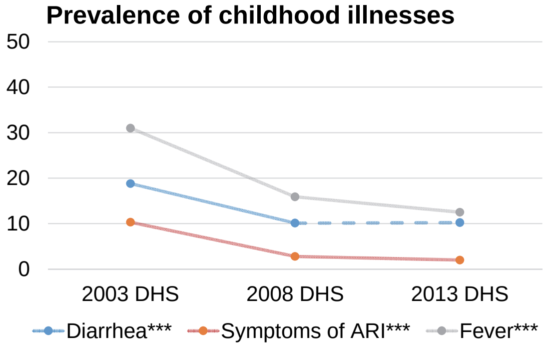
3.4. Care Seeking for Childhood Illnesses

Diarrhea, pneumonia, and malaria are leading causes of death among children under age 5 in sub-Saharan Africa, and in Nigeria in particular. In this section, to the extent possible, we examine the burden of these illnesses with indicators of case management and treatment. However, we are limited in our ability to diagnose these illnesses with DHS data. For example, we do not know from the DHS whether a child had pneumonia. What is asked is whether the child had a cough and rapid or difficult breathing that was chest-related in the two weeks preceding the survey. These symptoms are not specific to pneumonia and could identify a number of childhood illnesses, such as the common cold or bronchitis. Therefore the collection of symptoms is referred to as symptoms of acute respiratory infection (ARI). We also do not know whether a child had malaria in the two weeks preceding the survey; instead, we know whether the mother reported that the child had a fever during this period. The percentage of fever cases that are due to malaria varies across endemicity zones within Nigeria and can be highly dependent on the season of fieldwork. This section examines the burden of and care seeking for children's recent diarrhea, symptoms of ARI, and fever.

3.4.1. Prevalence of Childhood Illness

According to the 2013 DHS, 10% of children under age 5 had diarrhea, 13% had fever, and 2% had symptoms of ARI in the two weeks preceding the survey. The prevalence of each illness decreased significantly across the decade, with the greatest decrease between 2003 and 2008, and little change between 2008 and 2013 (see Figure 17).

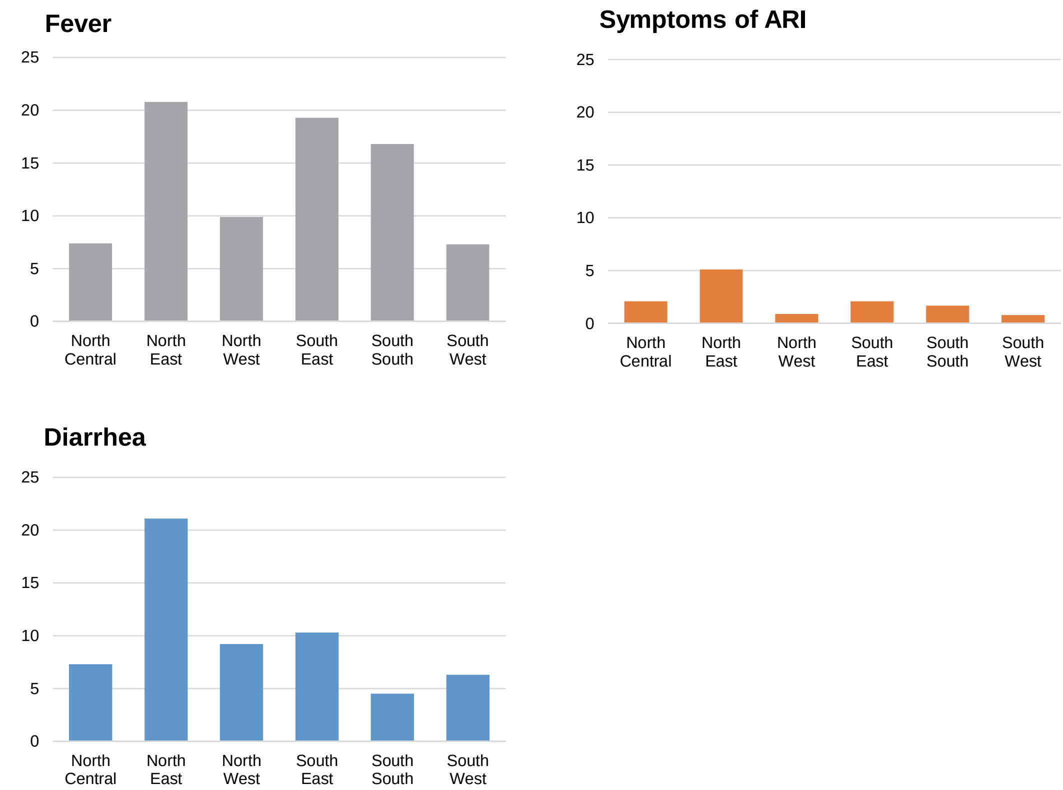
Figure 17. Percentage of children under age 5 who experienced diarrhea, symptoms of ARI, and/or fever in the past two weeks, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

As Figure 18 shows, childhood illnesses are distributed unequally across the country. For each of the three illnesses studied, in 2013 the prevalence was highest in the North East zone, followed by the South East. Diarrhea prevalence is lowest in the South South zone, fever prevalence is lowest in the North Central and South West, and prevalence of ARI symptoms is lowest in the North West and South West.

Figure 18. Percentage of children under age 5 who experienced diarrhea, symptoms of ARI, and/or fever in the past two weeks by region, Nigeria 2003, 2008, and 2013



3.4.2. Care Seeking for Childhood Illness

Care Seeking for Diarrhea

According to the 2013 survey, care was sought from a health facility or provider for less than one-third (29%) of children with diarrhea in the two weeks preceding the survey. “Health facility or provider” includes all public and private sources of care except pharmacies, chemists/PMS, shops, traditional practitioners, markets, and other sources of care, consistent with the 2013 Nigeria DHS final report.[2] Care seeking from a health facility or provider increased significantly from 19% in 2003 to 32% in 2008, but did not change between 2008 and 2013.

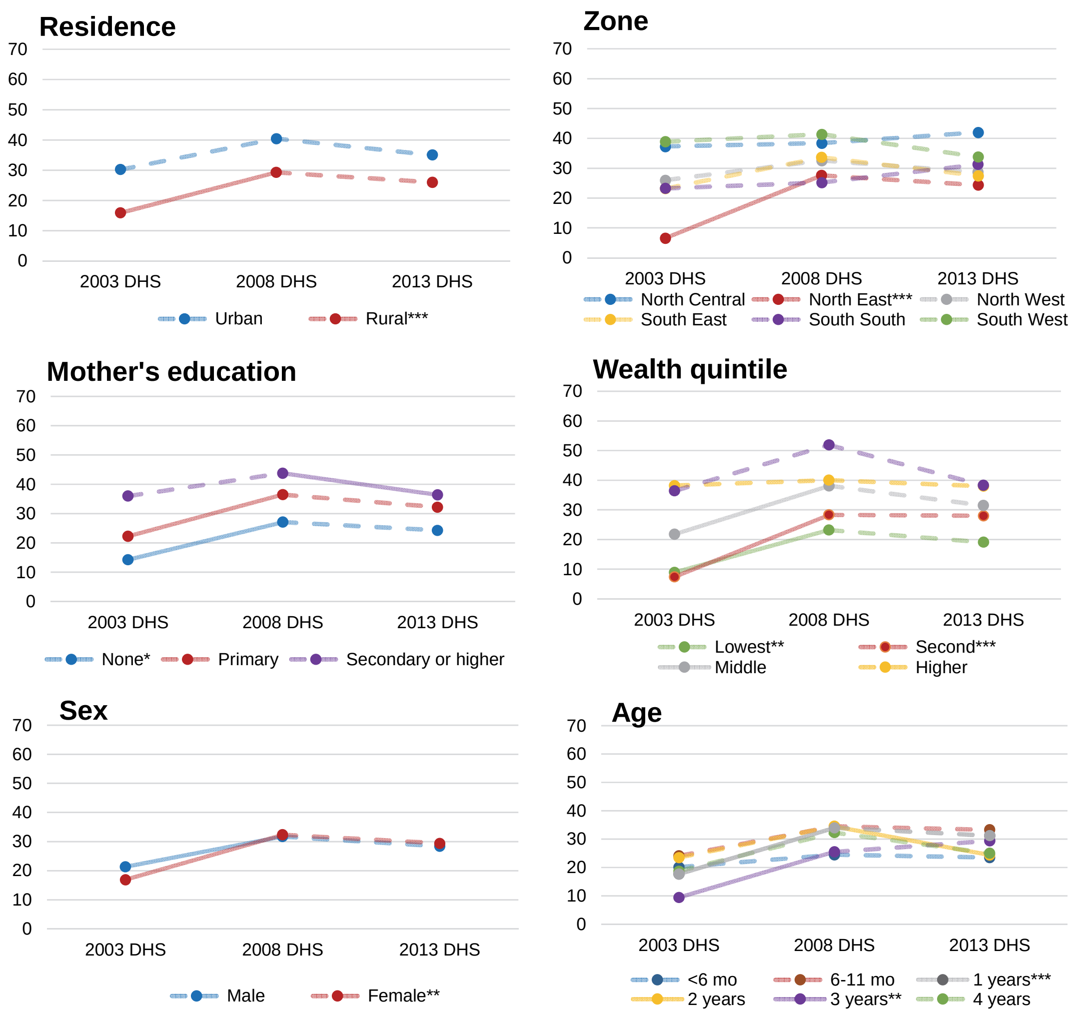
In 2003, the level of care seeking coverage differed significantly by mother’s education, household wealth, place of residence (though not statistically significant in 2003), and zone, with the lowest coverage among children in rural households, children whose mothers have no education, children in the poorest wealth quintile, and children in the North East (see Appendix Table 15). Significant improvements were observed between 2003 and 2008 in many of the subgroups with the lowest

[2] In Nigeria there is a high reliance on pharmacies as the sole source of care for children’s diarrhea, symptoms of ARI, and fever. Care was sought from a pharmacy for nearly one-third of children with diarrhea and symptoms of ARI and for over one third of children with fever (32 percent, 32 percent, and 35 percent, respectively, data not shown). Thus, if pharmacies were included in the care seeking indicator, the coverage estimates would be roughly double those presented in the report. According to current Ministry of Health policy, for-profit drug retailers and patent and proprietary medicine vendors are eligible to become community-based resource persons who can be trained and certified to deliver integrated community case management. However, current regulations also prohibit these vendors from selling antibiotics. A recent census of patent and proprietary medicine vendors conducted in two Nigerian states (Kogi and Kwara) found that levels of knowledge of the most effective treatment for malaria, pneumonia, and diarrhea among vendors are low (Treleaven et al. 2015).

coverage (children in rural areas, children in the North East, children in the lowest wealth quintile, and children whose mothers have no education). Overall, however, the equity gaps between subgroups did not improve between 2003 and 2013, and coverage remained lower in the same subgroups in 2013 (see Figure 19). Furthermore, no improvement was observed in any subgroup between the 2008 and 2013 surveys.

Diarrhea remains a leading cause of death for children under age 5 in Nigeria. In order to continue making improvements in child health and survival, more sick children need to access the health system to receive appropriate treatment.

Figure 19. Percentage of children under age 5 with recent diarrhea for whom care was sought from a health facility or provider, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Care seeking estimates for the three Southern zones in the 2003 survey are based on 25-49 unweighted cases and should be interpreted with caution.

Care Seeking for Symptoms of ARI

According to the 2013 DHS, care was sought from a health facility/provider for slightly over one-third (35%) of children with symptoms of ARI in the two weeks preceding the survey (see Footnote 2 on page 31). The level of care seeking for ARI symptoms remained steady across the decade; no change was observed between the three surveys. In the 2013 survey, coverage of the indicator differed by place of residence, mother's education, and household wealth (see Figure 20 and Appendix Table 16). In 2013 coverage was highest among children in the wealthiest quintile of households (64%), children whose mothers had at least a secondary education (44%), children in urban households (47%), and children in the South South zone (58%).

Figure 20. Percentage of children under age 5 with recent symptoms of ARI for whom care was sought from a health facility or provider, Nigeria 2003, 2008, and 2013

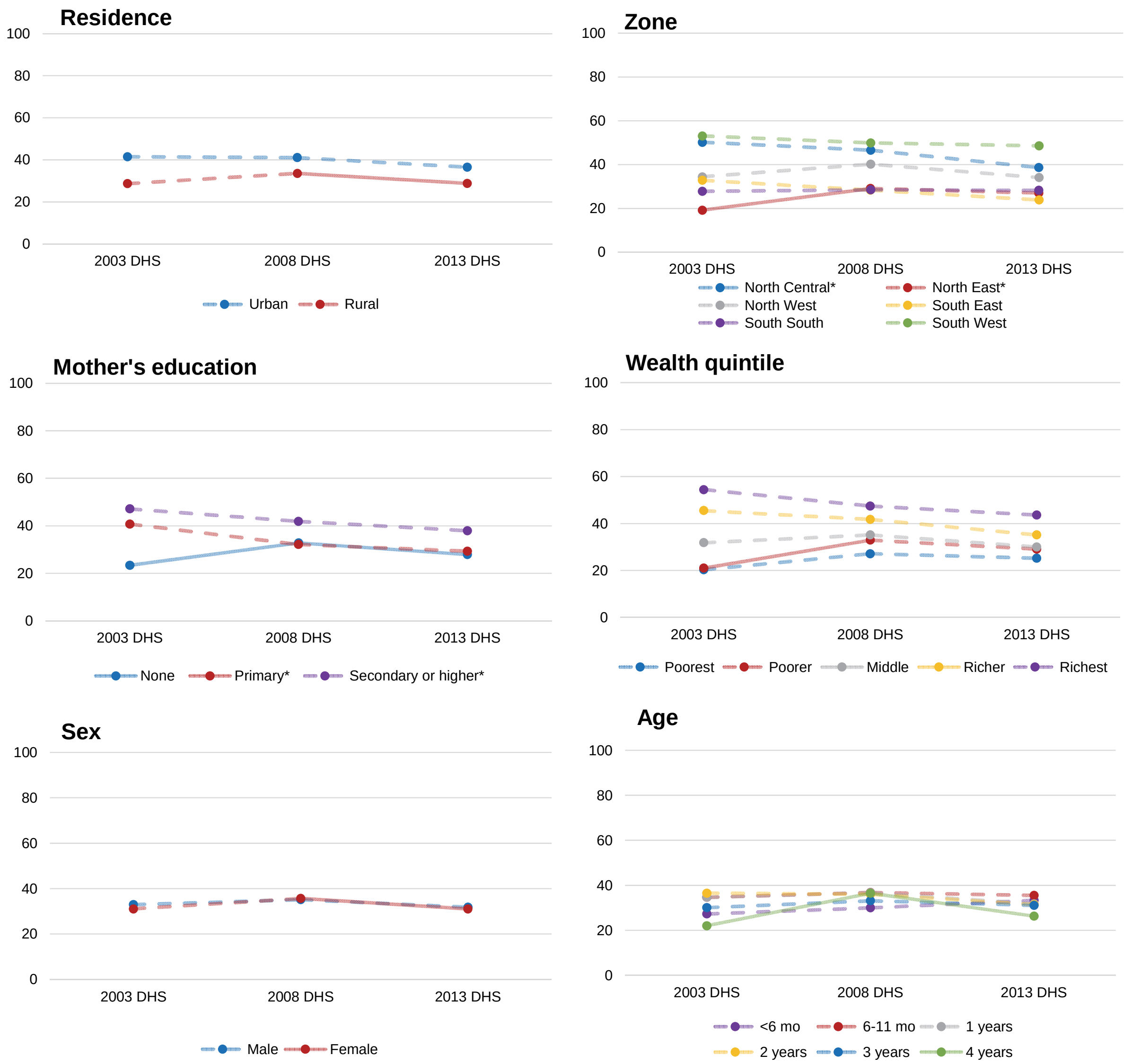
Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

Care seeking estimates based on fewer than 25 unweighted cases are not shown. For the following subgroups, estimates are based on 25-49 unweighted cases and should be interpreted with caution: For the 2003 survey, the South East and South West zones; for the 2008 survey, the South East and South West zones, and the highest wealth quintile; for the 2013 survey, children under age 6 months, and children in the highest wealth quintile.

Care Seeking for Fever

According to the 2013 survey, care was sought from a health facility or provider for about one-third (32%) of children with symptoms of fever in the two weeks preceding the survey (see Footnote 2 on page 31). The level of care seeking for fever symptoms remained steady across the decade; no change was observed between the three surveys. In the 2013 survey, coverage of the indicator differed by place of residence, zone, mother's education, and household wealth. In 2013 coverage was highest among children in the wealthiest quintile of households (44%), children whose mothers had at least a secondary education (38%), children in urban households (37%), and children in the South West zone (49%) (see Appendix Table 17 and Figure 21).

Figure 21. Percentage of children under age 5 with recent fever for whom care was sought from a health facility or provider, Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

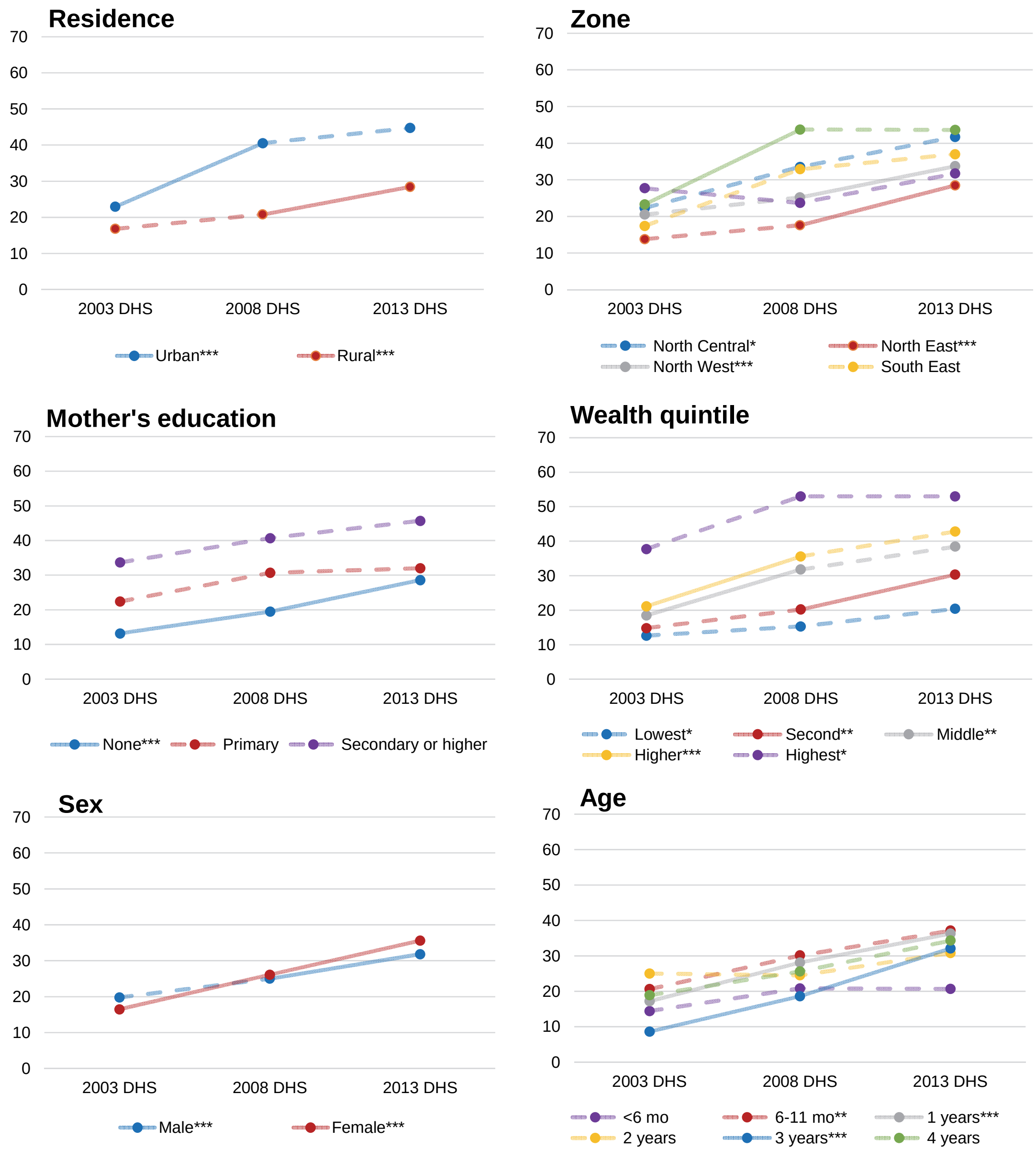
3.4.3. Appropriateness of Care and Treatment for Diarrhea[3]

Oral rehydration solution (ORS) has been a key component of treatment for children's diarrhea for decades. Current WHO and UNICEF guidelines for diarrhea treatment recommend the use of a low-osmolarity ORS formula along with zinc supplementation for 10-14 days to treat diarrhea for children under age 5 (WHO 2005). According to the 2013 DHS, coverage of ORS with zinc remains quite low nationally (1%) in Nigeria and is under 2% in every subgroup (results not shown). Given the infrequent use of zinc, we examine the use of ORS either with or without zinc among children with diarrhea in the two weeks preceding the survey.

Substantial improvements were made in the use of ORS to treat children's diarrhea across the decade, from 18% coverage in 2003 to 26% in 2008 and 34% in 2013. In 2003, the use of ORS differed by zone, mother's education, and household wealth quintile, with the lowest coverage among children in rural households, children in the North East and South East zones, children whose mothers had no education, and children in the lowest wealth quintile (see Appendix Table 18). Despite improvements in some of the subgroups with the lowest coverage in 2003—such as children whose mothers had no education—the equity gaps remained pronounced in 2013. Additionally, due to the concentration of improvements in coverage among children in urban households, the urban-rural equity gap widened over the decade (see Figure 22). Further efforts should be made to ensure that ORS is available to all children who have diarrhea.

[3] **Why do we assess the appropriateness of care only for children's recent diarrhea, but not for ARI symptoms or fever?** While antibiotics are the recommended treatment for pneumonia, antibiotic treatment is not necessary for children with some other acute respiratory infections such as the common cold. Since we cannot distinguish children with recent pneumonia from children with other acute respiratory infections, we do not attempt to evaluate the appropriateness of the treatment provided for these children. For fever, indicators of the appropriateness of care are available in the DHS. For example, we could examine the percentage of children who received first-line antimalarial treatment among children with recent fever who received any antimalarial. However, due to changes in the first-line treatment during the study period, which make the results difficult to interpret, and also due to small sample sizes, the indicator is not included.

Figure 22. Percentage of children under age 5 with recent diarrhea who received oral rehydration solution (ORS), Nigeria 2003, 2008, and 2013



Note: A solid line between adjacent surveys indicates a significant change, while a dotted line indicates no significant change. Asterisks are used to indicate the significance of the overall change between the 2003 and 2013 surveys. * p<0.05, ** p<0.01, *** p<0.001

ORS-use estimates for the three Southern zones in the 2003 survey are based on 25-49 unweighted cases and should be interpreted with caution.

4. Conclusions and Recommendations

This assessment of trends in child health in Nigeria between 2003 and 2013 shows mixed results. Significant improvements (positive trends) were observed over the ten-year period for child immunization coverage—polio, measles, and full immunization—as well as for some measures of nutrition—stunting, a measure of long-term malnutrition; and vitamin A supplementation—and for prevention or care seeking for childhood illnesses—ITN ownership and ITN use among children under age 5, care seeking from a health provider or facility for diarrhea, and use of ORS to treat children's diarrhea. However, negative trends were observed with respect to most other child nutrition indicators—dietary diversity for children age 6-23 months; prevalence of wasting among children under age 5, a measure of recent malnutrition; and iron supplementation. For other indicators of child nutrition and child illness care seeking—early initiation of breastfeeding, exclusive breastfeeding for the first six months, and care seeking from a health provider or facility for fever and for symptoms of ARI—coverage was stagnant across the decade and remains low. Overall, despite Nigeria's huge investments in promoting child health, the study results highlight the need for further improvements.

The results show extensive geographic disparities in child health across the country. Generally, the Northern zones—and particularly the North East and North West—have poorer child health outcomes compared with the Southern zones of the country. This is likely due in part to differences in levels of development and poverty in the North relative to the South. As shown in Figure 1, households in the lowest wealth quintile are concentrated in the North East and North West. Geographic disparities in child health are also likely driven by the deteriorating security situation in the Northern part of the country. The burden of childhood illnesses (recent fever, diarrhea, and symptoms of ARI) is highest, and coverage of care seeking for diarrhea and polio vaccination is lowest, in the North East, where there has been a six-year insurgency by Boko Haram. The disparities in child health in this area are yet another indication of the urgent need to resolve the security situation in the North.

Results also show persistent socioeconomic disparities across nearly all indicators of child health. Generally, children whose mothers have little or no education, children from poorer households, and children in rural areas are far more likely to have worse health indicators compared with other children. For the most part, these gaps were not closed between 2003 and 2013. Child health intervention programs and campaigns, as for widespread immunization, should be scaled up specifically in rural settings and in the Northern zones, with emphasis on reaching poorer neighborhoods.

Trends in several indicators suggest that children's nutritional status in Nigeria may have been worsening in recent years. While the prevalence of stunting—a measure of long-term malnutrition—declined between 2003, 2008, and 2013, the prevalence of wasting—a measure of short-term malnutrition—increased. The increase in short-term malnutrition, along with the decline in dietary diversity among children age 6-23 months between 2008 and 2013, suggests that household food security and the context of children's nutrition may be worsening. Additional efforts are needed to investigate this issue and identify strategies to promote child nutrition and household food security. One such strategy could be to rejuvenate school feeding programs to provide a balanced, diverse diet and foods fortified with essential micronutrients to children, as most families are too poor to afford adequate meals at home.

In Nigeria, malaria is the leading cause of death for children under age 5, followed by pneumonia and diarrhea. Although household ITN ownership and use of ITNs by children under age 5 increased substantially, from 1% in 2003 to 17% in 2013, coverage still falls far short of the goal of universal access. Policymakers may want to review the current strategy of distributing ITNs to children via EPI programs, since vaccination rates remain low. Furthermore, levels of care seeking for fever, symptoms of ARI, and diarrhea remain low. For each illness examined, about two-thirds of children do not receive care from a medical provider or health facility, according to the 2013 DHS. Given the number of deaths attributed to these diseases, child health programs should ensure that appropriate medical providers are accessible across the country and consider additional behavioral change campaigns to promote prompt care seeking for childhood illnesses.

In conclusion, Nigeria's efforts to achieve health equity for all parts of the country and to reduce child morbidity and mortality are still far from satisfactory on all indicators apart from polio vaccination coverage. While the Northern zones in particular remain the areas that need more attention, it should be emphasized that, despite some improvements in coverage since 2003, all parts of the country continue to fall short of national and international targets on various child health indicators.

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Appendices

Appendix Table 1. Characteristics of children under age 5, Nigeria 2003, 2008, and 2013

	2003 DHS		2008 DHS		2013 DHS	
	%	N	%	N	%	N
Current age of child						
<6 months	12.4	663	11.5	2,874	10.3	2,989
6-11 months	12.5	668	11.4	2,855	11.3	3,263
1 year	18.7	999	19.8	4,945	20.4	5,900
2 years	19.6	1,050	18.6	4,633	19.0	5,490
3 years	20.0	1,067	20.1	5,013	19.8	5,722
4 years	16.8	899	18.6	4653	19.3	5586
Sex of child						
Male	50.8	2,717	50.5	12,614	50.1	14,509
Female	49.2	2,628	49.5	12,360	49.9	14,440
Residence						
Urban	30.3	1,620	30.8	7,690	35.9	10,403
Rural	69.7	3,726	69.2	17,284	64.1	18,547
Zone						
North Central	14.6	781	13.7	3,434	13.9	4,019
North East	22.9	1,225	16.0	3,989	17.4	5,034
North West	34.0	1,818	30.4	7,594	36.2	10,485
South East	6.5	347	9.7	2,428	8.9	2,585
South South	12.8	684	13.3	3,310	9.5	2,742
South West	9.2	489	16.9	4,221	14.1	4,084
Mother's education						
None	50.0	2,675	45.4	11,342	48.2	13,945
Primary	23.6	1,259	23.2	5,805	19.2	5,563
Secondary or higher	26.4	1,412	31.3	7,827	32.6	9,441
Wealth quintile						
Lowest	21.7	1,162	22.6	5,634	22.9	6,636
Second	20.9	1,116	22.3	5,566	22.4	6,483
Middle	20.0	1,071	19.2	4,787	19.1	5,534
Higher	19.1	1,024	18.2	4,533	18.1	5,243
Highest	18.2	972	17.8	4,455	17.5	5,053
Total	**100.0**	**5,345**	**100.0**	**24,975**	**100.0**	**28,950**

Appendix Table 2. Percentage of most-recent born children under age 5 put to the breast within one hour of delivery, Nigeria 2003, 2008, and 2013

	2003 DHS				p-value[1]	2008 DHS				P-value[1]	2013 DHS				P-value[1]	Diff. 2003-2008[2]		Diff. 2008-2013[2]		Diff. 2003-2013[2]	
	%	LB	UB	N		%	LB	UB	N		%	LB	UB	N							
Current age of child					0.272					0.163					0.251						
<6 months	28.4	23.2	34.3	702		36.6	34.4	38.8	2,984		33.2	30.9	35.5	3,080		8.2	*	-3.4	*	4.8	
6-11 months	33.7	28.3	39.6	648		38.5	36.1	41.0	2,801		34.3	32.2	36.4	3,211		4.8		-4.2	*	0.6	
1 year	30.5	26.2	35.3	952		37.7	35.6	39.8	4,693		33.5	31.6	35.5	5,643		7.2	**	-4.2	**	3.0	
2 years	34.5	29.0	40.4	732		38.2	36.0	40.5	3,237		35.4	33.2	37.6	3,908		3.7		-2.8		0.9	
3 years	35.0	28.1	42.7	373		40.7	37.8	43.6	1,760		36.5	33.9	39.1	2,177		5.7		-4.2	*	1.5	
4 years	28.2	20.8	37.0	205		39.7	36.3	43.3	1,068		34.8	31.8	38.0	1,404		11.5	*	-4.9	*	6.6	
Sex of child					0.050					0.169					0.790						
Male	29.8	26.4	33.6	2,005		37.1	35.4	38.8	8,964		33.9	32.5	35.4	10,282		7.3	***	-3.2	**	4.1	*
Female	33.2	29.2	37.6	1,906		38.1	36.4	39.8	8,671		33.7	32.3	35.2	10,185		4.9	*	-4.4	***	0.5	
Residence					0.544					0.069					0.000						
Urban	33.0	28.3	38.0	1,144		39.6	37.1	42.3	5,330		40.4	38.3	42.5	7,278		6.6	*	0.8		7.4	**
Rural	30.9	26.5	35.6	2,766		36.7	34.8	38.6	12,305		30.2	28.7	31.8	13,189		5.8	*	-6.5	***	-0.7	
Zone					0.000					0.000					0.000						
North Central	44.8	38.8	50.8	575		58.8	54.8	62.8	2,525		46.0	43.1	48.9	2,890		14.0	***	-12.8	***	1.2	
North East	26.8	21.0	33.6	862		24.2	21.0	27.7	2,751		39.5	36.2	42.8	3,434		-2.6		15.3	***	12.7	**
North West	26.5	20.2	34.0	1,341		31.0	28.2	33.9	5,372		26.6	24.4	29.0	7,445		4.5		-4.4	*	0.1	
South East	56.8	41.4	70.9	222		36.7	33.3	40.3	1,603		32.5	28.9	36.3	1,719		-20.1	*	-4.2		-24.3	**
South South	39.9	33.0	47.2	544		49.8	45.4	54.3	2,310		42.6	39.3	46.0	2,002		9.9	*	-7.2	*	2.7	
South West	12.1	9.1	15.9	367		34.9	31.5	38.3	3,075		28.4	26.0	30.9	2,977		22.8	***	-6.5	**	16.3	***
Mother's education					0.002					0.000					0.000						
None	27.1	22.8	31.9	1,989		31.2	29.1	33.4	8,017		29.6	27.7	31.6	9,794		4.1		-1.6		2.5	
Primary	35.4	30.6	40.5	918		42.8	40.5	45.3	4,012		35.7	33.7	37.9	3,915		7.4	*	-7.1	***	0.3	
Secondary or higher	36.6	31.5	41.9	1,004		43.0	40.9	45.1	5,606		38.9	37.0	40.7	6,758		6.4	*	-4.1	**	2.3	
Wealth quintile					0.021					0.000					0.000						
Lowest	24.3	19.5	29.8	852		29.4	26.6	32.2	4,074		24.5	21.8	27.4	4,699		5.1		-4.9	*	0.2	
Second	29.5	24.1	35.6	846		36.9	34.3	39.7	3,916		30.0	27.8	32.2	4,588		7.4	*	-6.9	***	0.5	
Middle	34.9	29.3	40.9	808		41.7	39.1	44.3	3,350		36.3	34.1	38.6	3,902		6.8	*	-5.4	**	1.4	
Higher	35.2	28.7	42.2	735		42.0	39.6	44.4	3,204		41.7	39.3	44.1	3,674		6.8		-0.3		6.5	
Highest	35.0	28.5	42.1	670		40.3	37.3	43.3	3,091		40.2	37.4	43.0	3,604		5.3		-0.1		5.2	
Total	**31.5**	**28.1**	**35.1**	**3,911**		**37.6**	**36.1**	**39.1**	**17,635**		**33.8**	**32.6**	**35.1**	**20,467**		**6.1**	**	**-3.8**		**2.3**	

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 3. Percentage of children under age six months exclusively breastfed, Nigeria 2003, 2008, and 2013

	2003 DHS				P-value[1]	2008 DHS				P-value[1]	2013 DHS				P-value[1]	Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
	%	LB	UB	N		%	LB	UB	N		%	LB	UB	N				
Sex of child					0.636					0.235					0.017			
Male	16.5	11.7	22.8	345		12.2	10.3	14.5	1,440		15.3	13.1	17.8	1,446		-4.3	3.1	-1.2
Female	18.0	13.5	23.7	313		13.9	11.9	16.3	1,392		19.5	16.9	22.4	1,479		-4.1	5.6 **	1.5
Residence					0.156					0.000					0.000			
Urban	21.8	15.5	29.9	180		18.9	15.9	22.3	870		28.0	24.1	32.3	1,016		-2.9	9.1 ***	6.2
Rural	15.5	10.9	21.5	478		10.5	8.8	12.5	1,961		11.8	10.1	13.7	1,910		-5.0 *	1.3	-3.7
Zone					0.000					0.000					0.000			
North Central	42.1	31.2	53.9	89		20.6	16.4	25.6	380		20.9	16.4	26.2	429		-21.5 ***	0.3	-21.2 ***
North East	10.7	4.7	22.6	149		4.0	2.7	5.8	496		15.9	12.5	20.1	533		-6.7 *	11.9 ***	5.2
North West	8.7	5.4	13.9	233		8.1	5.3	12.1	818		4.3	2.8	6.6	1,020		-0.6	-3.8 *	-4.4 *
South East	(12.0)	(4.5)	(28.1)	35		13.7	10.1	18.3	271		23.0	17.4	29.8	267		1.7	9.3 *	11.0
South South	14.7	5.5	33.5	85		16.3	12.4	21.3	392		22.0	16.9	28.2	277		1.6	5.7	7.3
South West	34.5	20.9	51.1	67		22.0	17.4	27.4	475		42.1	35.7	48.8	401		-12.5	20.1 ***	7.6
Mother's education					0.000					0.000					0.000			
None	10.9	7.3	15.8	333		7.2	5.4	9.5	1,249		7.1	5.6	9.0	1,427		-3.7	-0.1	-3.8
Primary	14.2	8.6	22.4	151		13.5	10.8	16.8	625		20.0	16.1	24.6	517		-0.7	6.5 *	5.8
Secondary or higher	32.0	22.1	43.9	175		20.5	17.7	23.7	957		31.0	27.4	34.9	982		-11.5 *	10.5 ***	-1.0
Wealth quintile					0.001					0.000					0.000			
Lowest	11.8	7.1	19.1	150		7.0	4.7	10.2	673		5.1	3.5	7.5	691		-4.8	-1.9	-6.7 *
Second	5.3	2.4	11.3	136		8.0	6.0	10.6	621		11.0	8.4	14.2	692		2.7	3.0	5.7
Middle	19.5	11.5	31.2	113		12.1	9.2	15.8	530		16.1	12.8	20.0	545		-7.4	4.0	-3.4
Higher	23.3	14.8	34.6	136		20.1	16.4	24.4	516		24.2	19.8	29.1	513		-3.2	4.1	0.9
Highest	28.2	18.1	41.0	124		21.5	17.4	26.3	491		38.5	32.8	44.5	485		-6.7	17.0 ***	10.3
Total	**17.2**	**13.4**	**22.0**	**658**		**13.1**	**11.5**	**14.8**	**2,832**		**17.4**	**15.6**	**19.4**	**2,926**		**-4.1**	**4.3** ***	**0.2**

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Figures in parentheses are based on 25-49 unweighted cases.

Appendix Table 4. Percentage of youngest children age 6-23 months living with their mother who consumed four or more food groups during the day and night preceding the survey, Nigeria 2008 and 2013

	2008 DHS					2013 DHS						
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2008-2013[2]	
Sex of child					0.687					0.049		
Male	38.9	37.0	40.9	3,703		18.4	16.8	20.0	4,423		-20.5	***
Female	39.4	37.3	41.6	3,691		20.3	18.7	22.1	4,364		-19.1	***
Residence					0.000					0.000		
Urban	48.8	45.7	51.8	2,220		28.5	25.9	31.1	3,164		-20.3	***
Rural	35.1	33.1	37.1	5,174		14.2	12.9	15.6	5,623		-20.9	***
Zone					0.000					0.000		
North Central	47.6	43.7	51.6	974		18.6	15.6	22.0	1,178		-29.0	***
North East	29.5	26.0	33.3	1,158		18.1	15.5	21.2	1,502		-11.4	***
North West	24.2	21.2	27.4	2,342		12.1	10.2	14.2	3,234		-12.1	***
South East	47.3	42.6	52.1	701		40.2	35.5	45.1	809		-7.1	*
South South	53.8	49.8	57.7	975		33.0	28.3	38.1	839		-20.8	***
South West	53.8	49.5	58.0	1,243		17.5	14.6	20.8	1,226		-36.3	***
Mother's education					0.000					0.000		
None	28.3	26.0	30.7	3,406		11.2	9.7	12.9	4,146		-17.1	***
Primary	41.7	38.9	44.7	1,649		20.9	18.5	23.6	1,565		-20.8	***
Secondary or higher	53.2	50.7	55.7	2,338		29.5	27.0	32.1	3,075		-23.7	***
Wealth quintile					0.000					0.000		
Lowest	26.7	24.0	29.6	1,729		9.3	7.5	11.4	2,011		-17.4	***
Second	30.0	27.2	33.1	1,685		12.7	10.8	14.9	1,937		-17.3	***
Middle	37.7	34.7	40.8	1,381		19.5	17.2	22.1	1,674		-18.2	***
Higher	50.9	47.6	54.1	1,322		26.6	24.0	29.4	1,605		-24.3	***
Highest	57.7	53.8	61.5	1,276		32.8	29.2	36.7	1,559		-24.9	***
Total	**39.2**	**37.5**	**40.9**	**7,393**		**19.3**	**18.0**	**20.7**	**8,786**		-19.9	***

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

The percentages and sample sizes in this table may not exactly match the 2008 and 2013 DHS final reports. This is because (1) the denominator used in this report is slightly different than the one used in DHS final report tables, and (2) the definition of the indicator changed between the two surveys; this report uses the 2013 definition. Comparable food consumption information was not included in the 2003 survey.

Appendix Table 5. Percentage of children age 6-59 months who received vitamin A supplementation in the last six months, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS										
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]		Diff. 2008-2013[2]		Diff. 2003-2013[2]	
Current age of child					0.004					0.005					0.000						
6-11 months	31.3	26.6	36.4	668		25.7	23.6	27.8	2,855		36.0	33.7	38.4	3,263		-5.6	*	10.3	***	4.7	
1 year	31.2	26.9	35.9	999		27.9	26.2	29.7	4,945		44.8	42.8	46.8	5,900		-3.3		16.9	***	13.6	***
2 years	40.0	34.7	45.5	1,050		26.0	24.3	27.8	4,633		42.5	40.5	44.6	5,490		-14.0	***	16.5	***	2.5	
3 years	31.2	27.5	35.1	1,067		24.8	23.2	26.6	5,013		40.2	38.2	42.3	5,722		-6.4	**	15.4	***	9.0	***
4 years	34.1	29.3	39.1	899		24.6	22.8	26.5	4,653		40.6	38.5	42.8	5,586		-9.5	***	16.0	***	6.5	*
Sex of child					0.565					0.892					0.528						
Male	34.3	31.0	37.7	2,370		25.8	24.3	27.3	11,154		41.5	39.8	43.3	13,023		-8.5	***	15.7	***	7.2	***
Female	33.2	29.1	37.4	2,312		25.9	24.4	27.4	10,946		41.1	39.3	42.8	12,938		-7.3	***	15.2	***	7.9	***
Residence					0.000					0.000					0.000						
Urban	48.9	42.7	55.2	1,438		35.5	33.1	37.9	6,809		53.2	50.2	56.1	9,360		-13.4	***	17.7	***	4.3	
Rural	27.0	23.9	30.3	3,244		21.5	20.0	23.2	15,291		34.6	32.8	36.5	16,600		-5.5	**	13.1	***	7.6	***
Zone					0.000					0.000					0.000						
North Central	32.4	26.1	39.5	693		25.7	22.9	28.7	3,045		44.6	40.5	48.7	3,586		-6.7		18.9	***	12.2	**
North East	25.1	20.5	30.3	1,075		18.6	15.8	21.8	3,488		31.1	27.5	35.0	4,493		-6.5	*	12.5	***	6.0	
North West	15.2	12.0	19.1	1,584		13.9	11.6	16.5	6,770		26.1	23.8	28.5	9,448		-1.3		12.2	***	10.9	***
South East	60.4	40.0	77.8	312		28.5	25.1	32.1	2,152		56.7	52.1	61.1	2,311		-31.9	**	28.2	***	-3.7	
South South	55.8	48.2	63.2	597		34.4	30.8	38.1	2,910		64.8	61.5	68.0	2,457		-21.4	***	30.4	***	9.0	*
South West	76.4	70.5	81.4	421		46.1	42.8	49.6	3,735		64.4	60.1	68.5	3,665		-30.3	***	18.3	***	-12.0	**
Mother's education					0.000					0.000					0.000						
None	16.8	14.1	19.9	2,340		14.4	12.9	16.2	10,081		24.9	23.1	26.9	12,493		-2.4		10.5	***	8.1	***
Primary	40.4	36.2	44.7	1,106		27.5	25.4	29.7	5,169		47.3	44.8	49.8	5,024		-12.9	***	19.8	***	6.9	**
Secondary or higher	59.8	53.3	65.9	1,236		41.4	39.5	43.3	6,851		62.0	59.8	64.1	8,443		-18.4	***	20.6	***	2.2	
Wealth quintile					0.000					0.000					0.000						
Lowest	22.6	17.6	28.6	1,013		13.2	11.2	15.4	4,955		20.9	18.3	23.8	5,932		-9.4	**	7.7	***	-1.7	
Second	18.4	14.6	22.9	977		17.5	15.5	19.8	4,935		30.9	28.3	33.6	5,780		-0.9		13.4	***	12.5	***
Middle	24.5	20.1	29.5	959		26.2	23.9	28.7	4,247		42.8	39.9	45.8	4,975		1.7		16.6	***	18.3	***
Higher	43.6	38.3	49.0	887		33.1	30.5	35.8	4,011		53.0	50.0	56.0	4,708		-10.5	***	19.9	***	9.4	**
Highest	64.9	57.4	71.6	847		44.3	41.8	46.9	3,952		67.3	64.4	70.0	4,565		-20.6	***	23.0	***	2.4	
Total	**33.7**	**30.6**	**37.1**	**4,682**		**25.8**	**24.5**	**27.2**	**22,100**		**41.3**	**39.7**	**42.9**	**25,960**		**-7.9**	***	**15.5**	***	**7.6**	***

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 6. Percentage of children age 6-59 months given iron supplements in the last seven days, Nigeria 2008 and 2013

	2008 DHS					2013 DHS						
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2008-2013[2]	
Current age of child					0.065					0.123		
6-11 months	15.7	13.9	17.5	2,855		4.9	4.0	5.9	3,263		-10.8	***
1 year	17.0	15.5	18.5	4,945		5.9	5.1	6.9	5,900		-11.1	***
2 years	15.9	14.4	17.6	4,633		6.3	5.4	7.3	5,490		-9.6	***
3 years	15.4	14.0	16.9	5,013		5.6	4.8	6.6	5,722		-9.8	***
4 years	14.5	13.0	16.1	4,653		5.3	4.5	6.3	5,586		-9.2	***
Sex of child					0.398					0.770		
Male	15.5	14.3	16.7	11,154		5.7	5.0	6.5	13,023		-9.8	***
Female	15.9	14.7	17.3	10,946		5.6	5.0	6.4	12,938		-10.3	***
Residence					0.000					0.000		
Urban	25.8	23.5	28.2	6,809		7.2	6.1	8.5	9,360		-18.6	***
Rural	11.2	10.1	12.4	15,291		4.8	4.1	5.6	16,600		-6.4	***
Zone					0.000					0.000		
North Central	6.8	5.4	8.6	3,045		10.6	8.2	13.6	3,586		3.8	*
North East	4.1	3.3	5.0	3,488		5.2	4.2	6.3	4,493		1.1	
North West	3.2	2.5	4.1	6,770		1.7	1.2	2.4	9,448		-1.5	**
South East	16.4	13.4	20.0	2,152		13.2	10.2	17.0	2,311		-3.2	
South South	25.3	21.8	29.1	2,910		5.0	3.7	6.8	2,457		-20.3	***
South West	48.5	44.9	52.2	3,735		7.3	5.8	9.1	3,665		-41.2	***
Mother's education					0.000					0.000		
None	4.4	3.7	5.2	10,081		3.8	3.1	4.6	12,493		-0.6	
Primary	16.8	14.9	18.9	5,169		6.9	5.9	8.0	5,024		-9.9	***
Secondary or higher	31.5	29.4	33.8	6,851		7.8	6.7	9.0	8,443		-23.7	***
Wealth quintile					0.000					0.000		
Lowest	3.2	2.4	4.1	4,955		2.6	2.0	3.4	5,932		-0.6	
Second	6.8	5.7	8.1	4,935		3.9	3.1	4.9	5,780		-2.9	***
Middle	13.4	11.7	15.2	4,247		7.0	5.9	8.3	4,975		-6.4	***
Higher	22.9	20.7	25.4	4,011		7.9	6.6	9.4	4,708		-15.0	***
Highest	37.7	34.3	41.2	3,952		8.1	6.4	10.3	4,565		-29.6	***
Total	**15.7**	**14.6**	**16.9**	**22,100**		**5.7**	**5.1**	**6.4**	**25,960**		-10.0	***

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001. Information on iron supplementation not included in the 2003 survey.

Appendix Table 7. Percentage of children age 6-59 months given deworming medication in the six months preceding the survey, Nigeria 2008 and 2013

	2008 DHS					2013 DHS						
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2008-2013[2]	
Current age of child					0.000					0.000		
6-11 months	10.3	9.0	11.8	2,855		10.5	9.1	12.0	3,263		0.2	
1 year	20.6	18.9	22.4	4,945		20.1	18.6	21.7	5,900		-0.5	
2 years	25.2	23.4	27.2	4,633		22.2	20.6	23.9	5,490		-3.0	*
3 years	23.3	21.7	25	5,013		21.5	19.9	23.2	5,722		-1.8	
4 years	22.9	21.1	24.8	4,653		21.5	19.9	23.3	5,586		-1.4	
Sex of child					0.556					0.014		
Male	21.5	20.1	23	11,154		20.6	19.2	22.1	13,023		-0.9	
Female	21.1	19.7	22.6	10,946		19.2	18.0	20.5	12,938		-1.9	*
Residence					0.000					0.000		
Urban	33.9	31.3	36.6	6,809		28.4	26.1	30.7	9,360		-5.5	**
Rural	15.7	14.4	17.1	15,291		15.2	13.9	16.5	16,600		-0.5	
Zone					0.000							
North Central	9.4	7.9	11.2	3,045		17.2	14.6	20.1	3,586		7.8	***
North East	5.7	4.7	6.8	3,488		12.1	10.2	14.3	4,493		6.4	***
North West	4.0	3.1	5.2	6,770		9.0	7.9	10.2	9,448		5.0	***
South East	42.5	37.4	47.7	2,152		41.9	37.3	46.7	2,311		-0.6	
South South	48.4	44.2	52.7	2,910		44.5	40.0	49.0	2,457		-3.9	
South West	43.8	40.0	47.6	3,735		30.2	26.6	34.1	3,665		-13.6	***
Mother's education					0.000							
None	5.1	4.4	5.8	10,081		9.4	8.4	10.6	12,493		4.3	***
Primary	24.4	22.4	26.7	5,169		20.4	18.6	22.4	5,024		-4.0	**
Secondary or higher	42.9	40.6	45.3	6,851		35.2	33.0	37.4	8,443		-7.7	***
Wealth quintile					0.000					0.000		
Lowest	4.6	3.7	5.6	4,955		7.9	6.5	9.7	5,932		3.3	***
Second	9.7	8.4	11.2	4,935		11.8	10.1	13.7	5,780		2.1	
Middle	18.9	16.8	21.2	4,247		18.8	16.8	21.0	4,975		-0.1	
Higher	32.1	29.6	34.8	4,011		27.7	25.2	30.3	4,708		-4.4	*
Highest	48.5	45.0	51.9	3,952		39.1	36.1	42.2	4,565		-9.4	***
Total	**21.3**	**20.0**	**22.7**	**22,100**		**19.9**	**18.8**	**21.2**	**25,960**		-1.4	

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001. Information on deworming medication not included in the 2003 survey.

Appendix Table 8. Percentage of children under age 5 who are stunted, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS							
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
Current age of child					0.000					0.000					0.000			
<6 months	17.5	13.3	22.7	535		21.3	19.3	23.6	1,911		15.7	13.9	17.6	2,433		3.8	-5.6 ***	-1.8
6-11 months	30.9	26.1	36.1	610		28.7	26.5	31.0	2,169		25.5	23.3	27.8	2,883		-2.2	-3.2 *	-5.4 *
1 year	47.7	42.9	52.5	886		47.3	45.3	49.4	3,770		37.7	36	39.5	5,165		-0.4	-9.6 ***	-10.0 ***
2 years	50.8	45.5	56.2	954		48	46.0	49.9	3,767		45.7	43.8	47.7	4,961		-2.8	-2.3 ns	-5.1
3 years	49.0	44.9	53.1	977		42	40.1	44.1	4,288		42.8	40.8	44.8	5,386		-7.0 **	0.8 ns	-6.2 **
4 years	43.6	39.3	47.9	807		41.6	39.7	43.5	3,992		37.3	35.3	39.4	5,361		-2.0	-4.3 **	-6.3 **
Sex of child					0.000					0.000					0.000			
Male	45.9	42.7	49.1	2,371		43.0	41.6	44.3	9,861		38.6	37.3	40	13,045		-2.9	-4.4 ***	-7.3 ***
Female	38.9	35.8	42.0	2,399		38.4	37.1	39.6	10,035		35	33.7	36.4	13,144		-0.5	-3.4 ***	-3.9 *
Residence					0.000					0.000					0.000			
Urban	31.9	28.1	36.0	1,539		31.3	29.5	33.2	6365		26	24.3	27.7	9,725		-0.6	-5.3 ***	-5.9 **
Rural	47.3	44.1	50.6	3,231		45	43.7	46.3	13531		43.2	41.7	44.7	16,465		-2.3	-1.8	-4.1 *
Zone					0.000					0.000					0.000			
North Central	35.1	30.7	39.7	757		43.8	41.2	46.5	2,800		29.3	27	31.8	3764		8.7 **	-14.5 ***	-5.8 *
North East	47.1	41.9	52.3	1,093		48.6	46	51.1	3,097		42.3	39.9	44.7	4,286		1.5	-6.3 ***	-4.8
North West	59.8	55.9	63.5	1,452		52.6	50.5	54.7	5,488		54.8	52.6	56.9	9,049		-7.2 **	2.2	-5.0 *
South East	18.9	14.3	24.6	326		21.7	19.2	24.4	1,947		16	13.8	18.5	2,455		2.8	-5.7 **	-2.9
South South	26.3	21.8	31.4	635		31.1	28.3	34	2,769		18.3	16.4	20.4	2,619		4.8	-12.8 ***	-8.0 **
South West	28.5	24	33.3	507		31.2	28.8	33.7	3,795		22.2	20	24.6	4,016		2.7	-9.0 ***	-6.3 *
Mother's education					0.000					0.000					0.000			
None	54.5	51.4	57.6	2,173		51.1	49.6	52.6	7,992		49.7	48	51.3	11,537		-3.4	-1.4 ns	-4.8 **
Primary	40.5	36.5	44.5	1,094		40.3	38.4	42.2	4,578		33.1	31.1	35.1	4,971		-0.2	-7.2 ***	-7.4 ***
Secondary or higher	23.1	19.8	26.8	1,250		27.1	25.7	28.7	6,109		20.9	19.5	22.3	8,251		4.0 *	-6.2 ***	-2.2
Missing	41.5	34.6	48.8	253							38.1	35	41.2	1,431		-41.5	38.1 ns	-3.4 *
Wealth quintile					0.000					0.000					0.000			
Lowest	52.8	48.2	57.3	981		52.1	50	54.3	4,088		53.8	51.3	56.2	5,684		-0.7	1.7	1.0
Second	52.9	48.2	57.6	967		49	47	50.9	4,354		46.1	43.9	48.3	5,758		-3.9	-2.9	-6.8 *
Middle	48.3	43.4	53.2	954		41.8	39.8	43.9	3,948		35.1	32.9	37.2	5,073		-6.5 *	-6.7 ***	-13.2 ***
Higher	36.6	31.8	41.7	930		33.6	31.5	35.8	3,776		26.3	24.4	28.1	4,970		-3.0	-7.3 ***	-10.3 ***
Highest	20.2	16.6	24.3	938		24.2	22.3	26.2	3,731		18	16.4	19.8	4,704		4.0	-6.2 ***	-2.2
Total	**42.4**	**39.8**	**44.9**	**4,770**		**40.6**	**39.5**	**41.7**	**19,896**		**36.8**	**35.6**	**38.0**	**26,190**		**-1.8**	**-3.8 *****	**-5.6 *****

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 9. Percentage of children under age 5 who are wasted, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS					Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]			
Current age of child					0.000					0.000					0.000			
<6 months	15.9	11.9	20.9	535		17.5	15.6	19.5	1,911		24.8	22.6	27.0	2,433		1.6	7.3 ***	8.9 **
6-11 months	19	15.4	23.0	610		18.7	16.9	20.7	2,169		26.3	24.3	28.3	2,883		-0.3	7.6 ***	7.3 **
1 year	14.9	12.3	18.0	886		16.1	14.8	17.5	3,770		22.8	21.3	24.4	5,165		1.2	6.7 ***	7.9 ***
2 years	6.9	5.1	9.4	954		12.8	11.5	14.2	3,767		15.7	14.0	17.5	4,961		5.9 ***	2.9 **	8.8 ***
3 years	8.1	6.1	10.5	977		11.2	10.1	12.5	4,288		14.2	12.8	15.9	5,386		3.1 *	3.0 **	6.1 ***
4 years	5.6	4.0	8.0	807		11.5	10.2	12.9	3992		11.8	10.6	13.1	5,361		5.9 ***	0.3	6.2 ***
Sex of child					0.293					0.070					0.004			
Male	11.5	10.0	13.3	2,371		14.4	13.4	15.4	9,861		18.9	17.8	20.0	13,045		2.9 **	4.5 ***	7.4 ***
Female	10.4	8.8	12.2	2,399		13.4	12.5	14.4	10,035		17.2	16.2	18.2	13,144		3.0 **	3.8 ***	6.8 ***
Residence					0.127					0.000					0.467			
Urban	9.5	7.6	11.9	1,539		11.0	9.7	12.3	6,365		17.6	16.0	19.2	9,725		1.5	6.6 ***	8.1 ***
Rural	11.6	10.2	13.3	3,231		15.3	14.3	16.4	13,531		18.3	17.2	19.4	16,465		3.7 ***	3.0 ***	6.7 ***
Zone					0.000					0.000					0.000			
North Central	7.8	5.3	11.3	757		9.3	7.8	11.0	2,800		11.7	10.3	13.3	3,764		1.5	2.4 *	3.9 *
North East	10.7	8.7	13.2	1,093		22.2	19.3	25.3	3,097		19.5	17.4	21.7	4,286		11.5 ***	-2.7	8.8 ***
North West	14.3	11.9	17.2	1,452		19.9	18.0	21.9	5,488		27.1	25.2	29.2	9,049		5.6 **	7.2 ***	12.8 ***
South East	3.4	1.6	7.0	326		8.6	7.3	10.1	1,947		11.9	10.3	13.7	2,455		5.2 *	3.3 **	8.5 ***
South South	12.5	9.2	16.7	635		7.5	6.2	8.9	2,769		11.1	9.7	12.8	2,619		-5.0 **	3.6 ***	-1.4
South West	9.6	7.3	12.4	507		9.3	8.0	10.7	3,795		10.0	8.7	11.4	4,016		-0.3	0.7	0.4
Mother's education					0.028					0.000					0.000			
None	12.8	11.1	14.8	2,173		20.1	18.6	21.7	7,992		22.7	21.3	24.3	11,537		7.3 ***	2.6 *	9.9 ***
Primary	10.5	8.4	13.0	1,094		11.2	10.1	12.3	4,578		16.0	14.6	17.5	4,971		0.7	4.8 ***	5.5 ***
Secondary or higher	8.9	6.7	11.6	1,250		7.9	7.1	8.8	6,109		13.7	12.7	14.8	8,251		-1.0	5.8 ***	4.8 **
Missing	7.5	4.2	13.0	253							11.9	10.0	14.1	1,431		-7.5	11.9	4.4 ***
Wealth quintile					0.144					0.000					0.000			
Lowest	12.7	10.0	15.9	981		20.5	18.5	22.7	4,088		21.9	20.1	23.8	5,684		7.8 ***	1.4	9.2 ***
Second	12.9	10.4	16.0	967		17.0	15.3	18.8	4,354		19.7	18.0	21.4	5,758		4.1 *	2.7 *	6.8 ***
Middle	10.0	7.5	13.2	954		11.8	10.5	13.3	3,948		16.8	15.0	18.8	5,073		1.8	5.0 ***	6.8 ***
Higher	10.5	8.3	13.2	930		9.8	8.7	11.1	3,776		16.7	15.1	18.6	4,970		-0.7	6.9 ***	6.2 ***
Highest	8.5	6.1	11.8	938		9.3	8.2	10.7	3,731		13.9	12.4	15.5	4,704		0.8	4.6 ***	5.4 **
Total	**11.0**	**9.8**	**12.3**	**4,770**		**13.9**	**13.1**	**14.8**	**19,896**		**18.0**	**17.1**	**18.9**	**26,190**		**2.9 *****	**4.1 *****	**7.0 *****

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001.

Appendix Table 10. Percentage of children age 12-23 months with three doses of polio immunization, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS										
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]		Diff. 2008-2013[2]		Diff. 2003-2013[2]	
Sex of child					0.178					0.997					0.753						
Male	26.5	21.7	32.0	512		38.7	36.2	41.2	2,448		53.4	50.9	55.8	3,066		12.2	***	14.7	***	26.9	***
Female	32.5	25.6	40.3	486		38.7	36.3	41.1	2,497		53.8	51.2	56.4	2,834		6.2		15.1	***	21.3	***
Residence					0.000					0.000					0.001						
Urban	42.0	33.2	51.3	312		51.6	47.9	55.3	1,498		58.2	55.0	61.3	2,113		9.6		6.6	**	16.2	**
Rural	23.7	19.3	28.8	687		33.0	30.7	35.4	3,447		51.0	48.4	53.6	3,787		9.3	**	18.0	***	27.3	***
Zone					0.000					0.000					0.000						
North Central	36.8	25.8	49.3	149		40.5	35.8	45.4	640		45.5	40.8	50.2	812		3.7		5.0		8.7	
North East	24.8	18.5	32.4	219		28.6	24.5	33.0	780		34.8	30.5	39.3	1,023		3.8		6.2	*	10.0	*
North West	16.4	11.6	22.6	356		24.3	20.9	28.1	1,545		61.1	57.4	64.7	2,100		7.9	*	36.8	***	44.7	***
South East	57.4	35.9	76.4	74		52.5	46.8	58.1	504		62.3	56.6	67.6	550		-4.9		9.8	*	4.9	
South South	40.0	27.8	53.4	120		53.6	47.3	59.8	663		64.5	59.2	69.5	591		13.6		10.9	*	24.5	**
South West	44.8	33.5	56.7	81		53.4	48.2	58.5	814		52.1	47.2	57.0	823		8.6		-1.3		7.3	
Mother's education					0.000					0.000					0.000						
None	18.7	14.5	23.7	484		24.0	21.5	26.6	2,248		48.4	45.1	51.6	2,807		5.3		24.4	***	29.7	***
Primary	34.2	26.1	43.3	247		38.7	35.3	42.2	1,107		48.9	45.3	52.5	1,062		4.5		10.2	***	14.7	**
Secondary or higher	44.5	34.6	54.9	268		59.4	56.2	62.6	1,590		63.2	60.5	65.8	2,031		14.9	**	3.8		18.7	***
Wealth quintile					0.000					0.000					0.000						
Lowest	20.0	13.6	28.3	206		21.9	19.0	25.0	1,158		45	40.5	49.5	1,350		1.9		23.1	***	25.0	***
Second	23.6	17.2	31.6	202		29.7	26.3	33.3	1,092		51.7	47.7	55.7	1,330		6.1		22.0	***	28.1	***
Middle	25.1	18.3	33.3	219		38.2	34.6	41.9	945		50.5	46.8	54.1	1,100		13.1	**	12.3	***	25.4	***
Higher	26.3	19.1	35.0	185		48.9	44.6	53.1	892		56.4	52.4	60.2	1,060		22.6	***	7.5	*	30.1	***
Highest	54.4	43.1	65.3	187		62.8	58.2	67.1	858		67.4	63.7	70.8	1,060		8.4		4.6		13.0	*
Total	**29.4**	**25.1**	**34.2**	**999**		**38.7**	**36.7**	**40.7**	**4,945**		**53.6**	**51.6**	**55.6**	**5,900**		**9.3**	*******	**14.9**	*****	**24.2**	*******

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 11. Percentage of children age 12-23 months with measles immunization, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS								
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]		Diff. 2008-2013[2]		Diff. 2003-2013[2]	
Sex of child					0.358					974.000					0.161						
Male	33.8	27.7	40.4	512		41.5	38.9	44.0	2,448		43.1	40.4	45.8	3,066		7.7	*	1.6		9.3	**
Female	38.1	31.2	45.6	486		41.4	38.8	44.0	2,497		41.0	38.2	43.8	2,834		3.3		-0.4		2.9	
Residence					0.000					0.000					0.000						
Urban	52.1	43.0	61.1	312		59.1	55.5	62.7	1,498		61.9	58.0	65.5	2,113		7.0		2.8		9.8	*
Rural	28.5	23.2	34.5	687		33.7	31.3	36.3	3,447		31.0	28.4	33.7	3,787		5.2		-2.7		2.5	
Zone					0.000					0.000					0.000						
North Central	44.6	33.5	56.3	149		51.8	46.4	57.1	640		48.1	42.4	53.7	812		7.2		-3.7		3.5	
North East	22.5	16.8	29.6	219		24.8	21.1	29.0	780		26.8	22.7	31.4	1,023		2.3		2.0		4.3	
North West	15.6	10.5	22.6	356		19.5	15.9	23.7	1,545		22.3	18.8	26.2	2,100		3.9		2.8		6.7	
South East	64.1	43.4	80.6	74		63.9	58.6	68.8	504		72.2	66.7	77.2	550		-0.2		8.3	*	8.1	
South South	66.9	52.2	78.8	120		55.5	49.1	61.7	663		74.0	68.4	78.9	591		-11.4		18.5	***	7.1	
South West	73.1	61.5	82.3	81		65.5	60.0	70.6	814		62.5	57.4	67.4	823		-7.6		-3.0		-10.6	
Mother's education					0.000					0.000					0.000						
None	15.6	11.8	20.4	484		19.0	16.8	21.4	2,248		18.0	15.6	20.6	2,807		3.4		-1.0		2.4	
Primary	42.5	33.7	51.7	247		47.4	43.5	51.3	1,107		47.9	44.1	51.7	1,062		4.9		0.5		5.4	
Secondary or higher	66.5	57.6	74.3	268		69.0	66.1	71.9	1,590		72.3	69.6	74.9	2,031		2.5		3.3		5.8	
Wealth quintile					0.000					0.000					0.000						
Lowest	15.9	10.0	24.2	206		17.3	14.7	20.4	1,158		13.2	10.6	16.3	1,350		1.4		-4.1		-2.7	
Second	22.9	16.5	30.9	202		28.1	24.6	31.8	1,092		26.6	23.0	30.5	1,330		5.2		-1.5		3.7	
Middle	32.0	24.9	40.1	219		40.5	36.5	44.7	945		43.9	39.9	48.0	1,100		8.5		3.4		11.9	**
Higher	41.9	31.5	53.2	185		57.9	53.8	61.9	892		60.6	56.5	64.5	1,060		16.0	**	2.7		18.7	**
Highest	70.7	60.5	79.1	187		74.9	71.1	78.3	858		77.9	74.2	81.2	1,060		4.2		3.0		7.2	
Total	**35.9**	**31.1**	**41**	**999**		**41.4**	**39.3**	**43.6**	**4,945**		**42.1**	**39.8**	**44.4**	**5,900**		**5.5**	*	**0.7**		**6.2**	*

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 12. Percentage of children age 12-23 months fully vaccinated, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS							
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
Sex of child					0.011					0.858					0.532			
Male	9.1	6.5	12.5	512		22.6	20.5	24.7	2448		25.7	23.6	28.0	3,066		13.5 ***	3.1 *	16.6 ***
Female	17.0	11.8	23.9	486		22.8	20.8	24.9	2497		24.9	22.6	27.3	2,834		5.8	2.1	7.9 *
Residence					0.000					0.000					0.000			
Urban	25.1	18.8	32.8	312		37.5	34.1	41.1	1,498		42.5	39.2	45.9	2,113		12.4 **	5.0	17.4 ***
Rural	7.4	4.5	11.8	687		16.2	14.5	18.0	3,447		15.8	13.9	17.8	3,787		8.8 **	-0.4	8.4 **
Zone					0.000					0.000					0.000			
North Central	12.4	7.2	20.5	149		25.9	22.0	30.2	640		26.9	22.2	32.1	812		13.5 **	1.0	14.5 **
North East	6.0	3.3	10.4	219		7.6	5.6	10.4	780		14.2	11.4	17.5	1,023		1.6	6.6 **	8.2 **
North West	3.7	1.8	7.6	356		6.0	4.3	8.3	1,545		9.6	7.4	12.4	2,100		2.3	3.6 *	5.9 *
South East	44.6	31.6	58.4	74		42.9	37.8	48.1	504		51.7	45.7	57.6	550		-1.7	8.8 *	7.1
South South	20.8	12.3	33.1	120		36.0	30.1	42.5	663		52.0	45.9	58.0	591		15.2 *	16.0 ***	31.2 ***
South West	32.5	22.7	44.1	81		42.8	37.5	48.2	814		40.9	36.6	45.4	823		10.3	-1.9	8.4
Mother's education					0.000					0.000					0.000			
None	3.8	2.1	6.5	484		6.5	5.4	7.9	2248		6.9	5.6	8.6	2,807		2.7	0.4	3.1
Primary	13.0	8.2	19.8	247		23.1	20.1	26.3	1107		26.3	23.0	29.8	1,062		10.1 *	3.2	13.3 **
Secondary or higher	29.4	21.4	39.0	268		45.2	42.1	48.4	1590		50.3	47.3	53.2	2,031		15.8 **	5.1 *	20.9 ***
Wealth quintile					0.000					0.000					0.000			
Lowest	3.4	1.5	7.4	206		4.8	3.6	6.3	1,158		3.6	2.6	5.0	1,350		1.4	-1.2	0.2
Second	3.9	1.6	9.0	202		11.9	9.8	14.4	1,092		11.5	9.4	14.1	1,330		8.0 *	-0.4	7.6 *
Middle	8.9	4.8	15.9	219		19.7	16.8	22.8	945		24.0	20.9	27.5	1,100		10.8 **	4.3	15.1 ***
Higher	11.0	7.0	16.8	185		33.4	29.6	37.4	892		39.3	35.3	43.4	1,060		22.4 ***	5.9 *	28.3 ***
Highest	39.9	30.7	49.9	187		52.7	48.3	57.0	858		57.7	54.0	61.4	1,060		12.8 *	5.0	17.8 **
Total	**12.9**	**9.9**	**16.7**	**999**		**22.7**	**21.0**	**24.4**	**4,945**		**25.3**	**23.5**	**27.2**	**5,900**		**9.8 *****	**2.6 ***	**12.4 *****

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 13. Percentage of households owning at least one ITN, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS										
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]		Diff. 2008-2013[2]		Diff. 2003-2013[2]	
Under-fives in household					0.019					0.000					0.000						
No	1.7	1.1	2.7	3,462		5.4	4.9	6.0	17,612		42.1	40.5	43.7	19,025		3.7	***	36.7	***	40.4	***
Yes	2.9	2.0	4.0	3,763		10.7	9.8	11.6	16,458		56.8	55.0	58.6	19,497		7.8	***	46.1	***	53.9	***
Residence					0.000					0.155					0.000						
Urban	1.1	0.7	1.6	2,598		8.6	7.6	9.6	12,100		42.1	40.1	44.2	16,609		7.5	***	33.5	***	41.0	***
Rural	3.1	2.1	4.4	4,627		7.6	6.9	8.5	21,970		55.2	53.0	57.3	21,913		4.5	***	47.6	***	52.1	***
Zone					0.025					0.000					0.000						
North Central	4.3	1.9	9.5	1,040		7.4	6.3	8.7	4,568		49.6	45.5	53.7	5,942		3.1		42.2	***	45.3	***
North East	1.3	0.6	2.9	1,185		7.1	5.7	8.9	3,730		60.9	55.9	65.6	5,115		5.8	***	53.8	***	59.6	***
North West	3.1	1.9	5.1	1,911		7.9	6.4	9.7	7,178		49.2	46.1	52.3	9,992		4.8	***	41.3	***	46.1	***
South East	2.8	1.4	5.5	690		9.8	8.0	12.0	4,527		57.1	53.7	60.5	4,687		7.0	***	47.3	***	54.3	***
South South	2.0	1.0	4.2	1,315		10.3	8.7	12.1	5,966		42.7	39.4	46.1	5,239		8.3	***	32.4	***	40.7	***
South West	0.3	0.1	0.8	1,083		6.0	5.0	7.2	8,100		42.3	38.7	45.9	7,546		5.7	***	36.3	***	42.0	***
Wealth quintile					0.000					0.000					0.000						
Lowest	4.6	2.6	8.1	1,413		4.0	3.2	5.0	6,119		55.1	50.3	59.7	6,245		-0.6		51.1	***	50.5	***
Second	1.4	0.7	2.6	1,347		6.2	5.1	7.4	6,219		54.6	51.9	57.2	7,166		4.8	***	48.4	***	53.2	***
Middle	2.5	1.6	3.9	1,408		7.9	7.0	9.0	7,065		52.5	50.1	55.0	7,894		5.4	***	44.6	***	50.0	***
Higher	2.1	1.3	3.4	1,446		9.7	8.5	10.9	7,216		45.8	43.3	48.3	8,310		7.6	***	36.1	***	43.7	***
Highest	1.2	0.7	1.9	1,611		11.2	10.0	12.4	7,451		42.5	40.4	44.6	8,907		10.0	***	31.3	***	41.3	***
Total	**2.3**	**1.7**	**3.2**	**7,225**		**8.0**	**7.4**	**8.6**	**34,070**		**49.5**	**48.0**	**51.1**	**38,522**		**5.7**	*******	**41.5**	*******	**47.2**	*******

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 14. Percentage of children under age 5 who slept under an ITN the night before the survey, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS										
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]		Diff. 2008-2013[2]		Diff. 2003-2013[2]	
Current age of child					0.430					0.000					0.000						
<12 months	1.4	0.7	2.8	1,412		6.7	5.8	7.6	5,730		18.9	17.2	20.7	6,372		5.3	***	12.2	***	17.5	***
1 year	1.5	0.8	3.0	1078		6.4	5.6	7.4	4,987		17.9	16.3	19.7	6,060		4.9	***	11.5	***	16.4	***
2 years	0.9	0.3	2.2	1171		5.5	4.7	6.5	4,815		17.5	16.0	19.0	5,737		4.6	***	12.0	***	16.6	***
3 years	1.5	0.7	3.2	1192		4.4	3.7	5.1	5,336		14.9	13.5	16.3	6,137		2.9	**	10.5	***	13.4	***
4 years	0.8	0.3	2.0	1008		4.2	3.6	5.0	4,915		13.7	12.4	15.1	6,021		3.4	***	9.5	***	12.9	***
Sex of child					0.698					0.346					0.397						
Male	1.2	0.6	2.3	2,986		5.3	4.7	6.0	13,079		16.3	15.1	17.7	15,275		4.1	***	11.0	***	15.1	***
Female	1.3	0.7	2.2	2,875		5.6	5.0	6.3	12,703		16.8	15.5	18.2	15,049		4.3	***	11.2	***	15.5	***
Residence					0.116					0.012					0.053						
Urban	0.7	0.3	1.4	1,787		6.5	5.5	7.7	7,937		18.1	16.3	20.1	10,979		5.8	***	11.6	***	17.4	***
Rural	1.5	0.7	2.9	4,074		5.0	4.4	5.7	17,846		15.7	14.1	17.4	19,348		3.5	***	10.7	***	14.2	***
Zone					0.134					0.000					0.000						
North Central	2.8	0.9	8.6	854		3.8	3.0	4.8	3,607		16.9	14.0	20.3	4,177		1.0		13.1	***	14.1	**
North East	0.4	0.1	1.4	1,349		3.6	2.7	4.9	4,118		12.1	9.8	14.8	5,237		3.2	***	8.5	***	11.7	***
North West	1.7	0.7	4.1	1,965		4.1	3.2	5.4	7,792		14.8	12.5	17.5	10,994		2.4		10.7	***	13.1	***
South East	1.6	0.6	4.2	365		10.5	8.4	13.1	2,490		24.2	20.7	28.0	2,739		8.9	***	13.7	***	22.6	***
South South	0.5	0.1	2.3	774		9.4	7.6	11.6	3,399		19.0	16.6	21.8	2,915		8.9	***	9.6	***	18.5	***
South West	0.0			554		5.0	3.9	6.3	4,377		19.6	17.0	22.5	4,264		5.0	***	14.6	***	19.6	
Mother's education					0.451					0.000					0.000						
None	1.4	0.7	2.9	2,764		3.1	2.5	3.8	11,043		13.6	11.8	15.6	13,876		1.7		10.5	***	12.2	***
Primary	0.8	0.3	2.6	1,278		5.5	4.7	6.5	5,565		18.9	16.9	21.0	5,465		4.7	**	13.4	***	18.1	***
Secondary or higher	0.9	0.4	2.1	1,411		9.6	8.5	10.8	7,423		20.0	18.6	21.5	9,194		8.7	***	10.4	***	19.1	***
Missing	1.8	0.7	4.3	380							15.1	12.7	17.7	1,660		-1.8	***	15.1		13.3	***
Wealth quintile					0.009					0.000					0.000						
Lowest	2.6	1.2	5.5	1,263		2.5	1.9	3.4	5,817		11.8	9.8	14.2	6,927		-0.1		9.3	***	9.2	***
Second	0.4	0.2	1.1	1,273		4.3	3.4	5.4	5,770		17.4	14.9	20.1	6,818		3.9	***	13.1	***	17.0	***
Middle	1.3	0.5	3.6	1,156		6.3	5.3	7.5	4,953		19.8	17.7	22.2	5,812		5.0	**	13.5	***	18.5	***
Higher	0.9	0.3	2.4	1,116		7.1	5.9	8.6	4,668		17.0	15.2	19.1	5,547		6.2	***	9.9	***	16.1	***
Highest	0.8	0.3	1.7	1,053		8.0	6.8	9.4	4,574		17.7	15.8	19.7	5,222		7.2	***	9.7	***	16.9	***
Total	**1.2**	**0.7**	**2.2**	**5,861**		**5.5**	**4.9**	**6.1**	**25,782**		**16.6**	**15.4**	**17.8**	**30,327**		**4.3**	*******	**11.1**	*******	**15.4**	*******

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 15. Percentage of children under age 5 with recent diarrhea for whom care was sought from a health facility or provider, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS							
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
Current age of child					0.130					0.011					0.012			
<6 months	20.1	11.2	33.4	85		24.5	18.7	31.3	196		23.5	17.1	31.4	171		4.4	-1.0	3.4
6-11 months	24.1	16.9	33.1	178		34.5	28.5	40.9	424		33.3	28.7	38.2	537		10.4	-1.2	9.2
1 year	17.7	13.1	23.4	272		34.0	30.5	37.7	805		31.2	27.9	34.7	984		16.3 ***	-2.8	13.5 ***
2 years	23.5	13.3	38.0	239		34.5	30.2	39.1	469		24.4	20.5	28.8	609		11.0	-10.1 **	0.9
3 years	9.4	4.6	18.2	153		25.5	21.0	30.5	380		29.4	24.3	35.0	387		16.1 *	3.9	20.0 **
4 years	18.7	10.1	32.0	79		32.3	27.2	37.9	257		25.0	19.5	31.4	279		13.6	-7.3	6.3
Sex of child					0.127					0.737					0.584			
Male	21.3	15.7	28.3	524		31.7	28.7	34.8	1,336		28.4	25.4	31.6	1,482		10.4 **	-3.3	7.1
Female	16.9	11.8	23.6	482		32.3	29.1	35.8	1,194		29.4	26.6	32.5	1,484		15.4 ***	-2.9	12.5 **
Residence					0.057					0.000					0.001			
Urban	30.2	16.0	49.5	235		40.4	35.0	46.1	608		35.0	30.7	39.6	958		10.2	-5.4	4.8
Rural	15.9	12.5	20.0	771		29.3	26.6	32.2	1,922		26.0	23.2	29.0	2,008		13.4 ***	-3.3	10.1 ***
Zone					0.000					0.012					0.002			
North Central	37.3	29.2	46.2	116		38.4	31.6	45.8	193		42.0	32.9	51.7	295		1.1	3.6	4.7
North East	6.6	4.0	10.7	430		27.6	23.6	31.9	831		24.4	20.8	28.3	1,061		21.0 ***	-3.2	17.8 ***
North West	26.0	15.4	40.5	343		32.6	28.3	37.2	998		28.7	24.7	33.0	961		6.6	-3.9	2.7
South East	(23.2)	(8.4)	(49.8)	30		33.6	23.6	45.3	120		27.5	21.6	34.3	266		10.4	-6.1	4.3
South South	(23.3)	(10.9)	(43.0)	55		25.2	17.8	34.6	127		31.3	23.3	40.7	124		1.9	6.1	8.0
South West	(38.9)	(22.5)	(58.3)	31		41.4	33.2	50.0	261		33.8	26.1	42.5	259		2.5	-7.6	-5.1
Mother's education					0.000					0.000					0.000			
None	14.3	9.2	21.4	641		27.1	24.2	30.2	1,565		24.3	21.4	27.5	1,638		12.8 **	-2.8 ns	10.0 *
Primary	22.3	15.6	30.7	216		36.5	31.5	41.7	519		32.2	27.6	37.1	553		14.2 **	-4.3 ns	9.9 ns
Secondary or higher	36.0	25.4	48.2	149		43.8	38.5	49.3	446		36.4	32.2	40.8	775		7.8 ns	-7.4 *	0.4 ns
Wealth quintile					0.000					0.000					0.000			
Lowest	8.9	5.5	14.0	252		23.2	20.0	26.9	811		19.1	15.6	23.1	832		14.3 ***	-4.1	10.2 **
Second	7.4	4.6	11.6	263		28.3	24.3	32.6	717		28.0	24.0	32.3	774		20.9 ***	-0.3	20.6 ***
Middle	21.8	14.4	31.7	210		38.1	33.3	43.2	441		31.5	26.5	37.1	549		16.3 *	-6.6	9.7
Higher	38.2	22.8	56.4	194		40.0	33.5	46.9	348		38.0	31.9	44.4	450		1.8	-2.0	-0.2
Highest	36.4	24.0	50.9	87		51.9	42.7	60.9	213		38.3	31.5	45.6	362		15.5	-13.6	1.9
Total	**19.2**	**14.4**	**25.2**	**1,006**		**32.0**	**29.5**	**34.6**	**2,530**		**28.9**	**26.6**	**31.4**	**2,966**		**12.8 *****	**-3.1**	**9.7 ****

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Figures in parentheses are based on 25-49 unweighted cases.

Appendix Table 16. Percentage of children under age 5 with recent symptoms of ARI for whom care was sought from a health facility or provider, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS							
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
Current age of child					0.165					0.670					0.317			
<6 months	20.4	12.2	32.2	84		33.4	21.8	47.4	61		(28.2)	(14.2)	(48.2)	44		13.0	-5.2	7.8
6-11 months	32.2	21.3	45.5	109		33.8	24.4	44.6	93		33.5	23.0	46.0	93		1.6	-0.3	1.3
1 year	39.5	29.7	50.3	118		33.5	26.7	41.0	190		30.5	23.9	38.0	184		-6.0	-3.0	-9.0
2 years	39.8	27.6	53.5	104		30.3	22.8	39.1	142		44.6	34.8	54.9	115		-9.5	14.3	4.8
3 years	29.5	19.3	42.2	83		25.2	17.8	34.3	118		31.9	20.1	46.6	59		-4.3	6.7	2.4
4 years	30.5	16.3	49.7	53		34.5	24.9	45.5	86		35.8	25.5	47.6	69		4.0	1.3	5.3
Sex of child					0.890					0.098					0.467			
Male	32.5	24.7	41.3	284		28.6	23.3	34.6	348		36.2	29.9	43.0	279		-3.9	7.6	3.7
Female	33.2	24.7	43.0	266		34.5	29.1	40.4	342		32.8	26.6	39.7	286		1.3	-1.7	-0.4
Residence					0.783					0.624					0.003			
Urban	34.2	25.1	44.7	126		33.5	25.1	43.2	172		46.6	36.9	56.6	154		-0.7	13.1	12.4
Rural	32.4	24.6	41.3	424		30.9	26.0	36.3	519		30.0	25.0	35.5	411		-1.5	-0.9	-2.4
Zone					0.014					0.000					0.269			
North Central	53.2	36.8	68.8	53		56.8	41.5	70.9	47		28.5	18.1	42.0	83		3.6	-28.3 **	-24.7 *
North East	22.2	12.7	36.0	198		24.4	18.2	31.8	299		32.7	27.1	39.0	257		2.2	8.3	10.5
North West	37.5	24.6	52.5	160		46.5	36.3	57.0	143		40.5	28.6	53.5	91		9.0	-6.0	3.0
South East	(54.1)	(27.0)	(79.0)	22		(33.0)	(18.8)	(51.1)	43		29.9	17.7	45.8	53		-21.1	-3.1	-24.2
South South	23.7	12.9	39.3	84		14.6	8.3	24.5	115		32.1	19.4	48.3	48		-9.1	17.5	8.4
South West	(50.4)	(34.1)	(66.6)	33		(48.2)	(29.6)	(67.4)	43		a	a	a			-2.2	9.4	7.2
Mother's education					0.001					0.089					0.023			
None	23.2	16.9	31.0	295		29.7	24.2	36.0	386		31.2	25.7	37.3	277		6.5	1.5	8.0
Primary	41.8	29.8	54.9	143		27.9	20.4	36.9	155		27.5	18.1	39.3	115		-13.9	-0.4	-14.3
Secondary or higher	46.7	34.4	59.4	112		40.1	31.3	49.6	149		44.4	35.3	53.9	173		-6.6	4.3	-2.3
Wealth quintile					0.000					0.013					0.000			
Lowest	18.4	11.5	28.0	128		23.1	17.5	29.9	216		26.8	20.4	34.5	140		4.7	3.7	8.4
Second	25.4	14.0	41.6	138		30.8	23.3	39.4	200		27.7	20.9	35.8	189		5.4	-3.1	2.3
Middle	33.2	22.5	46.0	129		33.0	23.3	44.5	118		40.7	30.6	51.7	114		-0.2	7.7	7.5
Higher	45.2	33.0	58.0	94		40.2	28.8	52.7	97		36.9	26.3	49.1	72		-5.0	-3.3	-8.3
Highest	60.5	45.3	74.0	60		(48.0)	(34.0)	(62.4)	59		(63.7)	(44.3)	(79.5)	50		-12.5	15.7	3.2
Total	**32.8**	**26.4**	**40.0**	**550**		**31.6**	**27.2**	**36.2**	**690**		**34.5**	**29.9**	**39.3**	**565**		**-1.2**	**2.9**	**1.7**

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Figures in parentheses are based on 25-49 unweighted cases. An [a] indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.

Appendix Table 17. Percentage of children under age 5 with recent fever for whom care was sought from a health facility or provider, Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS							
	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	%	LB	UB	N	P-value[1]	Diff. 2003-2008[2]	Diff. 2008-2013[2]	Diff. 2003-2013[2]
Current age of child					0.034					0.303					0.109			
<6 months	27.3	19.7	36.4	161		30.0	24.4	36.3	268		33.3	27.1	40.0	203		2.7	3.3	6.0
6-11 months	34.7	27.5	42.6	275		36.8	32.4	41.5	553		35.5	30.6	40.6	556		2.1	-1.3	0.8
1 year	34.7	29.2	40.6	395		36.7	33.3	40.2	1,054		31.8	28.4	35.3	1,034		2.0	-4.9	-2.9
2 years	36.5	29.9	43.6	351		36.0	32.4	39.8	826		31.4	27.5	35.5	736		-0.5	-4.6	-5.1
3 years	30.1	24.3	36.7	282		33.1	29.1	37.3	688		31.1	26.8	35.8	591		3.0	-2.0	1.0
4 years	22.0	15.7	29.8	195		36.5	32.1	41.1	579		26.3	22.0	31.1	512		14.5 **	-10.2 **	4.3
Sex of child					0.492					0.755					0.696			
Male	33.0	28.7	37.7	842		35.2	32.5	38.1	2,075		31.8	29.0	34.8	1,867		2.2	-3.4	-1.2
Female	31.1	26.5	36.1	817		35.7	33.1	38.5	1,893		31.1	28.3	34.0	1,766		4.6	-4.6 *	0.0
Residence					0.001					0.004					0.002			
Urban	41.5	34.9	48.4	438		41.1	36.7	45.6	987		36.5	32.4	40.8	1,262		-0.4	-4.6	-5.0
Rural	28.7	24.7	33.1	1,221		33.6	31.0	36.2	2,981		28.8	26.1	31.6	2,370		4.9	-4.8 *	0.1
Zone					0.000					0.000					0.000			
North Central	50.2	42.5	58.0	187		46.6	40.2	53.0	331		38.6	31.0	46.9	297		-3.6	-8.0	-11.6 *
North East	19.2	13.8	26.2	458		29.1	24.6	34.1	872		27.0	23.8	30.5	1,045		9.9 *	-2.1	7.8 *
North West	34.4	28.6	40.7	648		40.2	36.0	44.7	1,189		34.1	29.5	39.0	1,034		5.8	-6.1	-0.3
South East	32.9	24.0	43.1	79		28.3	23.2	34.1	555		23.9	18.5	30.3	498		-4.6	-4.4	-9.0
South South	27.8	19.1	38.5	202		28.5	23.2	34.4	682		28.2	21.5	35.9	460		0.7	-0.3	0.4
South West	53.1	40.5	65.3	84		49.9	42.8	57.0	340		48.6	40.6	56.7	297		-3.2	-1.3	-4.5
Mother's education					0.000					0.000					0.000			
None	23.4	18.6	28.9	955		32.8	29.9	35.9	1,846		27.9	24.9	31.1	1,718		9.4 **	-4.9 *	4.5
Primary	40.7	33.4	48.6	356		32.1	28.4	36.1	893		29.3	24.9	34.1	714		-8.6	-2.8	-11.4 *
Secondary or higher	47.1	39.8	54.5	348		41.9	38.0	45.8	1,229		37.9	34.1	41.8	1,200		-5.2	-4.0	-9.2 *
Wealth quintile					0.000					0.000					0.000			
Poorest	20.3	15.0	26.9	381		27.1	23.4	31.0	1,001		25.2	21.3	29.6	899		6.8	-1.9	4.9
Poorer	21.0	15.8	27.4	391		32.9	28.9	37.1	953		29.1	25.2	33.3	837		11.9 **	-3.8	8.1
Middle	31.8	25.6	38.6	364		35.1	31.2	39.3	765		30.0	25.4	35.0	756		3.3	-5.1	-1.8
Richer	45.5	37.0	54.2	312		41.7	37.1	46.5	674		35.1	30.2	40.3	614		-3.8	-6.6	-10.4
Richest	54.4	44.8	63.8	211		47.4	41.8	53.1	575		43.6	37.5	50.0	526		-7.0	-3.8	-10.8
Total	**32.1**	**28.5**	**35.9**	**1,659**		**35.5**	**33.2**	**37.7**	**3,968**		**31.5**	**29.2**	**33.8**	**3,632**		**3.4**	**-4.0 ***	**-0.6**

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Appendix Table 18. Percentage of children under age 5 with recent diarrhea who received oral rehydration solution (ORS) Nigeria 2003, 2008, and 2013

	2003 DHS					2008 DHS					2013 DHS							
	%	LB	UB	N	P-value	%	LB	UB	N	P-value	%	LB	UB	N	P-value	Diff. 2003-2008	Diff. 2008-2013	Diff. 2003-2013
Current age of child					0.025					0.005					0.006			
<6 months	14.4	7.9	24.7	85		20.8	15.2	27.8	196		20.7	14.6	28.5	171		6.4	-0.1	6.3
6-11 months	20.6	13.5	30.0	178		30.1	24.7	36.0	424		37.1	32.4	42.0	537		9.5	7.0	16.5 **
1 year	17.2	12.9	22.4	272		28.1	24.5	32.1	805		36.3	32.6	40.3	984		10.9 **	8.2 **	19.1 ***
2 years	25.0	18.3	33.1	239		24.5	20.6	29.0	469		30.8	26.6	35.4	609		-0.5	6.3	5.8
3 years	8.6	4.9	14.7	153		18.6	14.8	23.2	380		32.1	26.7	38.0	387		10.0 *	13.5 ***	23.5 ***
4 years	18.9	10.6	31.5	79		25.6	20.4	31.6	257		34.3	27.5	41.9	279		6.7	8.7 ns	15.4
Sex of child					0.239					0.542					0.062			
Male	19.8	16.0	24.3	524		25.0	22.3	28.0	1,336		31.8	28.6	35.2	1,482		5.2	6.8 **	12.0 ***
Female	16.5	12.8	21.0	482		26.1	23.1	29.4	1,194		35.6	32.3	39.0	1,484		9.6 ***	9.5 ***	19.1 ***
Residence					0.053					0.000					0.000			
Urban	22.9	18.1	28.5	235		40.5	34.7	46.5	608		44.7	40.5	49.1	958		17.6 ***	4.2	21.8 ***
Rural	16.8	13.6	20.6	771		20.8	18.3	23.5	1,922		28.4	25.3	31.8	2,008		4.0	7.6 ***	11.6 ***
Zone					0.140					0.000					0.009			
North Central	22.3	13.5	34.6	116		33.5	27.5	40.1	193		41.7	32.9	51.2	295		11.2	8.2	19.4 *
North East	13.8	10.5	17.9	430		17.6	14.0	21.9	831		28.5	24.3	33.0	1,061		3.8	10.9 ***	14.7 ***
North West	20.5	15.8	26.1	343		25.2	21.2	29.6	998		33.7	29.1	38.7	961		4.7	8.5 **	13.2 ***
South East	(17.4)	(7.1)	(36.7)	30		32.9	22.9	44.7	120		37.0	29.0	45.8	266		15.5	4.1	19.6
South South	(27.7)	(14.7)	(46.0)	55		23.7	15.9	33.9	127		31.7	22.3	42.9	124		-4.0	8.0	4.0
South West	(23.3)	(11.8)	(40.7)	31		43.7	35.9	51.8	261		43.6	35.6	52.0	259		20.4 *	-0.1	20.3 *
Mother's education					0.000					0.000					0.000			
None	13.2	10.2	17.0	641		19.5	16.8	22.6	1,565		28.6	25.2	32.2	1,638		6.3 *	9.1 ***	15.4 ***
Primary	22.4	15.7	30.9	216		30.7	26.3	35.5	519		32.0	27.4	37.0	553		8.3	1.3	9.6
Secondary or higher	33.7	23.2	46.0	149		40.7	35.1	46.5	446		45.7	41.1	50.5	775		7.0	5.0	12.0
Wealth quintile					0.002					0.000					0.000			
Lowest	12.6	9.0	17.4	252		15.3	12.1	19.2	811		20.4	16.5	25.1	832		2.7	5.1	7.8 *
Second	14.8	9.9	21.5	263		20.2	16.7	24.3	717		30.3	26.6	34.4	774		5.4	10.1 **	15.5 **
Middle	18.5	11.5	28.4	210		31.8	27.4	36.6	441		38.4	33.2	43.8	549		13.3 *	6.6	19.9 **
Higher	21.1	15.3	28.4	194		35.6	29.3	42.5	348		42.8	36.3	49.6	450		14.5 **	7.2	21.7 ***
Highest	37.7	24.8	52.5	87		53.0	43.4	62.4	213		53.0	46.2	59.7	362		15.3	0.0	15.3 *
Total	**18.2**	**15.4**	**21.5**	**1,006**		**25.5**	**23.2**	**28.1**	**2,530**		**33.7**	**31.1**	**36.4**	**2,966**		**7.3 *****	**8.2 *****	**15.5 *****

LB and UB are the lower and upper boundaries of 95% confidence intervals. [1] P-value of association test for each year. [2] Percentage point difference between survey years with significance tests for the difference in proportions. P-values *<0.05 **<0.01 ***<0.001

Figures in parentheses are based on 25-49 unweighted cases.