

**Nigeria  
Malaria  
Indicator  
Survey  
2010**

**Preliminary Report**

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

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

**MEASURE DHS  
ICF Macro  
Calverton, Maryland, United States**

The 2010 Nigeria Malaria Indicator Survey (2010 NMIS) was implemented by the National Population Commission (NPC) and the National Malaria Control Programme (NMCP) from October 2010 through December 2010. ICF Macro provided technical assistance through the MEASURE DHS programme, a project funded by the United States Agency for International Development (USAID), which provides support and technical assistance in the implementation of population and health surveys in countries worldwide. Funding for the 2010 NMIS was provided by the NMCP, Global Funds [through the Society for Family Health (SFH) and Yakubu Gowon Centre (YGC)], World Bank, United Kingdom Department for International Development (DFID) [through the Support to Nigeria Malaria Programme (SuNMaP)], and USAID [through the MEASURE DHS programme at ICF Macro].

Additional information about the 2010 NMIS may be obtained from the headquarters of the National Population Commission, Plot 2031, Olusegun Obasanjo Way, Zone 7 Wuse, PMB 0281, Abuja, Nigeria; Telephone: (234) 09 523-9173, Fax: (234) 09 523-1024.

Information about the DHS programme may be obtained from the MEASURE DHS Project, ICF Macro, 11785 Beltsville Drive, Suite 300, Calverton, MD 20705, United States; Telephone: 301-572-0200; Fax: 301-572-0999; E-mail: [info@measuredhs.com](mailto:info@measuredhs.com); Internet: <http://www.measuredhs.com>.

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## ACRONYMS

ACT	artemisinin-based combination therapy
ANC	antenatal care
CSPro	Censuses and Surveys Processing
EA	enumeration area
FCT	Federal Capital Territory
FMOH	Federal Ministry of Health
GPS	global positioning system
ICF	Inner City Fund
IPT	intermittent preventive treatment
ITN	insecticide-treated net
LGA	local government area
NMCP	National Malaria Control Program
NMIS	Nigeria Malaria Indicator Survey
NPC	National Population Commission
NDHS	Nigeria Demographic and Health Survey
PSU	primary sampling unit
RDT	rapid diagnostic test
SFH	Society for Family Health
SP	sulfadoxine-pyrimethamine
TFR	total fertility rate
UNAIDS	Joint United Nations Programmes on HIV and AIDS
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNU	United Nations University
USAID	United States Agency for International Development
WHO	World Health Organisation
YGC	Yakubu Gowon Centre



## **I. INTRODUCTION**

The 2010 Nigeria Malaria Indicator Survey (2010 NMIS) was implemented by the National Population Commission (NPC), National Malaria Control Programme (NMCP), and other Roll Back Malaria partners from October 2010 through December 2010 on a nationally representative sample of more than 6,000 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 blood from a finger-prick blood sample. Results were immediately available and were provided to the children's parents or guardians. Thick blood smears and thin blood films were also made in the field and transported to the Department of Medical Microbiology and Parasitology at the College of Medicine, 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 2010 NMIS project are to provide information on malaria indicators and malaria prevalence, both at the national level and in each of the country's six geopolitical zones.

The 2010 NMIS represents the first malaria indicator survey conducted in all states and in the Federal Capital Territory (FCT) in Nigeria. This is the first malaria indicator survey to conduct rapid diagnostic testing and to collect and evaluate thick blood smears and thin blood films at the household level in a nationally representative survey.

This preliminary report presents a first look at selected results of the 2010 NMIS. A comprehensive analysis of the data will appear later in a final report. Although the results presented here are considered provisional, they are not expected to differ significantly from those presented in the final report.

## II. SURVEY IMPLEMENTATION

### A. Sample Design

The sample for the 2010 NMIS was designed to provide most of the key malaria indicators for the country as a whole, for urban and rural areas separately, and for each of the six zones formed by grouping the 36 states and the Federal Capital Territory (FCT). The zones are as follows:

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

The sampling frame used for the 2010 NMIS came from the 2006 Population and Housing Census of the Federal Republic of Nigeria, which was conducted in 2006 by the National Population Commission (NPC). 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). Nigeria has 36 states and a Federal Capital Territory, making a total of 37 states for the purposes of the sampling frame. The primary sampling unit (PSU), referred to as a cluster for the 2010 NMIS, is defined on the basis of EAs from the 2006 EA census frame. The 2010 NMIS sample was selected using a stratified two-stage cluster design consisting of 240 clusters, 83 in the urban areas and 157 in the rural areas.<sup>1</sup> A representative sample of approximately 6,000 households was selected for the 2010 NMIS survey, with a minimum target of 920 completed women's interviews per zone. In each state, the number of households was distributed proportionately among its urban and rural areas.

A complete listing of households was made and a mapping exercise was carried out for each cluster in August 2010 through September 2010, with the resulting lists of households serving as the sampling frame for the selection of households in the second stage. All regular households were listed. The NPC listing enumerators used global positioning system (GPS) receivers to record the coordinates of the 2010 NMIS sample clusters.

In the second stage of the selection process, an average number of 26 households was selected in each cluster by equal probability systematic sampling. All women age 15-49 who were either permanent residents of the households in the 2010 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 were eligible to be tested for malaria and anaemia.

### B. Questionnaires

Two questionnaires, the Household Questionnaire and the Woman's Questionnaire, were used for the 2010 NMIS. These questionnaires were adapted to reflect the population and health issues relevant to Nigeria at a series of meetings with various stakeholders from the NMCP and other government ministries and agencies, nongovernmental organizations, and international donors. In addition to English, the questionnaires were translated into three major Nigerian languages: Hausa, Igbo, and Yoruba.

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<sup>1</sup> The final survey sample included 239 clusters instead of 240 clusters. During fieldwork, access was not obtained in one cluster due to inter-communal disturbances.

The Household Questionnaire was used to list all the usual members and visitors of selected households. Some basic information was collected on the characteristics of each person listed, 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 the 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 Household Questionnaire was also used to record the results of the anaemia and malaria testing as well as the signatures of the interviewer and the respondent who gave consent. Children's temperatures were also recorded. 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, media exposure, etc.)
- 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)

### C. Malaria and Anaemia Testing

The 2010 NMIS incorporated three 'biomarkers': anaemia testing, malaria testing using RDTs, and thick blood smear and thin blood film sample preparation on microscope slides. Blood samples were obtained by taking finger prick blood samples from children age 6-59 months to perform on-the-spot testing for anaemia and malaria, and to prepare the smears and films that were read in the Department of Medical Microbiology and Parasitology laboratory at the University of Lagos to determine the presence of malaria parasitemia. Each team included one laboratory scientist responsible for implementing the malaria and anaemia testing and making the blood smear slides. Each field team included one nurse who, in addition to interviewing, was also responsible for ensuring that medications for malaria were given in accordance with the appropriate treatment protocols. Verbal and written informed consent for testing of children was requested from the child's parent or guardian and recorded at the end of the household interview.

**Anaemia testing.** Due to a strong correlation between anaemia and malaria infection, the NMIS included anaemia testing for children age 6-59 months. After requesting informed consent from the child's parent or guardian, blood samples were requested and collected using a microcuvette from a drop of blood taken from a finger prick (or a heel prick in the case of young children with small fingers). Haemoglobin analysis was carried out on site using a battery-operated portable HemoCue analyzer, which produces a result within one minute. Results were given to the child's parent or guardian verbally and in writing. Parents of children with a haemoglobin level under 7 g/dl were instructed to take the child to a health facility for follow-up care. All households with children age 6-59 months were given a brochure explaining the causes and prevention of anaemia. Results of the anaemia test were recorded on the household questionnaire.

**Rapid malaria testing.** 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 Paracheck *Pf* rapid diagnostic test (RDT), which tests for *P. falciparum*. The test includes a loop applicator that comes in a sterile packet. A tiny portion of blood is captured on the applicator and placed on the well of the device. Results are available in 15 minutes. The results were provided orally to the respondent or the child's parent/guardian and recorded in the Household Questionnaire.

Children who tested positive for malaria were offered a full course of medicine according to standard procedures for treating malaria in Nigeria (FMOH, 2008; see Table A), along with instructions on how to take the medication. In order to ascertain the correct dose, the nurse on each team asked about any medications the child may currently be taking. She then weighed the child using the SECA portable scales and provided the appropriate dose of artemisinin-based combination therapy (ACT) along with instructions on how to administer the medicines to the child. The parents/guardians of all children tested were informed about how to prevent malaria. All drugs for malaria treatment were provided by the SFH and NMCP.

**Malaria testing.** In addition to the Paracheck *Pf* RDT, a thick blood smear and thin blood film were prepared for all children tested. These blood smears were dried, packed carefully in the field, and then transported to the Department of Microbiology and Parasitology, University of Lagos, for microscopic reading and determination of malaria parasite presence and speciation. The purpose of the blood slides is to provide a ‘gold standard’ for the presence of parasites within the child’s blood and to ascertain the type of parasite. The lab had 10 experienced malaria microscopists working full-time or close to full-time for a period of about three months. Each slide was examined by two independent microscopists, and any discordant results were read by a third microscopist. An ICF Macro consultant provided additional in-service refresher training. ICF Macro also provided the computer software for documenting test results.

Treatment for Children with Positive Malaria Test Results on RDTs		
Weight	Age	Artemether-Lumefantrine**
Less than 5 kg	Refer*	Refer*
5-14 kg	6 months – 3 years	1 tablet twice a day for 3 days
15-25 kg	4 – 8 years	2 tablets twice daily for 3 days

\*IF CHILD WEIGHS LESS THAN 5 KGS, DO NOT LEAVE DRUGS. TELL PARENT TO TAKE CHILD TO HEALTH FACILITY.  
 \*\*The second dose should be given eight hours after the first dose on the day of commencement of treatment.

Source: Nigeria FMOH, National Malaria and Vector Control Division, 2008. National Guidelines on Diagnosis and Treatment of Malaria. Abuja, Nigeria.

#### D. Pretest Activities

The training for the pretest took place August 16-22, 2010. Twenty people participated in the training. Six female interviewers and four laboratory scientists were trained in the pretest. Six NPC staff members and 3 NMCP staff members led the training and served as supervisors for the pretest fieldwork. Participants were trained to administer questionnaires and collect biomarkers. The pretest training for the interviewers and supervisors consisted of a project overview and survey objectives, techniques of interviewing, field procedures, a detailed description of all sections of the Household Questionnaire and the Woman’s Questionnaire, and two days of field practice. The trainers/resource persons included professionals from NPC, NMCP, ICF Macro, SFH, and YGC.

The pretest fieldwork was conducted by three teams from August 19-22, 2010, in different EAs of Kaduna. The teams were divided according to languages. There was one Hausa team, one Yoruba team, and one Igbo team. The supervisors, who also served as editors, were drawn from among the core technical team from NPC and NMCP. At the end of fieldwork, a debriefing session was held on August 30, 2010, in Abuja with all staff involved in the pretest, and the questionnaires were amended based on the pretest findings.

## **E. Training of Field Staff**

NPC and NMCP recruited and trained 86 people for the fieldwork. They served as supervisors/editors, interviewers, reserve interviewers, and quality control interviewers. Training of field staff for the main survey was conducted during a two-week period in September 2010. The training course consisted of instruction regarding interviewing techniques and field procedures, a detailed review of items on the questionnaires, 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 2010 NMIS sample points. Fifteen laboratory scientists were provided two weeks of instruction and practice in collecting blood samples from children age 6-59 months. For haemoglobin testing, they used the HemoCue system, and for malaria testing, they used the Paracheck *Pf* rapid diagnostic test (RDT) and prepared thick blood smears and thin blood films. Fifteen nurses were also trained on taking children's temperature and offering and administering treatment to children who tested positive on the RDTs. During this period, 15 team supervisors/editors and 6 quality control interviewers were provided with additional training in methods of field editing, data quality control procedures, and fieldwork coordination. Fifteen supervisors/editors, 30 interviewers, 5 reserve interviewers, and 15 laboratory scientists were selected to make up 15 data collection teams for the 2010 NMIS. Six additional laboratory scientists were engaged in the logistics of transferring slides from the field to the laboratory in Lagos.

## **F. Fieldwork**

Fifteen interviewing teams carried out data collection for the 2010 NMIS. Each team consisted of one supervisor/editor (team leader), two female interviewers, one nurse, one laboratory scientist, and one driver. Six senior staff members from NPC and NMCP, designated as zonal coordinators, coordinated and supervised fieldwork activities. Roll Back Malaria (RBM) partners also monitored fieldwork. Data collection took place over a three-month period, from October 2010 through December 2010.

## **G. Data Processing**

All questionnaires for the 2010 NMIS were returned to the data processing centre at the NPC headquarters in Abuja. Activities performed included office editing, coding (of open-ended questions), data entry, and editing (of computer-identified errors). The data were processed by a team of one data entry supervisor, one questionnaire administrator, ten data entry operators, two office editors, and two secondary editors. Data entry and editing were accomplished using CSpPro software. The processing of data was initiated in October 2010 and completed in February 2011.

### III. RESULTS

#### A. Response Rates

The household and individual response rates for the 2010 NMIS are shown in Table 1. A total of 6,197 households were selected, and of these 5,986 were occupied. Of the households found occupied, 5,895 had occupants who were successfully interviewed, yielding a response rate of 99 percent. There is no significant difference in response rates between rural and urban areas..

In the interviewed households, a total of 6,527 women were identified as eligible for the individual interview, and 97 percent of them were successfully interviewed.

#### B. Household Composition

Information on key aspects of the composition of households, including the size of the household, is presented in Table 2. Nigerian households were found to mostly consist of 4 to 6 members, with the average household size being 5.2 people. This is consistent with the 2008 Nigeria Demographic and Health Survey (NDHS) in which the average household size was 4.4 members.

#### C. Characteristics of the Respondents

Table 3 shows the distribution of women age 15-49 by background characteristics. The table shows declining proportions of women with advancing age, indicating that Nigeria's age structure is broad based, that is, a young age structure. A similar trend was observed in the 2008 NDHS.

Table 3 shows that almost three quarters of women live in rural areas (72 percent). One-quarter of respondents are from the North West geopolitical zone and almost one-fifth live in South West, while the rest of the respondents are distributed among the remaining four zones.

More than half of women have had some education (58 percent) while 42 percent of women have had no education.

Result	Residence		Total
	Urban	Rural	
<b>Household interviews</b>			
Households selected	2,095	4,102	6,197
Households occupied	1,991	3,995	5,986
Households interviewed	1,944	3,951	5,895
Household response rate <sup>1</sup>	97.6	98.9	98.5
<b>Interviews with women age 15-49</b>			
Number of eligible women	2,143	4,384	6,527
Number of eligible women interviewed	2,088	4,256	6,344
Eligible women response rate <sup>2</sup>	97.4	97.1	97.2

Characteristic	Residence		Total
	Urban	Rural	
<b>Number of usual members</b>			
0	0.0	0.1	0.1
1	12.9	9.5	10.5
2	10.7	9.1	9.6
3	14.0	12.2	12.8
4	14.9	13.7	14.0
5	13.0	13.8	13.6
6	11.2	11.4	11.3
7	8.9	8.8	8.8
8	4.1	6.5	5.8
9+	10.2	14.9	13.5
Total	100.0	100.0	100.0
Mean size of households	4.8	5.4	5.2
Number of households	1,720	4,175	5,895

Table 3 Background characteristics of respondents			
Percent distribution of women age 15-49, by selected background characteristics, Nigeria 2010			
Background characteristic	Number of women		
	Weighted percent	Weighted	Unweighted
<b>Age</b>			
15-19	17.2	1,091	1,100
20-24	18.4	1,165	1,139
25-29	20.1	1,273	1,285
30-34	15.1	957	951
35-39	12.6	802	808
40-44	9.4	597	602
45-49	7.2	459	459
<b>Residence</b>			
Urban	28.4	1,803	2,088
Rural	71.6	4,541	4,256
<b>Zone</b>			
North Central	16.4	1,039	1,079
North East	15.0	951	1,087
North West	25.0	1,584	1,205
South East	10.7	681	1,011
South South	15.1	959	1,124
South West	17.8	1,130	838
<b>Education</b>			
No education	42.5	2,699	2,340
Primary	17.0	1,079	1,141
Secondary	32.9	2,084	2,331
More than secondary	7.6	483	532
Total 15-49	na	6,344	6,344

Note: Education categories refer to the highest level of education attended, whether or not that level was completed.  
na = Not applicable

#### D. Malaria

Malaria is one of the leading causes of death in developing countries (WHO, 2008). The 2010 NMIS collected data on measures to prevent malaria, including the use of mosquito nets among women and children and the prophylactic use of antimalarial drugs.

#### E. Ownership of Mosquito Nets

Table 4 shows that 44 percent of households nationwide own at least one mosquito net of any type, and 27 percent own more than one. Forty-two percent of households own at least one insecticide-treated net (ITN), while 25 percent own more than one. More rural (47 percent) than urban (36 percent) households own at least one net. Ownership of ITNs also differs by urban-rural residence (45 percent for rural households and 33 percent for urban households).

With regard to the geopolitical zones, ownership of at least one mosquito net of any type ranges from 24 percent in the South West to 67 percent in the North East. Ownership of at least one ITN ranges from a low of 20 percent in the South West to a high of 63 percent in the North East.

The 2010 NMIS shows that Nigeria has made great progress in net ownership between 2008 and 2010. In the 2008 NDHS, only 17 percent of households owned at least one mosquito net, and 8 percent owned at least one ITN.

**Table 4 Ownership of mosquito nets**

Percentage of households with at least one or more than one mosquito net (treated or untreated), ever-treated mosquito net, and insecticide-treated net (ITN); and the average number of nets per household, by background characteristics, Nigeria 2010

Background characteristics	Any type of mosquito net			Ever-treated mosquito net <sup>1</sup>			Insecticide-treated mosquito nets (ITNs) <sup>2</sup>			Number of households
	Percentage with at least one	Percentage with more than one	Average number of nets per household	Percentage with at least one	Percentage with more than one	Average number of ever-treated nets per household	Percentage with at least one	Percentage with more than one	Average number of ITNs per household	
<b>Residence</b>										
Urban	35.6	19.8	0.6	33.6	18.7	0.6	33.1	18.5	0.6	1,720
Rural	47.3	29.5	0.9	45.3	28.0	0.9	45.0	27.9	0.9	4,175
<b>Zone</b>										
North Central	32.7	16.7	0.6	32.1	16.2	0.6	32.1	16.2	0.6	951
North East	67.4	47.9	1.5	63.0	43.7	1.4	62.9	43.7	1.4	858
North West	59.7	39.3	1.2	58.2	38.0	1.1	58.2	38.0	1.1	1,296
South East	35.0	21.3	0.6	33.2	20.5	0.6	32.2	20.1	0.6	678
South South	45.2	21.7	0.8	44.6	21.3	0.7	43.8	21.1	0.7	859
South West	23.7	13.0	0.4	21.0	11.7	0.4	20.3	11.3	0.4	1,253
Total	43.9	26.7	0.9	41.9	25.3	0.8	41.5	25.1	0.8	5,895

<sup>1</sup> An ever-treated net is a pretreated net or a nonpretreated net that has subsequently been soaked with insecticide at any time.  
<sup>2</sup> An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment, (2) a pretreated net obtained within the past 12 months, or (3) a net that has been soaked with insecticide within the past 12 months.

## F. Use of Mosquito Nets

Table 5 shows that a total of 31 percent of children under age 5 slept under a mosquito net the night before the survey. Thirty-three percent of children under age 5 in rural areas slept under a mosquito net the night before the survey compared with 23 percent in urban areas. The data are similar for children under age 5 sleeping under an ITN the night before the survey: 29 percent total in Nigeria, 31 percent in rural areas, and 23 percent in urban areas. Among households with an ITN, 61 percent of children under age 5 in rural areas were reported to have slept under an ITN the night before the survey compared with 53 percent in urban areas. Overall, 36 percent of pregnant women age 15-49 slept under a mosquito net the night before the survey, 41 percent in rural areas versus 17 percent in rural areas. Among households with an ITN, 72 percent of pregnant women in rural areas and 39 percent of women in urban areas slept under an ITN the night before the survey.

## G. Indoor Residual Spraying

Table 5 shows that less than one percent of households reported that the walls of their homes were sprayed.

## H. Malaria Treatment during Pregnancy

The 2010 NMIS also collected data on malaria prevention during pregnancy. WHO recommendations to prevent malaria during pregnancy include intermittent preventive treatment (IPT) with at least two doses of an effective antimalarial drug, such as sulfadoxine-pyrimethamine (SP), during routine antenatal clinic visits (WHO, 2010). Table 5 shows that more than half (56 percent) of women in urban areas took antimalarial drugs for malaria prevention during their last pregnancy in the two years preceding the survey compared with 34 percent of women in rural areas. Nationally, 13 percent of women received IPT during their most recent pregnancy via antenatal care visits. Eighteen percent of women in urban areas received IPT during an antenatal visit compared with 12 percent of women in rural areas.

## **I. Childhood Fever**

Fever is an important contributing cause of childhood morbidity and mortality in developing countries. Prompt medical attention when a child has symptoms is, therefore, crucial in reducing child deaths. In the 2010 NMIS, for each child under age 5, mothers were asked if the child had experienced an episode of fever in the two weeks preceding the survey. Information was also collected on the percentage of episodes in which mothers sought treatment for their children. It should be noted that the morbidity data collected are subjective in the sense that they are based on a mother's perception of illness without validation by medical personnel. Thirty-five percent of children under age 5 were reported to have had a fever in the two weeks preceding the survey.

## **J. Treatment of Children with Fever**

Table 5 shows that among children under age 5 with fever in the two weeks preceding the survey, more children in urban areas took antimalarial drugs than children in rural areas (60 and 46 percent, respectively). Among children with fever, 30 percent in urban areas and 25 percent in rural areas took antimalarial drugs the same or next day after developing a fever.

## **K. Malaria Indicators for States with LLIN Campaigns**

Table 6 shows malaria indicators for states included in the World Bank Booster campaign, states included in other long-lasting insecticide net (LLIN) campaigns, and states that did not have any LLIN campaigns. Overall, states that had an LLIN campaign were three times more likely than states without an LLIN campaign to have had at least one mosquito net and at least one ITN: 75 percent for the World Bank Booster states and 77 percent for states with other net campaigns, compared with 24 percent for states without a net campaign. Among all the indicators, net usage for children under age 5 and pregnant women is higher in the states with net campaigns than in states without the net campaigns. Apart from net usage, variance among other malaria indicators does not differ much when comparing net campaign states with non-net campaign states.

Table 5 Malaria indicators

Possession and use of mosquito nets, indoor residual spraying, preventive malaria treatment during pregnancy, and treatment of children with fever using antimalarial drugs, by urban-rural residence, Nigeria 2010

Malaria indicators	Residence					
	Urban		Rural		Total	
	Percentage	Number	Percentage	Number	Percentage	Number
<b>Mosquito nets</b>						
Percentage of households with at least one mosquito net (treated or untreated)	35.6	1,720	47.3	4,175	43.9	5,895
Percentage of households with at least one insecticide-treated net (ITN) <sup>1</sup>	33.1	1,720	45.0	4,175	41.5	5,895
Percentage of children under 5 who slept under a mosquito net the night before the survey	23.4	1,420	32.6	4,815	30.5	6,234
Percentage of children under 5 who slept under an ITN the night before the interview <sup>1</sup>	22.5	1,420	31.1	4,815	29.1	6,234
Percentage of children under 5 who slept under an ITN the night before the interview in a HH with ITNs <sup>1</sup>	52.9	604	60.5	2,474	59.0	3,078
Percentage of pregnant women age 15-49 who slept under a mosquito net the night before the interview	16.5	166	40.8	586	35.5	752
Percentage of pregnant women age 15-49 who slept under an ITN the night before the interview <sup>1</sup>	16.1	166	38.7	586	33.7	752
Percentage of pregnant women age 15-49 who slept under an ITN the night before the interview in a HH with ITNs <sup>1</sup>	38.5	69	71.5	317	65.6	387
<b>Indoor Residual Spraying (IRS)</b>						
Proportion of surveyed households sprayed with a residual insecticide in the last 12 months	0.5	1,720	0.8	4,175	0.7	5,895
Proportion of children under 5 who slept under an ITN or in household sprayed with IRS in last 12 months	22.9	1,420	31.6	4,815	29.6	6,234
Proportion of pregnant women who slept under an ITN the previous night or in a household sprayed with IRS in the last 12 months	16.9	166	39.0	586	34.1	752
<b>Preventive malaria treatment during pregnancy</b>						
Percentage of last births in the two years preceding the survey for which the mother took antimalarial drugs for prevention during the pregnancy	56.3	538	34.4	1,716	39.6	2,255
Percentage of last births in the two years preceding the survey for which the mother got Intermittent Preventive Treatment (IPT) during an antenatal visit <sup>2</sup>	17.7	538	11.8	1,716	13.2	2,255
<b>Treatment of fever</b>						
Proportion of children under age 5 with fever in the two weeks preceding the survey	31.0	1,317	36.8	4,200	35.4	5,519
<b>Among children under age 5 with fever in the two weeks preceding the survey, percentage who took antimalarial drugs</b>						
Any antimalarial drug	59.8	409	46.3	1,548	49.1	1,956
SP/Fansidar	13.4	409	10.2	1,548	10.9	1,956
Chloroquine	29.2	409	28.3	1,548	28.5	1,956
Amodiaquine	1.2	409	1.3	1,548	1.3	1,956
Quinine	0.9	409	1.5	1,548	1.3	1,956
ACT	12.5	409	4.1	1,548	5.9	1,956
Other antimalarial	4.8	409	4.3	1,548	4.4	1,956
<b>Among children under age 5 with fever in the two weeks preceding the survey, percentage who took antimalarial drugs the same day/next day after developing fever</b>						
Any antimalarial drug	30.2	409	24.9	1,548	26.0	1,956
SP/Fansidar	4.8	409	6.1	1,548	5.8	1,956
Chloroquine	14.6	409	15.0	1,548	14.9	1,956
Amodiaquine	0.5	409	0.4	1,548	0.4	1,956
Quinine	0.6	409	0.5	1,548	0.5	1,956
ACT	7.9	409	2.0	1,548	3.2	1,956
Other antimalarial	1.8	409	2.2	1,548	2.1	1,956

<sup>1</sup> An ITN is a permanent net that does not require any treatment, a pretreated net obtained within the past 12 months, or a net that has been soaked with insecticide within the past 12 months.

<sup>2</sup> Intermittent preventive treatment is preventive treatment with at least two doses of SP/Fansidar during an antenatal visit.

Table 6 Malaria indicators among long-lasting insecticide net (LLIN) campaigns

Possession and use of mosquito nets, preventive malaria treatment during pregnancy, and treatment of children with fever using antimalarial drugs, by LLIN campaign states and non-LLIN campaign states, Nigeria 2010

Malaria indicators	World Bank Booster <sup>1</sup>		States with other LLIN campaigns <sup>2</sup>		States without LLIN campaigns <sup>3</sup>		Total	
	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number
<b>Mosquito nets</b>								
Percentage of households with at least one mosquito net (treated or untreated)	75.1	1,244	76.8	981	24.4	3,670	43.9	5,895
Percentage of households with at least one insecticide-treated net (ITN) <sup>4</sup>	71.7	1,244	75.4	981	22.3	3,670	41.5	5,895
Percentage of children under 5 who slept under a mosquito net the night before the survey	54.3	1,476	49.3	1,147	14.8	3,611	30.5	6,234
Percentage of children under 5 who slept under an ITN the night before the interview <sup>4</sup>	50.8	1,476	48.9	1,147	14.0	3,611	29.1	6,234
Percentage of children under 5 who slept under an ITN the night before the interview in a HH with ITNs <sup>4</sup>	66.2	1,132	60.8	922	49.4	1,024	59.0	3,078
Percentage of pregnant women age 15-49 who slept under a mosquito net the night before the interview	58.5	184	68.9	154	12.8	413	35.5	752
Percentage of pregnant women age 15-49 who slept under an ITN the night before the interview <sup>4</sup>	53.0	184	67.6	154	12.5	413	33.7	752
Percentage of pregnant women age 15-49 who slept under an ITN the night before the interview in a HH with ITNs <sup>4</sup>	74.8	130	79.5	131	41.3	125	65.6	387
<b>Indoor Residual Spraying (IRS)</b>								
Proportion of surveyed households sprayed with a residual insecticide in the last 12 months	1.7	1,244	0.7	981	0.4	3,670	0.7	5,895
Proportion of children under 5 who slept under an ITN or in household sprayed with IRS in last 12 months	51.1	1,476	49.5	1,147	14.5	3,611	29.6	6,234
Proportion of pregnant women who slept under an ITN the previous night or in household sprayed with IRS in the last 12 months	53.0	184	67.6	154	13.3	413	34.1	752
<b>Preventive malaria treatment during pregnancy</b>								
Percentage of last births in the 2 years preceding the survey for which the mother took antimalarial drugs for prevention during the pregnancy	34.4	513	38.1	418	42.1	1,324	39.6	2,255
Percentage of last births in the 2 years preceding the survey for which the mother got Intermittent preventive treatment (IPT) during an antenatal visit <sup>5</sup>	17.1	513	14.9	418	11.2	1,324	13.2	2,255
<b>Treatment of fever</b>								
Proportion of children under 5 with fever in the two weeks preceding the survey	37.3	1,326	31.2	1,043	36.1	3,149	35.4	5,519
<b>Among children under age 5 with fever in the two weeks preceding the survey, percentage who took antimalarial drugs</b>								
Any antimalarial drug	58.7	495	42.6	326	46.9	1,136	49.1	1,956
SP/Fansidar	18.6	495	5.4	326	9.1	1,136	10.9	1,956
Chloroquine	31.2	495	29.0	326	27.2	1,136	28.5	1,956
Amodiaquine	2.1	495	0.8	326	1.1	1,136	1.3	1,956
Quinine	2.4	495	0.0	326	1.3	1,136	1.3	1,956
ACT	8.2	495	5.0	326	5.1	1,136	5.9	1,956
Other antimalarial	1.3	495	3.3	326	6.1	1,136	4.4	1,956
<b>Among children under age 5 with fever in the two weeks preceding the survey, percentage who took antimalarial drugs the same day/next day after developing fever</b>								
Any antimalarial drug	37.6	495	15.8	326	23.9	1,136	26.0	1,956
SP/Fansidar	12.7	495	1.2	326	4.2	1,136	5.8	1,956
Chloroquine	19.1	495	9.9	326	14.4	1,136	14.9	1,956
Amodiaquine	1.2	495	0.5	326	0.1	1,136	0.4	1,956
Quinine	1.3	495	0.0	326	0.4	1,136	0.5	1,956
ACT	5.4	495	2.3	326	2.6	1,136	3.2	1,956
Other antimalarial	0.7	495	1.8	326	2.8	1,136	2.1	1,956

<sup>1</sup> World Bank Booster LLIN campaign States include Akwa Ibom, Anambra, Bauchi, Gombe, Jigawa, Kano, and Rivers.

<sup>2</sup> States with other LLIN campaigns include Adamawa, Ekiti, Kaduna, Kebbi, Niger, Ogun, and Sokoto.

<sup>3</sup> States without LLIN campaigns at the time of the NMIS include Abia, Bayelsa, Benue, Borno, Cross Rivers, Delta, Ebonyi, Edo, Enugu, FCT, Imo, Katsina, Kogi, Kwara, Lagos, Nasarawa, Ondo, Osun, Oyo, Plateau, Taraba, Yobe, and Zamfara.

<sup>4</sup> An ITN is a permanent net that does not require any treatment, a pretreated net obtained within the last 12 months, or a net that has been soaked with insecticide within the past 12 months.

<sup>5</sup> Intermittent preventive treatment is preventive treatment with at least two doses of SP/Fansidar during antenatal visit.

## L. Coverage of Anaemia and Malaria Testing among Children

Anaemia, defined as a low level of haemoglobin in the blood, decreases the amount of oxygen reaching the tissues and organs of the body and reduces their capacity to function. It is associated with impaired cognitive and motor development in children. Although there are many causes of anaemia, inadequate intake of iron, folate, vitamin B<sub>12</sub>, or other nutrients usually accounts for the majority of cases in many populations. Malaria accounts for a significant proportion of anaemia in children under age 5 in malaria-endemic areas. Other causes of anaemia include thalassemia, sickle cell disease, and intestinal worms. Promotion of the use of insecticide-treated nets and deworming medication every six months for children under age 5 are some of the important measures to take to reduce anaemia prevalence among children.

All children age 6-59 months living in the households selected for the 2010 NMIS were eligible for haemoglobin and malaria testing. In the 2010 NMIS, the HemoCue system was used to measure the concentration of haemoglobin in the blood, and the Paracheck *Pf* rapid diagnostic test (RDT) was used to detect malaria. As shown in Table 7, of the 5,612 children age 6-59 months eligible for testing, 90 percent were tested for anaemia and 91 percent were tested for malaria.

Table 7 Coverage of testing for anaemia and malaria in children				
Percentage of eligible children age 6-59 months who were tested for anaemia and for malaria, by characteristics, Nigeria 2010				
Background characteristics	Percentage tested for:			Number of children
	Anaemia	Malaria with RDT	Malaria microscopy	
<b>Age in months</b>				
6-8	84.5	85.9	85.6	354
9-11	86.8	89.3	89.7	281
12-17	91.3	92.5	92.2	689
18-23	91.4	92.6	92.8	474
24-35	90.6	91.8	91.4	1,201
36-47	90.2	91.5	91.1	1,252
48-59	89.9	91.0	91.0	1,361
<b>Child's sex</b>				
Male	89.6	90.9	90.8	2,847
Female	90.2	91.5	91.2	2,765
<b>Residence</b>				
Urban	89.3	90.5	90.7	1,544
Rural	90.1	91.4	91.2	4,068
<b>Zone</b>				
North Central	96.3	96.3	96.1	916
North East	88.4	88.7	88.3	1,021
North West	82.6	88.0	88.1	1,426
South East	89.1	88.4	88.3	718
South South	98.0	98.0	97.3	980
South West	87.5	87.1	87.3	551
<b>Education</b>				
No education	88.4	90.8	90.5	2,204
Primary	93.7	94.6	94.2	955
Secondary	92.5	92.8	92.9	1,328
More than secondary	89.1	89.1	89.1	230
Missing <sup>1</sup>	90.0	100.0	100.0	10
Total	89.9	91.2	91.0	5,612

<sup>1</sup>Includes cases in which it was not possible to match child to the mother in the household.

## M. Malaria Prevalence among Children

Malaria prevalence among children age 6-59 months was measured in the 2010 NMIS in two ways (Table 8). In the field, laboratory scientists used the Paracheck *Pf* rapid diagnostic test (RDT) to diagnose malaria from finger-prick blood samples; those children who tested positive for the presence of *P. falciparum* by the RDT were offered treatment with the antimalarial artemisinin-based combination therapy (ACT). In addition, lab scientists prepared thick blood smears and thin blood films that were transported to Lagos for microscopic examination in the laboratory.<sup>2</sup> Blood smears in which parasites were identified were classified as ‘slide positives.’ Thin blood films were read to determine *Plasmodium* parasite speciation.

Table 8 shows the results of both tests. Using the RDT, 52 percent of children age 6-59 months in Nigeria tested positive for malaria. Analysis of blood smears by microscopy revealed a lower prevalence: 42 percent of children age 6-59 months tested positive. Regardless of which test was used, malaria prevalence increases with age, is independent of gender, and decreases with mother’s education level. Malaria prevalence is higher in rural areas (48 percent by microscopy) than urban areas (23 percent by microscopy). By zone, malaria prevalence is highest in South West (50 percent by microscopy) and lowest in South East (28 percent by microscopy).

Background characteristics	Malaria prevalence			
	RDT positive	Number of children tested	Microscopy positive	Number of children tested
<b>Age in months</b>				
6-8	42.3	331	28.3	330
9-11	40.4	252	30.5	253
12-17	46.6	673	35.9	672
18-23	47.8	431	37.6	432
24-35	50.7	1,080	41.2	1,077
36-47	54.1	1,156	46.3	1,155
48-59	58.2	1,293	49.0	1,293
<b>Child’s sex</b>				
Male	51.7	2,631	42.2	2,632
Female	51.3	2,585	41.8	2,579
<b>Residence</b>				
Urban	36.5	1,189	22.5	1,191
Rural	55.9	4,027	47.7	4,020
<b>Zone</b>				
North Central	45.1	856	49.4	856
North East	46.8	792	30.9	788
North West	56.0	1,627	48.2	1,630
South East	35.6	406	27.6	405
South South	53.8	820	32.2	816
South West	60.5	716	50.3	716
<b>Education</b>				
No education	58.0	2,273	50.8	2,269
Primary	53.7	877	38.9	875
Secondary	36.8	1,081	28.7	1,084
More than secondary	32.9	182	13.1	182
Missing <sup>1</sup>	15.7	12	15.7	12
Total	51.5	5,216	42.0	5,211

<sup>1</sup> Includes cases in which it was not possible to match child to the mother in the household.

<sup>2</sup> All slides were read twice, independently by any of the 10 certified microscopists specially trained at the University of Lagos School of Medicine. Any discordant results were examined a third time by a third independent expert microscopist.

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