

# Nigeria

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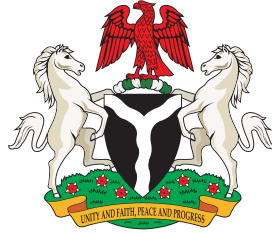
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**Malaria Indicator  
Survey**

**2015**

**Key Indicators**





The Federal Republic of Nigeria

# Nigeria

## Malaria Indicator Survey 2015

### Key Indicators

**National Malaria Elimination Programme**  
Federal Republic of Nigeria  
Abuja, Nigeria

**National Population Commission**  
Federal Republic of Nigeria  
Abuja, Nigeria

**National Bureau of Statistics**  
Federal Republic of Nigeria  
Abuja, Nigeria

**ICF International**  
Rockville, Maryland, USA

March 2016



The 2015 Nigeria Malaria Indicator Survey (2015 NMIS) was implemented by the National Malaria Elimination Programme (NMEP), the National Population Commission (NPopC), and the National Bureau of Statistics (NBS) from October 2015 through November 2015. Funding for the 2015 NMIS was provided by the United States Agency for International Development (USAID), the Global Fund to Fight AIDS, Tuberculosis, and Malaria, the United Kingdom Department for International Development (DFID) through the Support to National Malaria Program (SuNMaP), and UNICEF. ICF International provided technical assistance as well as funding to the project through The DHS Program, a USAID-funded project providing support and technical assistance in the implementation of population and health surveys in countries worldwide.

Additional information about the 2015 NMIS may be obtained from the National Malaria Elimination Programme, 1<sup>st</sup> Floor, Abia House, Central Business District, Abuja; Telephone: +234 803000296 or the headquarters of the National Population Commission, Plot 2031, Olusegun Obasanjo Way, Zone 7 Wuse District, PMB 0281, Abuja, Nigeria; Telephone: +234 9 523 9173; Fax: +234 9 5231024.

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## ACRONYMS

ACT	artemisinin-based combination therapy
ANC	antenatal care
CAPI	computer assisted personal interviewing
CSPro	Censuses and Surveys Processing
EA	enumeration area
FCT	Federal Capital Territory
FMoH	Federal Ministry of Health
ICF	ICF International ( <i>originally, Inner City Fund</i> )
IPTp	intermittent preventive treatment in pregnancy
IRS	indoor residual spraying
ITN	insecticide-treated net
LGA	Local Government Area
LLIN	long lasting insecticide-treated Net
LUTH	Lagos University Teaching Hospital
NBS	National Bureau of Statistics
NHREC	National Health Research Ethics Committee
NMEP	National Malaria Elimination Programme
NMIS	Nigeria Malaria Indicator Survey
NPHC	National Population and Housing Census
NPopC	National Population Commission
PSU	primary sampling unit
RBM	Roll Back Malaria
RDT	rapid diagnostic test
SP	sulphadoxine-pyrimethamine



# 1 INTRODUCTION

The 2015 Nigeria Malaria Indicator Survey (2015 NMIS) was implemented by the National Malaria Elimination Programme (NMEP), the National Population Commission (NPopC), and the National Bureau of Statistics (NBS) from October 2015 through November 2015 on a nationally representative sample of more than 8,000 households.

All women age 15-49 years in these households were eligible for individual interviews. During the interviews, they were asked questions about malaria prevention during pregnancy and treatment of childhood fevers. Children age 6 to 59 months who lived in the households were tested for anaemia and malaria, using finger- or heel-prick blood sample. Results were immediate and were provided to each child's parents or guardians. In addition, thick blood smears and thin films were made in the field and transported to the Department of Medical Microbiology and Parasitology at the College of Medicine, Lagos University Teaching Hospital (LUTH), University of Lagos. Microscopy was performed to determine the presence of malaria parasites and to identify the parasite species. Slide validation was carried out by the University of Calabar Teaching Hospital in Calabar.

The primary objectives of the 2015 NMIS were to provide information on malaria indicators and malaria prevalence, both at the national level and also in each of the country's 36 states and the Federal Capital Territory. The 2015 NMIS follows the 2010 NMIS and is the second malaria indicator survey conducted in Nigeria.

This Key Indicators report presents a first look at selected results of the 2015 NMIS. A comprehensive analysis of the data will appear in a later final report.



## 2 SURVEY IMPLEMENTATION

### 2.1 SAMPLE DESIGN

The sample for the 2015 NMIS was designed to provide most indicators for the country as a whole, for urban and rural areas separately, and for each of the country's six geo-political zones. Some of the survey indicators are provided for each of the 36 states and the Federal Capital Territory (FCT). Nigeria's geo-political zones and states are as follows:

1. **North Central:** Benue, Kogi, Kwara, Nasarawa, Niger, Plateau States and FCT
2. **North East:** Adamawa, Bauchi, Borno<sup>1</sup>, Gombe, Taraba, and Yobe States
3. **North West:** Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, and Zamfara States
4. **South East:** Abia, Anambra, Ebonyi, Enugu, and Imo States
5. **South South:** Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers States
6. **South West:** Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo States

The sampling frame for the 2015 NMIS is the National Population and Housing Census (NPHC) of the Federal Republic of Nigeria, which was conducted in 2006 by the National Population Commission (NPopC). Administratively, Nigeria is divided into states. Each state is subdivided into local government areas (LGAs), and each LGA is divided into localities. In addition to these administrative units, during the 2006 Population Census, each locality was subdivided into convenient areas called census enumeration areas (EAs). The primary sampling unit (PSU), referred to as a cluster for the 2015 NMIS, is defined on the basis of EAs from the 2006 EA census frame.

A two-stage sampling strategy was adopted. In the first stage, nine clusters (EAs) were selected from each state of the federation, including the Federal Capital Territory (FCT). The selection was done in such a way that it was representative of each state. This gave a total of 333 clusters across the country: 138 clusters in urban areas and 195 clusters in rural areas.

A complete list of households was made, and a mapping exercise was carried out for each cluster from June 2015 through July 2015. The resulting household lists from each cluster served as the sampling frame for the selection of households in the second stage. All dwellings with people residing within households were listed. The NPopC listing enumerators used global positioning system (GPS) receivers to record the coordinates of the 2015 NMIS sample clusters.

In the second stage of the selection process, 25 households were selected in each cluster by equal probability systematic sampling. All women age 15-49 who were either permanent residents of the households in the 2015 NMIS sample or visitors present in the households on the night before the survey were eligible to be interviewed. In addition, all children age 6-59 months residing in the selected households were eligible for malaria and anaemia tests. This sample size was used to guarantee that the survey key indicators could be produced for each of the country's six geo-political zones, where approximately 1,338 women in each zone were

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<sup>1</sup> Due to the state of insecurity in Borno during the data collection period, fieldwork was completed in three of the nine EAs included in the 2015 survey sample. Data collection did not occur in the remaining six EAs. No EAs in rural areas of Borno were visited; thus, estimates for national indicators and indicators in the North East zone do not include rural clusters of Borno.

expected to complete interviews. To produce some of the survey indicators at the state level for each of the 36 states and the FCT, individual interviews with approximately 217 women in each state were expected.

## **2.2 QUESTIONNAIRES**

Three questionnaires—the Household Questionnaire, the Woman’s Questionnaire, and the Biomarker Questionnaire—were used for the 2015 NMIS. These questionnaires were adapted to reflect the population and health issues relevant to Nigeria. The modifications were decided upon at a series of meetings with various stakeholders from the National Malaria Elimination Programme (NMEP) and other government ministries and agencies, nongovernmental organizations, and international donors. In addition to English, the questionnaires were translated into the three major Nigerian languages: Hausa, Igbo, and Yoruba. The questionnaires were programmed onto table computers, enabling computer assisted personal interviewing (CAPI) to be used for the survey.

The Household Questionnaire was used to list all the usual household members and visitors of selected households. Some basic information was collected on the characteristics of each person listed in the household, including his or her age, sex, education, and relationship to the head of the household. The data on the age and sex of household members, obtained from the Household Questionnaire, was used to identify women who were eligible for an individual interview. Additionally, the Household Questionnaire collected information on characteristics of the household’s dwelling unit, such as the source of water, type of toilet facilities, materials used for the floor of the house, ownership of various durable goods, and ownership and use of mosquito nets. The Women’s Questionnaire was used to collect information from all women age 15-49. These women were asked questions on the following main topics:

- Background characteristics (education and media exposure, for example)
- Birth history and childhood mortality
- Antenatal care and malaria prevention for most recent birth and pregnancy
- Malaria prevention and treatment
- Knowledge about malaria (symptoms, causes, prevention, and drugs used in treatment)

The Biomarker Questionnaire was used to record the results of the anaemia and malaria testing as well as the signatures of the fieldworker and the respondent who gave consent.

## **2.3 ANAEMIA AND MALARIA TESTING**

The 2015 NMIS collected finger- (or heel-) prick blood samples from children age 6-59 months to perform on-the-spot testing for anaemia and malaria. Thick and thin blood smears were collected to be read in the laboratory to detect the presence of *Plasmodium* parasites and to determine the parasite species. Each field team included one laboratory scientist who carried out the anaemia and malaria testing and prepared the blood smears. A nurse provided malaria medications for children who tested positive for malaria, in accordance with the appropriate treatment protocols. Written, informed consent for each test was granted by the child’s parent or guardian before tests were conducted. The survey protocol, including blood specimen collection and analysis, was approved by ICF International’s institutional review board and by the Nigeria National Health Research Ethics Committee (NHREC).

*Anaemia testing.* Due to the strong correlation between malaria infection and anaemia, the 2015 NMIS included anaemia testing for children age 6-59 months to ascertain anaemia prevalence. Blood samples were drawn using a single-use, retractable, spring-loaded, sterile lancet to make a finger- or heel-prick. Health technicians then collected blood in a microcuvette from the finger- or heel-prick. Haemoglobin analysis was carried out on site using a battery-operated portable HemoCue ® analyser, which produces a result in less than 1 minute. Results were given to the child's parent or guardian verbally and in writing. Parents of children with a haemoglobin level under 8 g/dl were advised to take the child to a health facility for follow-up care and were given a referral letter with the haemoglobin reading to show to staff at the health facility. Results of the anaemia test were recorded on the Household Questionnaire and on a brochure which also contained information on the causes and prevention of anaemia was left in the household.

*Malaria testing using a rapid diagnostic test (RDT).* Another major objective of the NMIS was to provide information about the extent of malaria infection among children age 6-59 months. Using the same finger- (or heel-) prick used for anaemia testing, a drop of blood was tested immediately using the SD BIOLINE Malaria Ag P.f (HRP-II)<sup>TM</sup> rapid diagnostic test (RDT), which is a qualitative test to detect histidine-rich protein II antigen of malaria *Plasmodium falciparum* in human whole blood. *Plasmodium falciparum* (Pf) is the major cause of malaria in Nigeria. The test includes a disposable sample applicator that comes in a standard package. A tiny volume of blood is captured on an applicator and placed in the well of the testing device. All field laboratory scientists were trained to perform the RDT in the field, in accord with manufacturers' instructions. The laboratory scientists read, interpreted, and recorded RDT results after 15 minutes. RDT results were recorded as either positive or negative, with faint test lines being considered positive. As with the anaemia testing, malaria RDT results were provided to the child's parent or guardian in oral and written form and were recorded on the Biomarker Questionnaire. Children who tested positive for malaria using the RDT were offered a full course of treatment according to Nigeria national malaria treatment guidelines, provided they were not currently on treatment with ACT and had not completed a full course of ACT during the preceding 2 weeks. To ascertain the correct dose, nurses on each field team were provided with treatment guidance charts and were instructed to ask about signs of severe malaria and about any medications the child might already be taking. The nurses then provided the age-appropriate dose of ACT along with instructions on how to administer the medicine to the child.<sup>2</sup>

*Malaria testing using blood smears.* In addition to the RDT, thick and thin blood smears were prepared in the field. Each blood smear slide was given a bar code label, with a duplicate affixed to the Biomarker Questionnaire. An additional copy of the bar code label was affixed to a blood sample transmittal form to track the blood samples from the field to the laboratory. The slides were dried in a dust-free environment and stored in slide boxes. The laboratory scientists fixed the thin smears in the field at the end of each day by dipping each slide in absolute methanol. The thick and thin smear slides were collected regularly from the field, along with the completed questionnaires, and transported to zonal staining sites for staining, after which they were taken to Lagos University Teaching Hospital (LUTH) for logging and microscopic reading. Thick smears were first examined to determine presence of *Plasmodium* infection. Thin smears for all positive thick smears were then read to determine the species of *Plasmodium* parasite.

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<sup>2</sup> Dosage of ACT was based on recipient's age. The proper dosage for a child age 6 months to 3 years is one tablet of artemether-lumefantrine (co-formulated tablets containing 20 mg of artemether and 120 mg of lumefantrine) to be taken twice daily for 3 days, while the dosage for a child age 4-7 is two tablets of artemether-lumefantrine to be taken twice daily for 3 days. Artesunate-amodiaquine was also used. For children age 2-11 months, co-formulated tablets containing 25 .mg of artesunate and 67.5 mg of amodiaquine were given to be taken once daily for 3 days. For children 1-5 years, co-formulated tablets containing 50 mg of artesunate and 135 mg of amodiaquine were given to be taken once daily for 3 days.

## **2.4 TRAINING OF FIELD STAFF**

A two-level training method was adopted. The first level of training was the training of trainers (TOT), which involved the state coordinators who were senior officers from the three main implementing agencies (NMEP, NPopC, and NBS), other stakeholders, and some laboratory scientists who assisted in the training for the main survey. This training lasted for 2 weeks.

For the main training, which lasted 3 weeks, NMEP, NPopC, and NBS recruited and trained 287 people for the fieldwork. They served as supervisors (team leaders), interviewers, reserve interviewers, quality control officers, nurses, laboratory scientists, state coordinators, IT officers, and other central coordinators. Training of field staff for the main survey was conducted during a 3-week period in September 2015. The training course consisted of instruction regarding interviewing techniques and field procedures, a detailed review of items on the questionnaires, use of computer assisted personal interviewing (CAPI), instruction for administering and obtaining parental/guardian consent to test children for anaemia and malaria, mock interviews between participants in the classroom, and practice interviews with real respondents in areas outside the 2015 NMIS sample points. Forty-two laboratory scientists were provided 3 weeks of instruction and practice in collecting blood samples from children under age 5 years. Forty-one nurses who were trained as interviewers were also trained to offer and administer treatment to children with positive RDTs. Forty team supervisors underwent additional training in supervisor CAPI responsibilities and fieldwork coordination. Thirty-seven supervisors, 111 interviewers (of whom 37 were nurses), and 37 laboratory scientists were selected for the 37 field teams. Nineteen state coordinators, 19 quality control officers, 1 central lab coordinator, and 2 general central coordinators were engaged to coordinate and monitor state teams. The state coordinators were also responsible for transferring slides to zonal staining sites. Additionally, in September 2015, 16 lab scientists from 8 zonal staining centres were trained on the 2015 NMIS blood smear staining protocol in a 2-day centralized training in September 2015.

## **2.5 FIELDWORK**

Thirty-seven field teams carried out data collection for the 2015 NMIS. Each team consisted of one supervisor (team leader), three interviewers (one of whom was a nurse), one laboratory scientist, and one driver. In addition to quality control officers and state and central coordinators, Roll Back Malaria (RBM) partners and national monitors from the three implementing agencies also monitored the fieldwork. Data collection took place over a 6-week period, from October 2015 through November 2015.

## **2.6 DATA PROCESSING**

Data for the 2015 NMIS was collected in the form of responses to questions on tablet computers. The computers were programmed by an ICF data processing specialist and loaded with the Household, Biomarker, and Woman's Questionnaires in English and the three major local languages. They were Bluetooth-enabled to facilitate electronic transfer of files, for example, the transfer of questionnaire data from the Household Questionnaires among survey team members and the transfer of completed questionnaires to the team supervisors' tablets. The field supervisors transferred data on a daily basis to the central data processing office using the Internet. To facilitate communication and monitoring, each field worker was assigned a unique identification number.

The Census Survey Processing software (CSPro) was used for data editing, weighting, cleaning, and tabulation. In the NPopC central office, data received from the supervisors' tablets were registered and checked for any inconsistencies and outliers. Data editing and cleaning included structure and internal consistency checks to ensure completeness of work in the field. Any anomalies were communicated to the respective team through field coordinators and the team supervisor. Corrected results were resent to the central processing unit.



## 3 RESULTS

### 3.1 RESPONSE RATES

The household and individual response rates for the 2015 NMIS are shown in Table 1. A total of 8,148 households were selected for the sample. This does not include six rural clusters in Borno State and one cluster in Plateau State that were dropped from the sample because of security concerns. Of these households, 7,841 were occupied. Of the occupied households, 7,745 were successfully interviewed, yielding a response rate of 99 percent. The response rate among households in rural areas was slightly higher (99 percent) than in urban areas (98 percent). No clusters in rural areas of Borno State were visited; thus, estimates for national indicators and indicators in the North East Zone do not include rural Borno State.

In the interviewed households, 8,106 women were identified as eligible for individual interview. Interviews were completed with 8,034 women, yielding a response rate of 99 percent. The eligible women's response rate does not differ by urban or rural residence.

### 3.2 HOUSEHOLD COMPOSITION

Information on the composition of households appears in Table 2. Fifteen percent of households are headed by women, with female headship higher in urban (19 percent) than in rural (12 percent) areas. The mean household size is 4.9 persons. Household size is similar in urban (4.6 persons) and rural areas (5.1 persons). Eleven percent of households have nine or more persons. The proportion of households with nine or more persons is higher in rural (13 percent) than urban (8 percent) areas.

### 3.3 CHARACTERISTICS OF THE RESPONDENTS

To provide a demographic and socioeconomic profile of individual female respondents, Tables 3.1 and 3.2 provide the distribution of women age 15-49 by age group, residence, zone, education, wealth, and state.

More than half of respondents are less than age 30, and 6 in 10 (61 percent) reside in rural areas. The largest proportion of respondents lives in the North West (29 percent), and the smallest proportion lives in the South East (10 percent).

**Table 1 Results of the household and individual interviews**

Number of households, number of interviews, and response rates, according to residence (unweighted), Nigeria 2015

Result	Residence		Total
	Urban	Rural	
<b>Household interviews</b>			
Households selected	3,400	4,748	8,148
Households occupied	3,231	4,610	7,841
Households interviewed	3,166	4,579	7,745
Household response rate <sup>1</sup>	98.0	99.3	98.8
<b>Interviews with women age 15-49</b>			
Number of eligible women	3,221	4,885	8,106
Number of eligible women interviewed	3,200	4,834	8,034
Eligible women response rate <sup>2</sup>	99.3	99.0	99.1

Note: National estimates do not include rural areas of Borno State.

<sup>1</sup> Households interviewed/households occupied.

<sup>2</sup> Respondents interviewed/eligible respondents.

**Table 2 Household composition**

Percent distribution of households by sex of head of household and by household size, and mean size of household, according to residence, Nigeria 2015

Background characteristic	Residence		Total
	Urban	Rural	
<b>Household headship</b>			
Male	81.1	88.3	85.4
Female	18.9	11.7	14.6
Total	100.0	100.0	100.0
<b>Number of usual members</b>			
1	13.7	10.1	11.5
2	10.8	11.2	11.0
3	16.2	13.3	14.5
4	14.5	13.4	13.8
5	14.6	13.7	14.0
6	10.8	11.4	11.1
7	7.0	8.2	7.7
8	4.4	6.0	5.4
9+	8.1	12.7	10.9
Total	100.0	100.0	100.0
Mean size of households	4.6	5.1	4.9
Number of households	3,083	4,662	7,745

Notes: National estimates do not include rural areas of Borno State. Table is based on de jure household members, i.e. usual residents.

**Table 3.1 Background characteristics of respondents: National**

Percent distribution of women age 15-49 by selected background characteristics, Nigeria 2015

Background characteristic	Number of women		
	Weighted percent	Weighted number	Unweighted number
<b>Age</b>			
15-19	17.1	1,376	1,405
20-24	19.1	1,533	1,512
25-29	20.4	1,636	1,620
30-34	16.5	1,325	1,329
35-39	12.1	971	986
40-44	9.1	729	715
45-49	5.8	464	467
<b>Residence</b>			
Urban	39.0	3,129	3,200
Rural	61.0	4,905	4,834
<b>Zone</b>			
North Central	16.9	1,357	1,472
North East	13.4	1,077	1,541
North West	29.4	2,359	1,814
South East	10.1	811	927
South South	13.4	1,080	1,172
South West	16.8	1,351	1,108
<b>Education</b>			
No education	38.8	3,119	2,982
Primary	15.5	1,244	1,273
Secondary	35.5	2,848	2,935
More than secondary	10.2	823	844
<b>Wealth quintile</b>			
Lowest	18.0	1,444	1,262
Second	19.1	1,534	1,471
Middle	19.5	1,567	1,672
Fourth	20.5	1,651	1,801
Highest	22.9	1,837	1,828
Total 15-49	100.0	8,034	8,034

Notes: Estimates for North East Zone do not include the rural areas in Borno State. Education categories refer to the highest level of education attended, whether or not that level was completed.

Thirty-nine percent of women have never attended school, 16 percent have attended primary school, 36 percent have attended secondary school, and 10 percent have gone beyond secondary schooling. There has been a slight improvement since the 2010 NMIS, when 43 percent of women had no education, and 8 percent had gone beyond secondary schooling.

Table 3.2 presents by state of residence the weighted and unweighted numbers and the weighted percent distributions of interviewed women age 15-49.

<b>Table 3.2 Background characteristics of respondents: States</b>			
Percent distribution of women age 15-49 by state, Nigeria 2015			
State	Number of women		
	Weighted percent	Weighted number	Unweighted number
<b>North Central</b>			
FCT-Abuja	0.6	46	178
Benue	3.3	267	179
Kogi	2.3	188	220
Kwara	2.4	195	183
Nasarawa	1.6	131	262
Niger	3.6	285	205
Plateau	3.0	244	245
<b>North East</b>			
Adamawa	2.6	209	313
Bauchi	3.5	284	274
Borno - Urban	0.7	58	88
Gombe	1.9	155	287
Taraba	2.0	163	289
Yobe	2.6	207	290
<b>North West</b>			
Jigawa	4.6	371	281
Kaduna	3.8	305	244
Kano	6.1	491	252
Katsina	6.5	519	279
Kebbi	2.5	198	221
Sokoto	2.2	178	251
Zamfara	3.7	297	286
<b>South East</b>			
Abia	1.5	123	207
Anambra	2.2	177	116
Ebonyi	2.0	159	213
Enugu	2.0	162	214
Imo	2.4	189	177
<b>South South</b>			
Akwa Ibom	2.3	187	197
Bayelsa	1.6	126	234
Cross River	1.9	151	194
Delta	1.8	144	164
Edo	1.4	112	152
Rivers	4.5	361	231
<b>South West</b>			
Ekiti	1.2	99	157
Lagos	4.5	358	261
Ogun	1.9	151	188
Ondo	1.8	145	129
Osun	2.9	235	170
Oyo	4.5	362	203
Total 15-49	100.0	8,034	8,034

Notes: Estimates for North East Zone do not include the rural areas in Borno State. Education categories refer to the highest level of education attended, whether or not that level was completed.

### 3.4 MALARIA

An estimated 3.2 billion people worldwide are at risk for malaria, a preventable and treatable mosquito-borne illness. In 2015 alone, there were an estimated 214 million new cases of malaria and 438,000 deaths. (WHO 2015). Of these, Nigeria accounted for up to 25 percent of the global cases and deaths.

This section presents data to help assess how well malaria control strategies are working. Included are the percentages of households with nets available, the sources of these nets, and net usage by household members. The chapter also presents information for other preventive measures such as the use of indoor residual spraying (IRS) against mosquitoes and the prophylactic use of antimalarial drugs by pregnant women.

Data are shown in detail for the following indicators:

- Household ownership of mosquito nets
- Distribution of nets by source of mosquito net
- Mosquito net usage among household members, pregnant women, and children under age 5 who slept inside a net the night before the survey
- Household receiving IRS
- Women who took one or more preventive doses of antimalarial drugs during pregnancy, at least one of which was obtained as part of antenatal care from a health facility (referred to as intermittent preventive treatment or IPTp)
- Children under age 5 who experienced an episode of fever in the 2 weeks preceding the survey, whether advice or treatment was sought, the timeliness with which advice was sought, and whether the child had blood taken for testing
- Rates of anaemia and malaria among children age 6-59 months

### 3.5 OWNERSHIP OF MOSQUITO NETS

Tables 4.1 and 4.2 present national and state data, respectively, showing the percentages of households that own at least one mosquito net, insecticide-treated net (ITN), and long-lasting insecticidal net (LLIN); the average number of nets, ITNs, and LLINs per household; and the percentages of households with at least one net, ITN, and LLIN for every two persons who stayed in the household the night preceding the survey. National data are shown by background characteristics for residence, zone, and wealth quintile.

Overall, 71 percent of households in Nigeria have at least one mosquito net, 69 percent have at least one ITN, and 69 percent have at least one LLIN. Most nets in Nigeria are LLINs. Net ownership is higher in rural than in urban areas: 73 percent of rural households have at least one LLIN compared with 63 percent of urban households. By zone, ownership of at least one LLIN is highest in the North West (91 percent) and lowest in the South West (53 percent). Ownership of at least one LLIN decreases with increasing wealth. Eighty-six percent of households in the lowest wealth quintile own at least one LLIN, decreasing to 58 percent of households in the highest wealth quintile. By state, ownership of at least one LLIN ranges from 38 percent in Kwara and Edo to 97 percent in Katsina and Bauchi.

On average, households in Nigeria own 1.7 nets, 1.6 ITNs, and 1.6 LLINs. Rural households own 1.8 LLINs, while urban households own 1.4. By zone, the average number of LLINs owned by households ranges

from 1.0 in South West to 2.3 in North West. The average number of LLINs owned by households decreases from 2.3 among households in the lowest wealth quintile to 1.2 among households in the highest wealth quintile. By state, mean LLIN ownership ranges from 0.7 in five states (Delta, Kwara, Lagos, Ogun, and Ondo) to 2.8 in Jigawa and Katsina.

**Table 4.1 Household ownership of insecticide-treated mosquito nets: National**

Percentage of households with at least one mosquito net (treated or untreated), insecticide-treated net (ITN), and long-lasting insecticidal net (LLIN); average number of nets, ITNs, and LLINs per household; and percentage of households with at least one net, ITN, and LLIN per two persons who stayed in the household last night, by background characteristics, Nigeria 2015

Background Characteristic	Percentage of households with at least one mosquito net			Average number of nets per household			Number of households	Percentage of households with at least one mosquito net for every two persons who stayed in the household last night <sup>1</sup>			Number of households with at least one person who stayed in the household last night
	Any mosquito net	Insecticide-treated mosquito net (ITN) <sup>2</sup>	Long-lasting insecticidal net (LLIN)	Any mosquito net	Insecticide-treated mosquito net (ITN) <sup>2</sup>	Long-lasting insecticidal net (LLIN)		Any mosquito net	Insecticide-treated mosquito net (ITN) <sup>2</sup>	Long-lasting insecticidal net (LLIN)	
<b>Residence</b>											
Urban	65.7	63.0	62.8	1.4	1.4	1.4	3,083	31.5	29.9	29.9	3,071
Rural	74.7	72.7	72.6	1.8	1.8	1.8	4,662	39.6	38.1	38.0	4,657
<b>Zone</b>											
North Central	56.9	55.4	55.2	1.2	1.2	1.2	1,311	25.8	24.8	24.7	1,310
North East	80.1	79.6	79.6	2.1	2.1	2.1	843	38.0	36.9	36.9	842
North West	91.3	90.6	90.6	2.4	2.3	2.3	1,993	45.5	44.8	44.8	1,989
South East	69.9	64.0	63.3	1.6	1.4	1.4	876	40.0	36.4	36.2	874
South South	66.3	63.9	63.5	1.6	1.5	1.5	1,154	42.1	40.1	39.8	1,150
South West	56.6	53.0	53.0	1.0	1.0	1.0	1,567	26.7	24.9	24.9	1,561
<b>Wealth quintile</b>											
Lowest	87.3	86.3	86.3	2.3	2.3	2.3	1,237	43.5	42.5	42.5	1,237
Second	73.8	73.2	73.1	1.8	1.8	1.7	1,423	36.9	36.0	36.0	1,423
Middle	70.6	68.8	68.8	1.7	1.6	1.6	1,621	38.6	37.2	37.1	1,617
Fourth	67.4	64.0	63.8	1.6	1.5	1.5	1,682	36.3	34.4	34.3	1,677
Highest	61.7	57.8	57.5	1.2	1.2	1.2	1,782	29.1	27.0	26.8	1,773
<b>Total</b>	<b>71.1</b>	<b>68.8</b>	<b>68.7</b>	<b>1.7</b>	<b>1.6</b>	<b>1.6</b>	<b>7,745</b>	<b>36.4</b>	<b>34.9</b>	<b>34.8</b>	<b>7,727</b>

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> De facto household members.

<sup>2</sup> An insecticide-treated mosquito net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Although ownership of at least one mosquito net is high across Nigeria (71 percent), only 3 in 10 households have at least one LLIN for every two persons who slept in the household the night preceding the survey, 38 percent in rural areas and 30 percent in urban areas.

Ownership of at least one LLIN has increased steadily from 44 percent in the 2010 NMIS to 48 percent in the 2013 NDHS, and to 69 percent in 2015. The average number of LLINs owned by households increased from 0.8 in 2013 to 1.6 in 2015. Ownership of at least one LLIN per every two persons who slept in the household the night preceding the survey increased from 21 percent in 2013 to 35 percent in 2015. Much of the increase in net ownership has been among urban households.

Table 4.2 Household ownership of insecticide-treated mosquito nets: States

Percentage of households with at least one mosquito net (treated or untreated), insecticide-treated net (ITN), and long-lasting insecticidal net (LLIN); average number of nets, ITNs, and LLINs per household; and percentage of households with at least one net, ITN, and LLIN per two persons who stayed in the household last night, by state, Nigeria 2015

State	Percentage of households with at least one mosquito net			Average number of nets per household			Number of households	Percentage of households with at least one mosquito net for every two persons who stayed in the household last night <sup>1</sup>			Number of households with at least one person who stayed in the household last night
	Any mosquito net	Insecticide-treated mosquito net (ITN) <sup>2</sup>	Long-lasting insecticidal net (LLIN)	Any mosquito net	Insecticide-treated mosquito net (ITN) <sup>2</sup>	Long-lasting insecticidal net (LLIN)		Any mosquito net	Insecticide-treated mosquito net (ITN) <sup>2</sup>	Long-lasting insecticidal net (LLIN)	
<b>North Central</b>											
FCT-Abuja	48.5	45.1	42.2	1.0	0.9	0.9	41	28.0	23.4	22.9	41
Benue	42.6	41.7	41.7	0.8	0.8	0.8	313	16.3	15.6	15.6	313
Kogi	59.1	54.7	54.7	1.1	1.0	1.0	174	22.0	20.2	19.8	174
Kwara	39.2	37.7	37.7	0.7	0.7	0.7	195	15.1	13.6	13.6	195
Nasarawa	77.6	76.4	76.4	2.1	2.0	2.0	92	33.3	33.0	33.0	92
Niger	62.1	61.2	60.8	1.3	1.3	1.3	293	36.9	36.3	36.3	293
Plateau	78.9	78.3	78.3	1.9	1.9	1.9	202	34.2	33.6	33.6	202
<b>North East</b>											
Adamawa	70.6	70.6	70.6	1.6	1.6	1.6	150	31.1	31.1	31.1	150
Bauchi	98.6	97.3	97.3	2.8	2.7	2.7	235	56.3	53.0	53.0	235
Borno - Urban	64.1	64.1	64.1	1.2	1.2	1.2	48	11.3	11.3	11.3	47
Gombe	87.2	86.9	86.9	2.5	2.4	2.4	122	38.7	37.7	37.7	122
Taraba	53.6	52.9	52.9	1.0	0.9	0.9	128	17.1	16.5	16.5	128
Yobe	82.6	82.6	82.6	2.3	2.3	2.3	161	41.8	41.8	41.8	161
<b>North West</b>											
Jigawa	95.4	95.4	95.4	2.8	2.8	2.8	301	55.9	55.7	55.7	301
Kaduna	92.8	91.6	91.6	2.6	2.6	2.6	274	55.0	52.9	52.9	274
Kano	89.0	88.0	88.0	2.1	2.1	2.1	423	40.7	40.2	40.2	423
Katsina	97.6	97.1	97.1	2.8	2.8	2.8	409	54.2	53.7	53.7	405
Kebbi	86.7	86.7	86.7	1.6	1.6	1.6	200	22.1	22.1	22.1	200
Sokoto	77.8	77.3	77.3	1.3	1.3	1.3	157	24.0	24.0	24.0	157
Zamfara	90.1	88.6	88.6	2.7	2.6	2.6	229	49.1	47.3	47.3	229
<b>South East</b>											
Abia	66.5	51.9	50.6	1.3	1.0	1.0	134	37.5	29.9	28.9	132
Anambra	74.8	74.8	73.5	1.7	1.7	1.7	234	49.8	47.9	47.9	234
Ebonyi	89.5	88.9	88.4	2.8	2.7	2.7	151	64.2	62.7	62.7	151
Enugu	56.6	56.6	56.6	0.9	0.9	0.9	165	19.8	19.8	19.8	165
Imo	62.5	45.9	45.9	1.2	0.8	0.8	192	28.1	20.4	20.4	192
<b>South South</b>											
Akwa Ibom	75.5	74.2	74.2	2.2	2.2	2.2	204	55.6	54.8	54.8	203
Bayelsa	51.0	45.4	45.4	1.1	1.0	1.0	120	26.0	22.7	22.7	120
Cross River	86.0	82.7	80.6	2.0	1.9	1.8	180	58.8	55.2	54.7	179
Delta	49.6	43.2	43.2	1.0	0.9	0.9	160	28.6	24.3	24.3	160
Edo	39.7	38.7	38.3	0.8	0.7	0.7	153	19.7	18.3	17.9	153
Rivers	75.8	75.4	75.4	1.8	1.8	1.8	337	47.3	46.8	46.3	335
<b>South West</b>											
Ekiti	73.4	73.4	73.4	1.5	1.5	1.5	138	50.7	50.2	50.2	137
Lagos	52.8	44.3	44.3	0.8	0.7	0.7	314	13.5	11.8	11.8	312
Ogun	50.5	39.1	39.1	0.9	0.7	0.7	172	25.0	19.2	19.2	169
Ondo	50.1	50.1	50.1	0.7	0.7	0.7	248	25.7	25.7	25.7	248
Osun	66.1	65.7	65.7	1.3	1.3	1.3	300	38.6	38.1	38.1	299
Oyo	53.4	51.3	51.3	1.1	1.0	1.0	396	21.2	18.6	18.6	396
<b>Total</b>	<b>71.1</b>	<b>68.8</b>	<b>68.7</b>	<b>1.7</b>	<b>1.6</b>	<b>1.6</b>	<b>7,745</b>	<b>36.4</b>	<b>34.9</b>	<b>34.8</b>	<b>7,727</b>

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> De facto household members.

<sup>2</sup> An insecticide-treated mosquito net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

### 3.6 SOURCE OF MOSQUITO NETS

There are many potential sources of nets in Nigeria. The Federal Ministry of Health (FMOH) and other stakeholders have conducted net distribution campaigns between 2009 and 2013 and net replacement campaigns from 2013 to 2015. Pregnant women may receive mosquito nets during a routine antenatal care (ANC) visit. Parents of children below age 5 may receive them during routine immunisation visits to health facilities. Mosquito nets can also be purchased directly at shops, markets or from hawkers.

Tables 5.1 and 5.2 present the percent distribution of mosquito nets by source of the net, first by national background characteristics of residence, zone, and wealth, and then by state. Three-fourths (77 percent) of nets were obtained through a campaign, compared with slightly more than half (56 percent) of nets in the 2010 NMIS. Seven percent came from an immunisation visit; 6 percent were purchased from a shop, supermarket, open market, or hawker; and 5 percent came from an antenatal care visit.

Table 5.1 Source of nets: National

Percent distribution of mosquito nets by source of the net, according to background characteristics, Nigeria 2015

Background characteristic	Campaign	Antenatal care visit	Immunisation visit	Government health facility	Non-government health facility <sup>1</sup>	Religious institution	Pharmacy/medicine store	Shop/supermarket/open market/hawker	School	Community directed distributor (CDD)	Other	Don't know/missing	Total	Number of mosquito nets
<b>Residence</b>														
Urban	74.4	5.4	5.2	1.9	0.2	0.1	0.7	9.0	0.2	0.8	1.9	0.2	100.0	4,369
Rural	77.7	4.3	7.7	2.4	0.1	0.4	0.2	5.0	0.1	1.1	0.9	0.1	100.0	8,569
<b>Zone</b>														
North Central	75.8	10.8	2.9	0.5	0.4	0.0	0.3	7.7	0.2	0.2	1.0	0.1	100.0	1,594
North East	68.0	4.1	6.2	0.1	0.2	0.0	0.5	20.2	0.1	0.1	0.3	0.1	100.0	1,754
North West	81.9	2.1	9.2	1.1	0.0	0.0	0.0	4.5	0.0	0.4	0.8	0.0	100.0	4,744
South East	80.5	4.8	7.0	1.2	0.1	0.3	0.0	1.9	0.2	1.7	2.2	0.0	100.0	1,382
South South	69.8	3.1	6.2	9.8	0.1	1.3	0.3	2.1	0.6	4.2	2.1	0.4	100.0	1,852
South West	75.6	8.5	5.2	1.9	0.2	0.5	1.3	4.2	0.2	0.2	2.0	0.2	100.0	1,612
<b>Wealth quintile</b>														
Lowest	81.2	2.5	8.3	0.3	0.0	0.0	0.3	6.5	0.0	0.4	0.6	0.0	100.0	2,833
Second	82.0	3.6	6.8	1.3	0.0	0.7	0.1	4.8	0.0	0.3	0.4	0.0	100.0	2,535
Middle	76.7	4.8	7.5	2.4	0.0	0.1	0.4	6.5	0.2	0.5	0.9	0.0	100.0	2,740
Fourth	72.8	5.8	6.1	4.1	0.3	0.3	0.3	5.4	0.4	2.6	1.7	0.2	100.0	2,612
Highest	68.9	7.3	5.3	3.4	0.3	0.3	0.7	8.9	0.4	1.3	2.8	0.3	100.0	2,219
<b>Total</b>	<b>76.6</b>	<b>4.7</b>	<b>6.9</b>	<b>2.2</b>	<b>0.1</b>	<b>0.3</b>	<b>0.3</b>	<b>6.4</b>	<b>0.2</b>	<b>1.0</b>	<b>1.2</b>	<b>0.1</b>	<b>100.0</b>	<b>12,938</b>

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> Includes nongovernmental organizations (NGOs), private hospitals, and mission clinics

A higher percentage of nets in urban households (9 percent) than in rural households (5 percent) came from a shop, supermarket, open market, or hawker. However, a higher percentage of households in rural areas obtained nets through immunisation visits than urban households (8 percent compared with 5 percent, respectively). The source of nets varied widely by zone. A higher percentage of nets came from ANC visits in North Central (11 percent) and South West (9 percent) than in other zones, which range from 2 to 5 percent. South South has the highest percentage of nets obtained from visits to government health facilities (10 percent), compared with the other zones, which are 2 percent of less. Twenty percent of nets in North East came from a shop, supermarket, open market, or hawker compared with 8 percent or less in other zones. Generally, the percentage of nets sourced from campaigns decreases with an increase in household wealth. Among households that obtained nets through ANC visits, however, the percentage increases with an increase in wealth quintile. Net source varies considerably across states; for example, 98 percent of nets were obtained from a campaign in Ekiti State, compared with 38 percent in Yobe State.

Table 5.2. Source of nets: States

Percent distribution of mosquito nets by source of the net, by state, Nigeria 2015

State	Campaign	Antenatal care visit	Immunisation visit	Government health facility	Non-government health facility <sup>1</sup>	Religious institution	Pharmacy/medicine store	Shop/supermarket/open market/hawker	School	Community directed distributor (CDD)	Other	Don't know/missing	Total	Number of mosquito nets
<b>North Central</b>														
FCT-Abuja	49.1	7.5	1.6	3.1	1.3	0.5	3.1	23.7	4.4	0.0	1.0	4.8	100.0	43
Benue	86.0	6.3	2.2	0.8	0.0	0.0	0.3	4.3	0.0	0.0	0.1	0.0	100.0	249
Kogi	69.5	7.4	6.1	0.0	2.9	0.0	0.4	10.3	0.0	1.4	2.1	0.0	100.0	196
Kwara	70.6	1.6	9.7	0.0	0.0	0.0	1.6	12.9	0.0	0.7	2.9	0.0	100.0	134
Nasarawa	81.1	7.8	3.3	1.2	0.0	0.0	0.3	5.8	0.0	0.0	0.5	0.0	100.0	190
Niger	66.7	21.1	0.7	0.0	0.0	0.0	0.0	10.3	0.3	0.0	0.9	0.0	100.0	391
Plateau	83.8	10.1	1.7	0.6	0.0	0.0	0.0	3.2	0.0	0.0	0.6	0.0	100.0	392
<b>North East</b>														
Adamawa	49.5	2.9	15.8	0.3	0.6	0.2	0.0	30.0	0.0	0.0	0.7	0.0	100.0	247
Bauchi	88.1	1.0	4.2	0.0	0.1	0.0	1.4	4.9	0.0	0.0	0.1	0.2	100.0	655
Borno - Urban	30.6	0.0	4.8	0.0	0.0	0.0	0.0	64.7	0.0	0.0	0.0	0.0	100.0	58
Gombe	85.4	12.1	0.5	0.0	0.0	0.0	0.0	0.6	0.6	0.4	0.2	0.2	100.0	302
Taraba	65.2	12.8	3.8	0.7	0.8	0.0	0.6	14.1	0.3	0.0	1.7	0.0	100.0	122
Yobe	37.5	1.3	9.2	0.0	0.0	0.0	0.0	51.7	0.0	0.0	0.3	0.0	100.0	370
<b>North West</b>														
Jigawa	66.5	1.8	31.2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	100.0	840
Kaduna	87.1	1.4	7.2	1.0	0.0	0.0	0.0	2.5	0.0	0.0	0.9	0.0	100.0	720
Kano	82.1	1.9	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0	2.6	0.0	100.0	885
Katsina	94.7	2.9	0.8	0.1	0.0	0.0	0.0	1.4	0.0	0.0	0.1	0.0	100.0	1,157
Kebbi	58.5	1.8	20.7	12.8	0.0	0.0	0.0	4.7	0.0	0.0	1.4	0.0	100.0	325
Sokoto	57.6	5.4	23.1	0.0	0.0	0.0	0.0	13.5	0.0	0.0	0.4	0.0	100.0	201
Zamfara	92.7	1.5	0.2	0.0	0.0	0.0	0.0	2.2	0.0	3.3	0.0	0.1	100.0	616
<b>South East</b>														
Abia	49.3	13.2	31.8	1.0	0.7	0.0	0.0	1.2	0.2	1.0	1.5	0.0	100.0	175
Anambra	91.1	2.5	0.6	0.0	0.0	0.7	0.0	3.9	0.0	0.4	0.7	0.0	100.0	408
Ebonyi	93.9	2.3	1.4	0.2	0.0	0.3	0.0	1.1	0.0	0.5	0.3	0.0	100.0	421
Enugu	77.1	12.7	9.6	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	100.0	149
Imo	62.9	2.0	8.1	6.3	0.0	0.0	0.0	1.1	1.0	8.1	10.5	0.0	100.0	229
<b>South</b>														
Akwa Ibom	66.7	0.6	0.8	21.8	0.0	0.0	0.1	1.1	0.0	5.1	3.0	0.8	100.0	453
Bayelsa	65.3	5.4	15.9	0.4	0.0	0.0	0.0	8.9	4.1	0.0	0.0	0.0	100.0	135
Cross River	88.6	3.9	7.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	362
Delta	57.6	7.8	2.4	18.2	0.3	0.5	0.5	5.4	0.0	0.0	7.2	0.0	100.0	162
Edo	63.2	8.2	15.4	0.6	0.6	0.0	4.5	4.7	0.0	0.0	2.9	0.0	100.0	117
Rivers	66.4	1.7	6.8	8.3	0.2	3.6	0.0	1.4	0.8	8.6	1.6	0.5	100.0	623
<b>South West</b>														
Ekiti	97.8	1.2	0.4	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	100.0	205
Lagos	62.1	14.5	7.4	0.0	1.3	0.0	0.0	7.6	0.0	0.0	7.1	0.0	100.0	255
Ogun	46.7	12.9	8.8	17.6	0.0	0.4	0.9	5.8	0.0	2.4	3.8	0.6	100.0	163
Ondo	86.5	4.5	2.0	0.0	0.0	0.0	2.3	4.6	0.0	0.0	0.0	0.0	100.0	176
Osun	88.9	2.5	2.0	0.0	0.0	0.4	2.0	1.9	0.0	0.0	2.0	0.4	100.0	379
Oyo	67.9	13.6	8.8	0.5	0.0	1.5	1.9	5.1	0.8	0.0	0.0	0.0	100.0	434
Total	76.6	4.7	6.9	2.2	0.1	0.3	0.3	6.4	0.2	1.0	1.2	0.1	100.0	12,938

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> Includes nongovernmental organizations (NGOs), private hospitals, and mission clinics

### 3.7 INDOOR RESIDUAL SPRAYING AGAINST MOSQUITOES

Indoor residual spraying (IRS) is the spraying of the interior walls and ceilings of a dwelling with long-lasting insecticide. Table 6 presents the percentage of households that have had IRS in the past 12 months, the percentage of households with at least one ITN and/or IRS in the past 12 months, and the percentage of households with at least one ITN for every two persons and/or IRS in the past 12 months, by background characteristics. One percent of households has had IRS in the past 12 months. Therefore, the patterns of IRS and/or ITN ownership follow the patterns of ITN ownership alone.



Table 6 Indoor residual spraying against mosquitoes

Percentage of households in which someone has come into the dwelling to spray the interior walls against mosquitoes (IRS) in the past 12 months, the percentage of households with at least one ITN and/or IRS in the past 12 months, and the percentage of households with at least one ITN for every two persons and/or IRS in the past 12 months, by background characteristics, Nigeria 2015

Background characteristic	Percentage of households with IRS <sup>1</sup> in the past 12 months	Percentage of households with at least one ITN <sup>2</sup> and/or IRS in the past 12 months	Percentage of households with at least one ITN <sup>2</sup> for every two persons and/or IRS in the past 12 months	Number of households
<b>Residence</b>				
Urban	2.0	63.2	30.8	3,083
Rural	0.8	72.9	38.6	4,662
<b>Zone</b>				
North Central	0.8	55.5	25.3	1,311
North East	2.5	80.1	38.4	843
North West	0.8	90.7	45.2	1,993
South East	2.6	64.1	37.2	876
South South	1.0	64.2	40.5	1,154
South West	0.9	53.2	25.4	1,567
<b>Wealth quintile</b>				
Lowest	0.6	86.3	42.9	1,237
Second	0.5	73.4	36.5	1,423
Middle	1.2	68.9	37.6	1,621
Fourth	1.8	64.3	35.0	1,682
Highest	1.8	58.1	27.9	1,782
Total	1.3	69.0	35.5	7,745

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.

<sup>2</sup> An insecticide-treated mosquito net (ITN) is a factory-treated net that does not require any further treatment (LLIN) or a net that has been soaked with insecticide within the past 12 months.

Nearly three-fourths (72 percent) of households with IRS were sprayed by a government worker or government program, 10 percent by a private company, 4 percent by a non-governmental organisation, 7 percent by other sources, and 8 percent did not know who did the spraying (data not shown).

### 3.8 USE OF MOSQUITO NETS

Table 7.1 shows, by background characteristics the percentages of the de facto household population who, the night before the survey, slept inside a mosquito net, inside an ITN, under an LLIN, and inside an ITN or in a dwelling with IRS in the past 12 months. The table also includes the percentages of the households that slept inside an ITN among households that own at least 1 ITN. Thirty-eight percent of the de facto household population slept inside a mosquito net, and 37 percent slept inside an ITN or an LLIN. This is an increase from the 2010 NMIS, when 24 percent of the de facto household population slept inside a net the night before the survey, and 23 percent slept inside an ITN or LLIN. In households with at least one ITN, half (50 percent) of the de facto household population slept inside an ITN the night preceding the survey – similar to the proportion in 2010.

Table 7.1 Use of mosquito nets by persons in the household: National

Percentages of de facto household population who, the night before the survey, slept inside a mosquito net (treated or untreated), inside an insecticide-treated net mosquito (ITN), inside a long-lasting insecticidal net (LLIN), and slept inside an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among the de facto household population with at least one ITN, the percentage who slept inside an ITN the night before the survey, by background characteristics, Nigeria 2015

Background characteristic	Household population				Household population in households with at least one ITN <sup>1</sup>		
	Percentage who slept inside any mosquito net last night	Percentage who slept inside an ITN <sup>1</sup> last night	Percentage who slept inside an LLIN last night	Percentage who slept inside an ITN <sup>1</sup> last night or in a dwelling sprayed with IRS <sup>2</sup> in the past 12 months	Number	Percentage who slept inside an ITN <sup>1</sup> last night	Number
<b>Residence</b>							
Urban	30.3	29.3	29.2	30.5	14,021	42.0	9,776
Rural	43.1	42.1	42.0	42.6	23,654	54.3	18,341
<b>Zone</b>							
North Central	31.0	30.2	30.1	30.7	6,467	50.3	3,884
North East	45.9	45.4	45.4	47.2	5,062	55.0	4,179
North West	55.1	54.4	54.3	54.7	11,823	59.1	10,877
South East	23.1	21.2	21.0	22.4	3,660	31.3	2,476
South South	30.3	28.9	28.5	29.8	4,563	42.3	3,122
South West	22.7	21.1	21.1	21.7	6,100	36.0	3,579
<b>Wealth quintile</b>							
Lowest	53.1	52.5	52.5	52.7	7,527	60.2	6,575
Second	45.6	44.6	44.6	45.1	7,540	58.3	5,769
Middle	40.6	39.8	39.7	40.4	7,549	52.3	5,756
Fourth	29.1	27.6	27.4	28.8	7,569	39.6	5,276
Highest	23.3	22.1	21.9	23.4	7,489	34.8	4,741
Total	38.4	37.3	37.2	38.1	37,674	50.0	28,117

Notes: Table is based on people who stayed in the household the night before the interview. Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> An insecticide-treated mosquito net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

<sup>2</sup> Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.

Members of rural households are more likely than their counterparts in urban households to have slept under an ITN or LLIN the previous night (42 percent compared with 29 percent, respectively). Among households with at least one ITN, more than half of the household population residing in rural areas (54 percent) slept under an ITN the previous night compared with 42 percent of urban households.

By zone, North West has the highest net use: 54 percent of the household population slept inside an LLIN the previous night, and in households with at least one ITN, 59 percent of the household population slept inside an ITN the previous night. Net use is lowest in South East, where 31 percent of the household population, in households with at least one ITN, slept inside an ITN the previous night. Among households with at least one ITN, ITN use decreases with increasing household wealth, where 60 percent of household members in the lowest wealth quintile slept inside an ITN the night preceding the survey, and 35 percent of household members in the highest wealth quintile slept inside an ITN.

Table 7.2 shows, by state, among households with at least one ITN, the percentage of the household population who slept inside an ITN the night before the survey. Net use varies considerably across states; for example, in households with at least one ITN, 82 percent of the de facto household population slept inside a net the previous night in Borno-Urban, compared with 13 percent in Abia State.

Table 7.2 Use of mosquito nets by persons in the household: States

Percentages of de facto household population who, the night before the survey, slept inside a mosquito net (treated or untreated), inside an insecticide-treated net mosquito (ITN), inside a long-lasting insecticidal net (LLIN), and slept inside an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among the de facto household population with at least one ITN, the percentage who slept inside an ITN the night before the survey, by state, Nigeria 2015

State	Household population				Number	Household population in households with at least one ITN <sup>1</sup>	
	Percentage who slept inside any mosquito net last night	Percentage who slept inside an ITN <sup>1</sup> last night	Percentage who slept inside an LLIN last night	Percentage who slept inside an ITN <sup>1</sup> last night or in a dwelling sprayed with IRS <sup>2</sup> in the past 12 months		Percentage who slept inside an ITN <sup>1</sup> last night	Number
<b>North Central</b>							
FCT-Abuja	18.0	17.4	16.2	22.3	191	37.6	89
Benue	25.2	24.6	24.6	25.1	1,397	51.9	662
Kogi	24.3	22.3	22.2	22.3	831	38.5	482
Kwara	17.7	16.6	16.6	16.6	872	39.3	368
Nasarawa	45.0	44.4	44.4	46.8	580	54.6	471
Niger	38.2	38.0	37.6	38.0	1,406	62.2	858
Plateau	38.8	38.4	38.4	38.4	1,189	47.8	953
<b>North East</b>							
Adamawa	31.7	31.6	31.6	31.6	904	44.9	637
Bauchi	60.6	59.2	59.2	61.1	1,457	60.1	1,437
Borno - Urban	57.5	57.5	57.5	57.5	271	81.7	191
Gombe	34.1	33.6	33.6	38.9	761	37.5	682
Taraba	27.5	27.3	27.3	28.1	684	49.1	381
Yobe	55.9	55.9	55.9	57.9	986	64.6	852
<b>North West</b>							
Jigawa	76.2	75.5	75.5	75.5	1,793	78.6	1,721
Kaduna	62.5	61.6	61.6	61.7	1,596	66.6	1,475
Kano	44.4	43.8	43.8	44.1	2,386	48.2	2,170
Katsina	53.6	53.6	53.6	53.8	2,601	54.9	2,542
Kebbi	37.6	37.6	37.6	38.6	1,214	43.1	1,059
Sokoto	48.7	48.7	48.7	48.7	816	63.5	626
Zamfara	59.4	56.4	56.1	57.2	1,417	62.3	1,284
<b>South East</b>							
Abia	10.5	7.0	6.6	7.8	516	13.0	279
Anambra	24.9	24.1	24.1	28.0	915	31.7	694
Ebonyi	51.0	50.0	49.4	50.8	755	55.1	685
Enugu	14.1	14.1	14.1	14.1	655	21.9	423
Imo	10.4	5.9	5.9	5.9	819	12.3	396
<b>South South</b>							
Akwa Ibom	37.5	36.8	36.8	37.0	796	45.3	647
Bayelsa	21.5	18.2	18.0	19.0	535	36.6	267
Cross River	52.1	49.6	47.6	49.6	662	57.5	570
Delta	20.7	18.1	17.6	18.7	634	38.0	302
Edo	11.5	10.7	10.7	12.2	602	22.5	285
Rivers	31.7	31.7	31.5	33.4	1,334	40.3	1,051
<b>South West</b>							
Ekiti	27.5	27.3	27.3	27.3	496	33.6	404
Lagos	13.8	11.1	11.1	13.3	1,402	24.6	631
Ogun	16.0	12.2	12.2	12.7	637	28.9	269
Ondo	20.1	20.1	20.1	20.1	806	39.0	416
Osun	21.9	21.4	21.4	21.4	1,074	29.8	770
Oyo	33.2	31.4	31.4	31.5	1,685	48.5	1,089
<b>Total</b>	<b>38.4</b>	<b>37.3</b>	<b>37.2</b>	<b>38.1</b>	<b>37,674</b>	<b>50.0</b>	<b>28,117</b>

Notes: Table is based on people who stayed in the household the night before the interview. Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> An insecticide-treated mosquito net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

<sup>2</sup> Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.

Pregnant women and young children are particularly vulnerable to malaria. Among pregnant women, the disease adversely affects birth outcomes and can lead to spontaneous abortion, pre-term labour, low birth weight, and stillbirth. Pregnant women and children are populations of particular interest to programs endeavouring to reduce the burden of malaria, and preventing malaria among pregnant women and children is a key step in reducing malaria-related morbidity and mortality. Among young children, malaria has high rates of mortality; and, even when not fatal, it can affect nutrition and growth.

Table 8 presents by background characteristics, the percentages of children under age 5 who, the night before the survey, slept inside a mosquito net, inside an ITN, inside an LLIN, and inside an ITN or in a dwelling with IRS in the past 12 months. The table also shows, among children under age 5 in households with at least one ITN, the percentage who slept inside an ITN the night before the survey, by background characteristics. Less than half of children under age 5 (45 percent) slept inside any mosquito net the night preceding the survey, although slightly more than half (57 percent) of children in households with at least one ITN slept inside an ITN the previous night. The proportion of children under age 5 sleeping inside any net has increased from 30 percent in 2010 to 45 percent in 2015, although the proportion of children in households with at least one ITN who slept inside an ITN the previous night has slightly decreased since 2010, from 59 percent to 57 percent.

**Table 8 Use of mosquito nets by children**

Percentages of children under age five who, the night before the survey, slept inside a mosquito net (treated or untreated), inside an insecticide-treated mosquito net (ITN), inside a long-lasting insecticidal net (LLIN), and slept inside an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among children under five years of age in households with at least one ITN, the percentage who slept inside an ITN the night before the survey, by background characteristics, Nigeria 2015

Background characteristic	Children under age five in all households				Number of children	Children under age five in households with at least one ITN <sup>1</sup>	
	Percentage who slept inside any mosquito net last night	Percentage who slept inside an ITN <sup>1</sup> last night	Percentage who slept inside an LLIN last night	Percentage who slept inside an ITN <sup>1</sup> last night or in a dwelling sprayed with IRS <sup>2</sup> in the past 12 months		Percentage who slept inside an ITN <sup>1</sup> last night	Number of children
<b>Residence</b>							
Urban	35.6	34.4	34.1	35.6	2,349	48.4	1,671
Rural	49.5	48.2	48.1	48.6	4,659	60.3	3,726
<b>Zone</b>							
North Central	39.6	39.1	38.8	39.3	1,305	59.7	854
North East	50.4	49.9	49.9	51.1	987	60.6	813
North West	62.8	61.9	61.9	62.2	2,280	65.9	2,141
South East	27.6	25.1	24.6	26.6	602	34.7	437
South South	35.4	32.7	31.8	33.7	777	46.3	548
South West	24.0	22.4	22.4	23.1	1,057	39.2	604
<b>Wealth quintile</b>							
Lowest	58.9	58.8	58.8	58.8	1,463	66.8	1,286
Second	52.0	51.0	50.9	51.4	1,616	66.0	1,247
Middle	47.2	46.0	45.8	46.6	1,329	56.9	1,074
Fourth	33.6	31.6	31.2	32.6	1,303	43.7	942
Highest	28.8	26.9	26.6	28.3	1,298	41.3	847
<b>Total</b>	<b>44.8</b>	<b>43.6</b>	<b>43.4</b>	<b>44.2</b>	<b>7,008</b>	<b>56.6</b>	<b>5,397</b>

Notes: Table is based on children who stayed in the household the night before the interview. Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> An insecticide-treated mosquito net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

<sup>2</sup> Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.

Similar to net use in the household population seen in Table 7.1, children in rural areas (50 percent) were more likely to have slept inside any net the previous night than children in urban areas (36 percent). By zone, North West has the highest net use among children; two-thirds (66 percent) of children in households with at least one ITN slept inside an ITN the previous night. In South East, 35 percent of children in households with at least one ITN slept inside an ITN the previous night. As seen with the household population, net use decreases with increasing wealth. In households with at least one ITN, 67 percent of children under 5 in the lowest wealth quintile slept inside an ITN the night preceding the survey compared with 41 percent in the highest wealth quintile.

Table 9 presents the percentage of pregnant women age 15-49 who, the night before the survey, slept inside any mosquito net, inside an ITN, inside an LLIN, and inside an ITN or in a dwelling with IRS in the past 12 months; and among pregnant women age 15-49 in households with at least one ITN, the percentage who slept inside an ITN the night before the survey, by background characteristics. Half (50 percent) of pregnant women age 15-49 slept inside any mosquito net the previous night, and more than half (62 percent) of women in households with at least one ITN slept inside an ITN the previous night. As seen in the preceding net use tables, while the percentage of pregnant women who slept inside a net the previous night has increased since the 2010 NMIS (when it was 35 percent) to 50 percent, the proportion of pregnant women in households with at least one ITN who slept inside an ITN the previous night has decreased from 65 percent to 62 percent.

**Table 9 Use of mosquito nets by pregnant women**

Percentages of pregnant women age 15-49 who, the night before the survey, slept inside a mosquito net (treated or untreated), inside an ITN, and slept inside an ITN or in a dwelling in which the interior walls have been sprayed against mosquitos (IRS) in the past 12 months; and among pregnant women age 15-49 in households with at least one ITN, the percentage who slept inside an ITN the night before the survey, by background characteristics, Nigeria 2015

Background characteristic	Among pregnant women age 15-49 in all households				Number of pregnant women	Among pregnant women age 15-49 in households with at least one ITN <sup>1</sup>	
	Percentage who slept inside any mosquito net last night	Percentage who slept inside an ITN <sup>1</sup> last night	Percentage who slept inside an LLIN last night	Percentage who slept inside an ITN <sup>1</sup> last night or in a dwelling sprayed with IRS <sup>2</sup> in the past 12 months		Percentage who slept inside an ITN <sup>1</sup> last night	Number of pregnant women
<b>Residence</b>							
Urban	37.5	36.0	35.4	36.6	271	50.0	196
Rural	55.9	54.7	54.7	55.0	626	67.0	511
<b>Zone</b>							
North Central	39.5	37.8	37.8	37.8	129	61.8	79
North East	57.2	55.5	55.5	56.8	140	62.5	124
North West	68.6	67.8	67.8	67.8	325	72.0	306
South East	24.9	23.1	20.9	24.7	77	36.5	48
South South	33.4	33.4	33.4	34.1	107	49.4	72
South West	35.6	33.2	33.2	33.2	119	52.1	76
<b>Wealth quintile</b>							
Lowest	67.1	66.4	66.4	66.5	229	69.5	219
Second	60.9	59.5	59.1	59.7	185	74.3	148
Middle	49.9	48.8	48.8	49.1	169	65.0	127
Fourth	32.8	29.3	28.7	30.7	140	44.6	92
Highest	31.5	31.2	31.2	31.6	175	45.2	121
<b>Total</b>	<b>50.3</b>	<b>49.0</b>	<b>48.8</b>	<b>49.4</b>	<b>897</b>	<b>62.3</b>	<b>706</b>

Notes: Table is based on women who stayed in the household the night before the interview. Figures in parentheses are based on 25-49 unweighted cases. Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> An insecticide-treated mosquito net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

<sup>2</sup> Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.

As seen with the de facto household population and children under age 5, net use among pregnant women age 15-49 is higher in rural areas than in urban areas. Sixty-seven percent of pregnant women age 15-49 in rural areas in households with an ITN slept inside an ITN the previous night, compared with 50 percent of women in urban areas. Similar to the pattern seen with children under age 5, North West has the highest proportion of pregnant women age 15-49 who slept inside any net the previous night (69 percent), and South East has the lowest (25 percent). Similar to net use in the general population, net use among pregnant women decreases with increasing wealth. In households with at least one ITN, 74 percent of women in the second wealth quintile and 70 percent of pregnant women in the lowest wealth quintile slept inside an ITN the night preceding the survey compared with 45 percent in the highest wealth quintile.

### 3.9 USE OF INTERMITTENT PREVENTIVE TREATMENT BY WOMEN DURING PREGNANCY

The 2015 NMIS also collected information on malaria prevention during pregnancy. WHO recommendations include intermittent preventive treatment (IPTp) with sulphadoxine-pyrimethamine (SP) at each routine antenatal (ANC) clinic visit (at least 1 month apart) after the first trimester (WHO 2014). Women receive SP during their antenatal care visits under directly observed therapy. It is also possible that pregnant women obtain SP from sources outside of antenatal care visits.

Table 10 presents the percentage of women age 15-49 with a live birth in the 2 years preceding the survey who, during the pregnancy preceding the last birth, received one, two, or three or more doses of SP, at least one of which was received during an ANC visit, by background characteristics. Less than half (47 percent) of women received at least one dose SP, and slightly fewer than one in five (19 percent) received three or more doses of SP. Women in urban areas were more likely to have received at least one dose of IPTp (63 percent) than women in rural areas (38 percent). While South West has the highest proportion of women who received at least one dose of IPTp (64 percent), North East and South East have the highest proportions of women who received three or more doses (both 26 percent). Receipt of IPTp increases with education; nearly two-thirds (61 percent) of women with secondary or more education received at least one dose of IPTp, compared with one-third (33 percent) of women with no education. As wealth increases, so does IPTp uptake. Twenty-seven percent of women in the lowest wealth quintile received at least one dose of IPTp, increasing to 65 percent of women in the highest wealth quintile.

Table 10 Use of intermittent preventive treatment (IPTp) by women during pregnancy

Percentage of women age 15-49 with a live birth in the 2 years preceding the survey who, during the pregnancy preceding the last birth, received one or more doses of SP at least one of which was received during an ANC visit, received two or more doses of SP at least one of which was received during an ANC visit, and received three or more doses of SP at least one of which was received during an ANC visit, by background characteristics, Nigeria 2015

Background characteristic	Percentage who received 1 or more doses of SP <sup>1</sup>	Percentage who received 2 or more doses of SP <sup>1</sup>	Percentage who received 3 or more doses of SP <sup>1</sup>	Number of women with a live birth in the two years preceding the survey
<b>Residence</b>				
Urban	62.6	50.4	24.1	889
Rural	37.9	30.0	16.2	1,633
<b>Zone</b>				
North Central	36.9	28.4	18.0	441
North East	52.5	43.5	26.0	350
North West	39.5	28.7	15.4	815
South East	50.4	42.5	26.0	225
South South	46.8	39.3	15.8	282
South West	64.0	53.7	19.5	409
<b>Education</b>				
No education	32.9	25.1	13.3	1,107
Primary	49.0	36.2	18.6	402
Secondary	60.6	50.7	25.6	809
More than secondary	60.9	51.2	24.2	203
<b>Wealth quintile</b>				
Lowest	26.7	21.5	10.1	487
Second	34.4	26.2	16.4	594
Middle	50.6	38.2	20.4	462
Fourth	59.1	46.6	25.5	470
Highest	64.9	55.4	23.1	508
Total	46.6	37.2	19.0	2,522

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> Received the specified number of doses of SP, at least one of which was received during an ANC visit.

### 3.10 MEDIA EXPOSURE TO MALARIA MESSAGES

Malaria education programmes in Nigeria aim to provide Nigerians with an understanding of the risks of malaria, its symptoms, and how to prevent malaria and access treatment for it. It is important to understand the reach of these programmes. Women interviewed in the 2015 NMIS were asked if they had seen or heard any messages about malaria in the 6 months before the survey and if so, the source of the messages.

Table 11 presents the percentage of women age 15-49 who have seen or heard a message about malaria in the past 6 months, and among women who have seen or heard a message in the past 6 months, the percentage who encountered that message via specific media, by background characteristics. Thirty-six percent of women age 15-49 reported that they saw or heard a message about malaria in the 6 months before the survey. The three most common sources of messages among women were radio (70 percent), television (32 percent), and community workers (17 percent).

Table 11 Media exposure to malaria messages

Among women age 15-49, the percentage who have seen or heard a message about malaria in the past 6 months, and among those who have heard or seen any message about malaria, the percentage exposed to a message about malaria through specific media, by background characteristics, Nigeria 2015

Background characteristic	All women age 15-49		Among women age 15-49 who have seen or heard any message about malaria in the past 6 months, the percentage exposed to a message about malaria through specific media:												Number of women exposed to a message about malaria in the past 6 months
	Percentage who have seen or heard a message about malaria in the past 6 months	Number of women	Radio	Television	Community worker <sup>1</sup>	Mosque/church	Town announcer/community event	Bill-board/poster/t-shirt	Leaflet/fact-sheet/brochure	Relative/friend/neighbor/school	Social media	Antenatal care visit	Health centre or hospital	Other	
<b>Residence</b>															
Urban	43.8	3,129	73.7	49.1	14.0	2.7	4.6	11.6	7.2	6.9	2.1	2.2	3.3	0.6	1,372
Rural	30.4	4,905	67.0	15.9	19.1	3.5	5.3	4.7	0.9	6.8	0.4	1.8	3.7	0.5	1,490
<b>Zone</b>															
North Central	25.7	1,357	52.6	32.3	25.3	3.8	7.6	7.3	1.4	9.1	1.2	4.5	2.5	0.0	349
North East	31.4	1,077	73.6	31.2	14.5	2.1	2.6	1.9	0.4	5.3	0.7	0.8	1.8	0.4	338
North West	34.9	2,359	80.4	8.2	9.4	3.4	3.5	4.3	0.6	3.6	0.2	1.2	2.1	0.0	823
South East	42.0	811	63.2	33.9	14.1	0.8	9.0	2.5	2.1	6.9	1.9	1.0	2.1	3.0	341
South South	38.0	1,080	52.1	35.9	21.1	1.2	3.8	6.0	0.9	7.2	0.4	0.9	8.7	0.9	410
South West	44.4	1,351	80.9	60.2	21.2	5.5	5.4	21.4	14.8	10.6	3.2	3.5	4.2	0.0	600
<b>Education</b>															
No education	27.1	3,119	74.4	8.7	14.6	3.5	4.2	2.6	0.4	4.5	0.0	2.0	2.4	0.1	844
Primary	36.9	1,244	72.1	21.7	21.5	2.6	8.1	4.6	2.1	5.4	0.1	0.4	2.8	1.1	459
Secondary	38.7	2,848	66.7	41.6	17.3	2.8	5.1	10.9	5.5	9.1	2.1	2.2	4.2	0.7	1,102
More than secondary	55.6	823	69.1	60.9	14.2	3.6	2.9	14.3	8.2	7.2	2.5	3.1	4.4	0.4	457
<b>Wealth quintile</b>															
Lowest	24.0	1,444	73.6	2.5	13.8	3.0	5.6	5.0	0.7	6.3	0.0	1.2	2.8	0.0	347
Second	27.8	1,534	69.1	4.4	20.5	3.1	5.1	4.1	0.7	5.3	0.0	0.5	2.3	0.0	427
Middle	34.1	1,567	69.3	18.2	20.4	3.3	8.0	4.5	2.0	6.5	0.6	2.7	3.2	1.0	534
Fourth	41.1	1,651	70.5	33.2	18.5	3.5	4.7	5.3	2.3	6.8	1.2	2.1	4.9	1.2	678
Highest	47.7	1,837	69.7	64.0	12.3	2.8	3.0	15.3	9.2	8.0	2.8	2.5	3.5	0.2	876
<b>Total</b>	<b>35.6</b>	<b>8,034</b>	<b>70.2</b>	<b>31.8</b>	<b>16.7</b>	<b>3.1</b>	<b>5.0</b>	<b>8.0</b>	<b>3.9</b>	<b>6.8</b>	<b>1.2</b>	<b>2.0</b>	<b>3.5</b>	<b>0.5</b>	<b>2,862</b>

Note: Percentages may add up to more than 100% because multiple responses were allowed. Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> Includes community health extension worker (CHEW), village health worker (VHW), role model caregiver (RMC), and community-directed distributor (CCD).

Urban women were more likely (44 percent) than rural women (30 percent) to have seen or heard a message about malaria. Women in South West (44 percent) were the most likely to have encountered a message, and women in North Central (26 percent) were the least likely. The source of those messages varied considerably across zones. For instance, although similar proportions of women in North West (35 percent) and South South (38 percent) had seen or heard a message, television was the source for only 8 percent of those women in North West compared with 36 percent of those women in South South. Having seen or heard a message about malaria is positively associated with education and wealth. Twenty-seven percent of women with no education and 56 percent of women with more than secondary education saw or heard a message on malaria. By wealth quintile, this proportion ranges from 24 percent in the lowest wealth quintile to 48 percent in the highest.

### **3.11 MANAGEMENT OF FEVER IN CHILDREN**

Fever is a major symptom of malaria in young children. It is very important that children with fever be tested for malaria and, if results are positive, be treated promptly. In the 2015 NMIS, for each child less than age 5, mothers were asked if the child had experienced an episode of fever in the 2 weeks preceding the survey, and if so, whether treatment or advice was sought and whether blood testing was performed.

Table 12 presents the percentage of children less than age 5 with fever in the 2 weeks before the survey, and among those children with fever, the percentage for whom advice or treatment was sought, the percentage for whom advice was sought the same or next day, and the percentage who had blood taken for testing, by background characteristics. Forty-one percent of children had a fever in the 2 weeks preceding the survey. Of these children with fever, advice was sought for 66 percent. Advice was sought for 35 percent of children the same day or the day after the fever began, and 13 percent had blood taken from a finger or heel for testing. Rural children (46 percent) were more likely than urban children (30 percent) to have had fever in the 2 weeks, but care-seeking was more common for urban children (71 percent) than rural children (64 percent). The prevalence of fever was highest in North West (52 percent), but care-seeking was also lowest in North West (60 percent) as was the proportion of children who had blood taken for testing (10 percent). In contrast, while South West had the lowest prevalence of fever (24 percent), it had the highest proportion of children who had blood taken for testing (29 percent). The percentage of children below age 5 with recent fever decreases dramatically with increasing wealth, declining from 51 percent in the lowest wealth quintile to 26 percent in the highest wealth quintile. Blood testing, on the other hand, increases with increasing wealth, as 9 percent of children in the lowest wealth quintile had blood taken for testing compared with 22 percent in the highest wealth quintile.



Table 12 Prevalence, diagnosis, and prompt treatment of children with fever

Percentage of children under age 5 with fever in the 2 weeks preceding the survey; and among children under age 5 with fever, percentage for whom advice or treatment was sought, percentage for whom advice or treatment was sought the same or next day following the onset of fever, and percentage who had blood taken from a finger or heel for testing, by background characteristics, Nigeria 2015

Background characteristic	Children under age 5		Children under age 5 with fever			
	Percentage with fever in the 2 weeks preceding the survey	Number of children	Percentage for whom advice or treatment was sought <sup>1</sup>	Percentage for whom advice or treatment was sought <sup>1</sup> the same or next day	Percentage who had blood taken from a finger or heel for testing	Number of children
<b>Residence</b>						
Urban	30.2	2,160	71.2	46.6	17.4	653
Rural	46.3	4,203	64.4	31.6	11.0	1,947
<b>Zone</b>						
North Central	29.9	1,181	76.8	43.1	15.6	353
North East	48.0	904	69.1	37.2	11.3	434
North West	52.1	2,053	59.5	31.4	9.5	1,070
South East	38.3	564	75.9	44.1	11.0	216
South South	42.9	700	66.1	26.2	10.9	300
South West	23.5	962	65.2	42.5	29.1	226
<b>Wealth quintile</b>						
Lowest	50.7	1,316	56.8	22.1	8.8	667
Second	48.5	1,462	68.1	37.0	11.2	709
Middle	42.3	1,177	69.9	40.3	13.4	497
Fourth	34.0	1,188	67.8	39.6	13.4	404
Highest	26.4	1,220	72.9	46.4	21.6	322
Total	40.9	6,364	66.1	35.4	12.6	2,600

Note: Estimates for North East Zone do not include the rural areas in Borno State.

<sup>1</sup> Excludes advice or treatment from a traditional practitioner

### 3.12 ANAEMIA AND MALARIA PREVALENCE AMONG CHILDREN

All children age 6-59 months living in the households selected for the 2015 NMIS were eligible for malaria and anaemia testing. Haemoglobin analysis was carried out on site using a battery-operated portable HemoCue analyser. Malaria testing in the field was done using a rapid diagnostic test (RDT) and in the laboratory was done by microscopic examination of thick and thin blood smears. The RDT used for detecting malaria in the 2015 NMIS was the SD BIOLINE Malaria Ag P.f (HRP-II)™ device. Ninety-five percent of eligible children were tested for anaemia, 95 percent were tested for malaria with RDTs, and 91 percent of children had blood smears prepared for microscopy readings (data not shown).

Tables 13.1 and 13.2 present the percentage of children age 6-59 months with haemoglobin lower than 8.0 g/dl, by background characteristics and by state. A haemoglobin concentration less than 8.0 g/dl is considered low and may indicate that an individual has malaria (Korenromp et al. 2004). Fewer than 1 in 10 (9 percent) children have low haemoglobin, a slight decrease from 13 percent in the 2010 NMIS. Urban children are less likely (5 percent) than rural children (12 percent) to have low haemoglobin. Children in North West are much more likely

Table 13.1 Haemoglobin <8.0 g/dl in children: National

Percentage of de facto children age 6-59 months with haemoglobin lower than 8.0 g/dl, by background characteristics, Nigeria 2015

Background characteristic	Haemoglobin <8.0 g/dl	Number of children
<b>Residence</b>		
Urban	4.7	2,028
Rural	11.7	4,027
<b>Zone</b>		
North Central	4.5	1,135
North East	7.2	829
North West	17.7	1,953
South East	5.4	514
South South	5.5	669
South West	4.7	955
<b>Wealth quintile</b>		
Lowest	17.1	1,237
Second	13.1	1,404
Middle	8.1	1,168
Fourth	4.8	1,123
Highest	1.9	1,123
Total	9.3	6,055

Notes: Table is based on children who stayed in the household the night before the interview. Haemoglobin levels are adjusted for altitude using CDC formulas (CDC, 1998). Haemoglobin is measured in grams per decilitre (g/dl). Estimates for North East Zone do not include the rural areas in Borno State.

(18 percent) than children in other zones (5 to 7 percent) to have low haemoglobin. The percentage of children with low haemoglobin decreases greatly with increasing wealth: 17 percent of children under age 5 in the lowest wealth quintile have low haemoglobin compared with 2 percent in the highest wealth quintile. By state, rates of low haemoglobin among children range from less than 1 percent in Ondo State to 26 percent in Kano State.

**Table 13.2 Haemoglobin <8.0 g/dl in children: States**

Percentage of de facto children age 6-59 months with haemoglobin lower than 8.0 g/dl, by state, Nigeria 2015

State	Haemoglobin <8.0 g/dl	Number of children
<b>North Central</b>		
FCT-Abuja	9.0	26
Benue	1.6	246
Kogi	5.1	143
Kwara	5.4	123
Nasarawa	6.5	108
Niger	0.6	265
Plateau	9.8	224
<b>North East</b>		
Adamawa	11.4	142
Bauchi	6.9	254
Borno - Urban	(1.6)	20
Gombe	5.6	105
Taraba	7.7	130
Yobe	5.3	178
<b>North West</b>		
Jigawa	17.1	336
Kaduna	14.3	250
Kano	25.8	378
Katsina	16.1	463
Kebbi	3.7	167
Sokoto	19.4	154
Zamfara	21.4	206
<b>South East</b>		
Abia	1.4	63
Anambra	6.0	127
Ebonyi	7.9	131
Enugu	4.7	89
Imo	4.4	105
<b>South South</b>		
Akwa Ibom	4.1	106
Bayelsa	5.5	109
Cross River	7.2	90
Delta	4.6	117
Edo	8.2	60
Rivers	5.2	187
<b>South West</b>		
Ekiti	6.5	75
Lagos	2.1	270
Ogun	3.9	101
Ondo	0.0	129
Osun	10.5	138
Oyo	6.4	242
<b>Total</b>	<b>9.3</b>	<b>6,055</b>

Notes: Table is based on children who stayed in the household the night before the interview. Haemoglobin levels are adjusted for altitude using CDC formulas (CDC 1998). Haemoglobin is measured in grams per decilitre (g/dl). Figures in parentheses are based on 25-49 unweighted cases. Estimates for North East Zone do not include the rural areas in Borno State.

Tables 14.1 and 14.2 present the percentage of children age 6-59 months classified as having malaria according to a rapid diagnostic test (RDT) and microscopy, by background characteristics and by state. Overall, less than half (45 percent) of children age 6-59 months tested positive for malaria by RDT. Analysis of blood smears revealed a much lower malaria prevalence, 27 percent. In the 2010 NMIS, 52 percent of children had positive results with RDTs and 42 percent had positive results using microscopy.

Regardless of which diagnostic method was used, malaria prevalence is higher in rural than in urban areas and prevalence decreases as household wealth increases. According to microscopy results, children in rural areas are three times as likely as children in urban areas to test positive for malaria (36 percent compared with 12 percent, respectively). Malaria prevalence was highest in North West at 37 percent, and lowest in South East at 14 percent. Malaria prevalence decreases as wealth increases: 43 percent of children under 5 in the lowest wealth quintile tested positive for malaria by RDT compared with 4 percent in the highest wealth quintile. By state, the prevalence of malaria among children ranges from 0 percent in Lagos State to 64 percent in Kebbi State.

**Table 14.1 Prevalence of malaria in children: National**

Percentage of children age 6-59 months classified as having malaria according to RDT, by background characteristics, Nigeria 2015

Background characteristic	Malaria prevalence according to RDT		Malaria prevalence according to microscopy	
	RDT positive	Number of children	Microscopy positive	Number of children
<b>Residence</b>				
Urban	24.2	2,029	11.5	1,933
Rural	55.7	4,021	35.6	3,800
<b>Zone</b>				
North Central	50.7	1,134	32.0	1,074
North East	42.8	824	25.9	789
North West	58.3	1,951	37.1	1,854
South East	31.7	516	13.7	499
South South	28.6	668	19.3	630
South West	32.1	957	16.6	888
<b>Wealth quintile</b>				
Lowest	64.3	1,235	43.2	1,192
Second	62.3	1,405	40.6	1,299
Middle	49.4	1,166	27.4	1,088
Fourth	30.5	1,124	17.2	1,076
Highest	12.6	1,121	4.3	1,079
<b>Total</b>	<b>45.1</b>	<b>6,050</b>	<b>27.4</b>	<b>5,733</b>

Table 14.2 Prevalence of malaria in children: States

Percentage of de facto children age 6-59 months classified as having malaria according to RDT, by state, Nigeria 2015

State	Malaria prevalence according to RDT		Malaria prevalence according to microscopy	
	RDT positive	Number of children	Microscopy positive	Number of children
<b>North Central</b>				
FCT-Abuja	38.5	26	20.2	25
Benue	55.3	246	44.5	230
Kogi	26.2	143	5.4	131
Kwara	49.7	122	26.4	121
Nasarawa	57.1	108	35.9	99
Niger	52.9	265	33.5	258
Plateau	57.6	224	35.8	210
<b>North East</b>				
Adamawa	55.5	139	34.7	135
Bauchi	41.1	253	19.6	238
Borno - Urban	(5.6)	20	(0.0)	32
Gombe	46.5	105	28.6	105
Taraba	53.4	130	42.9	119
Yobe	29.7	178	18.9	160
<b>North West</b>				
Jigawa	58.2	336	27.9	308
Kaduna	55.2	250	36.7	233
Kano	60.2	376	27.7	368
Katsina	54.2	463	27.8	445
Kebbi	48.9	167	63.6	157
Sokoto	66.0	154	46.6	157
Zamfara	69.9	206	62.6	185
<b>South East</b>				
Abia	21.1	64	8.2	64
Anambra	21.1	127	10.2	134
Ebonyi	51.1	131	30.0	120
Enugu	35.1	89	10.5	84
Imo	24.1	105	5.1	98
<b>South South</b>				
Akwa Ibom	27.7	106	22.8	95
Bayelsa	36.2	109	31.4	102
Cross River	40.7	90	26.1	82
Delta	24.7	116	20.4	111
Edo	35.0	60	18.6	56
Rivers	19.5	187	7.3	184
<b>South West</b>				
Ekiti	36.0	75	28.8	75
Lagos	1.9	270	0.0	246
Ogun	34.6	101	14.7	94
Ondo	48.1	129	21.3	121
Osun	54.6	138	33.4	133
Oyo	42.1	244	19.2	220
Total	45.1	6,050	27.4	5,733

Notes: Figures in parentheses are based on 25-49 unweighted cases. Estimates for North East Zone do not include the rural areas in Borno State.

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