Liberia

Malaria Indicator Survey

2011

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National Malaria Control Program
Ministry of Health and Social Welfare
Monrovia, Liberia

Liberia Institute of Statistics and
Geo-Information Services
Monrovia, Liberia

ICF International
Calverton, Maryland, USA

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This report summarizes the findings of the 2011 Liberia Malaria Indicator Survey (LMIS) carried out by the National Malaria Control Program of the Ministry of Health and Social Welfare (MOHSW) in collaboration with the Liberia Institute for Statistics and Geo-Information Services (LISGIS). The government of Liberia provided financial assistance in terms of in-kind contribution of personnel, office space, and logistical support. Financial support for the survey was provided by the United States Agency for International Development (USAID) from President's Malaria Initiative funds through ICF International. ICF International also provided technical assistance, medical supplies, and equipment for the survey through the MEASURE DHS program, which is funded by USAID and is designed to assist developing countries in collecting data on fertility, family planning, and maternal and child health. The opinions expressed in this report are those of the authors and do not necessarily reflect the views of USAID.

Additional information about the survey may be obtained from the National Malaria Control Program, Ministry of Health and Social Welfare, Capitol By-Pass, PO Box 10-9009, 1000 Monrovia 10, Liberia (Telephone: 231-651-6577 or 231-652-8010; E-mail: jjonesdr@yahoo.com).

Information about the DHS program may be obtained from MEASURE DHS, ICF International, 11785 Beltsville Drive, Suite 300, Calverton, MD 20705, U.S.A. (Telephone: 1-301-572-0200; Fax: 1-301-572-0999; E-mail: reports@measuredhs.com; Internet: www.measuredhs.com).

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FOREWORD

Malaria is the leading cause of attendance at outpatient departments and also is the number one cause of inpatient deaths in Liberia. Hospital records suggest that at least 33 percent of all inpatient deaths and 41 percent of deaths among children under age 5 are attributable to malaria (NMCP, 2009). This health problem was exacerbated by 15 years of civil conflict that resulted in large population displacements as well as damage to health systems. Although curable and preventable, malaria remains a major public health problem in Liberia, taking its greatest toll on young children and pregnant women. In an effort to reduce the malaria burden in Liberia, the Ministry of Health and Social Welfare (MOHSW), through the National Malaria Control Program (NMCP), introduced a policy and strategic plan for malaria control and prevention. The NMCP is currently implementing its third plan, the Liberia National Malaria Strategic Plan for 2010- 2015. This plan is in line with the Abuja Declaration, signed by the government of Liberia in April 2000. The overarching goal of the Liberia National Malaria Strategic Plan for 2010- 2015 is to reach the Millennium Development Goal 6, to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

Since 2005, with funding from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and the U.S. President's Malaria Initiative (PMI) and other partners, the NMCP and her partners have increased scaled-up malaria prevention interventions within the following areas: case management of malaria, management of malaria in pregnancy, integrated vector management, and advocacy and behavior change interventions. In addition, the plan also aims to strengthen the NMCP program by improving program management, operational research, monitoring and evaluation, and overall health systems strengthening.

The NMCP relies on the Liberia Malaria Indicator Survey (LMIS), now conducted every two years, to track the progress of malaria control interventions in the general population. The first LMIS was conducted in 2005 and provided baseline data for all key malaria control and prevention indicators for Liberia. The 2009 LMIS updated data for the program, and the 2011 LMIS measures progress over the past six years.

The results presented in this report clearly indicate that coverage of malaria control interventions in Liberia is increasing gradually. However, use of interventions is still low, indicating that more needs to be done, both by the MOHSW and partners in terms of bednet ownership and behavior change communication, if Liberia is to achieve the Millenium Development Goal 6 target of reducing malaria morbidity and mortality by 50 percent by the year 2015.

The 2011 Liberia Malaria Indicator Survey will help the NMCP and other partners in the RBM initiative to assess the current Malaria Control Policy and Strategic Plan. Moreoever, it will assist the program to better plan and implement future malaria control activities in Liberia. We want to urge our partners, both local and international, to double their efforts in rolling back malaria in Liberia.

Mrs. Yah M. Zolia
DEPUTY MINISTER FOR PLANNING, RESEARCH AND DEVELOPMENT
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ACKNOWLEDGMENTS

The 2011 Liberia Malaria Indicator Survey (2011 LMIS) presents the major findings of a survey of a large, nationally representative sample of more than 4,000 households. This survey was conducted by the National Malaria Control Program (NMCP), with assistance from the Liberia Institute of Statistics and Geo-Information Services (LISGIS), from late September 2011 through December 2011. The 2011 LMIS is a follow-up to the 2005 and 2009 LMIS surveys and provides updated estimates of basic demographic and malaria indicators.

The primary objective of the 2011 LMIS is to provide current information for policymakers, planners, researchers, and programme managers. Topics include ownership, access, and use of mosquito bednets; coverage of the intermittent preventive malaria treatment program among pregnant women; prompt and effective malaria treatment practices among children under age 5; and malaria-related knowledge, attitudes, and practices in the general population. Additionally, the 2011 LMIS provides population-based prevalence estimates for anemia and malaria among children age 6-59 months.

I would like to extend my heartfelt thanks and appreciation to all institutions and individuals that made the 2011 Liberia Malaria Indictor Survey (LMIS) achievable. NMCP extends its acknowledgment and gratitude to the various agencies and individuals in the government, donor community, and public sector for support that facilitated the successful implementation of the survey. Specific mention is due to the overall coordinating body for the LMIS: the Technical and Coordinating Committee (TCC), made up of the Planning Department of the Ministry of Health and Social Welfare (MOHSW), LISGIS, the United Nations Children's Fund (UNICEF), and the World Health Organization (WHO). Administrative and moral support was provided by many individuals, including Dr. Walter Gwenigale, Minister of Health and Social Welfare, RL; Mrs. Yah M. Zolia, Deputy Minister for Planning, Research and Human Resource Development, MOHSW; Dr. Bernice Dahn, Deputy Minister/Chief Medical Officer, MOHSW, RL; Mr. T. Edward Liberty, Director, LISGIS; Mr. Tolbert Nyenswah, Deputy Program Manager, NMCP/MOHSW; Dr. Noe Rakotondrajaona, Malaria Advisor, USAID/Liberia; Dr. Filiberto Hernandez, PMI/CDC; Dr. James Tanu Duworko, USAID; Mr. Kaa Williams, USAID; county health officers and county superintendents of the 15 counties in Liberia; and the Internal Affairs Ministry. Finally, Dr. Saye Dahn Baawo of the Family Health Division of the MOHSW made valuable comments on the questionnaire. ICF International provided technical assistance and funding to the 2011 LMIS through the MEASURE DHS project, a USAID-funded programme supporting the implementation of population and health surveys in countries worldwide. Financial support was provided by the President's Malaria Initiative (PMI) through the United States Agency for International Development (USAID). Finally, we wish to thank all field personnel for commitment to high-quality work under difficult conditions and all LMIS respondents for their patience and cooperation.

Again, I am highly grateful to all institutions and individuals who contributed to the successful completion of the LMIS and the writing of this final report.

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LIBERIA

All population values are from the Liberia 2008 Population and Housing Census

INTRODUCTION 1

1.1 COUNTRY PROFILE: GEOGRAPHY, ECONOMY, AND HISTORY

1.1.1 Geography and Economy

Liberia is located on the west coast of Africa, with a land area of 110,080 sq km and a coastline of 560 km along the Atlantic Ocean. It is bordered by Sierra Leone to the west, Guinea to the northwest, and Côte d'Ivoire to the northeast and the east (see map). The country is divided into 15 counties that are further subdivided into 95 districts, chiefdoms, and clans, with a population of approximately 3.5 million people (LISGIS, 2008). Most of the country lies below 500 m in altitude; rain forest and swampy areas are common geographic features. The climate is suitable for malaria transmission throughout the year in almost all parts of the country. During the main rainy season—July through September—temperatures average 24.5°C and rise to 26.5°C in December and January when it is predominantly dry. Rainfall in the coastal areas where the capital, Monrovia, lies, is over 5,000 mm a year; however, this decreases as one moves inland to as little as 2,000 mm. Average humidity is about 72 percent (Ministry of Health, 2001).

Driven by iron-ore and rubber exports and increased timber production, Liberia's economy grew by an estimated 6.9 percent in 2011 (African Economic Outlook). Foreign direct investment in mine construction and palm-oil plantations as well as rubber and timber industries will contribute to growth in the coming years. Coupled with iron-ore exports, which began in 2011, these resources are predicted to increase the Liberian gross domestic product to 8.8 percent in the current year and stabilize growth at 7.2 percent by 2013. Despite the economic growth of the country, more than four-fifths (84 percent) of the population lives below the poverty line on less than US$1.25 per day (UNDP, 2011). Liberia's Human Development Index (HDI), a composite score of the population's general well-being as measured by the United Nations Development Program (UNDP), is 0.329. The 2011 HDI compiles indicators that measure life expectancy, health, education, and standard of living to generate a composite score ranging from a low of 0.0 to a high of 1.0. The HDI score for Liberia ranks the country 182 out of 187 countries with comparable data. The HDI of Sub-Saharan Africa, as a region, has increased from 0.365 in 1980 to 0.463 today, which places Liberia's score below the regional average. Table 1.1 presents a few development indicators for Liberia.

Table 1.1 Selected human development indicators for Liberia 2011

GDP per capita in PPP terms	$396
Total expenditure on health (as a percent of GDP)	13.2 percent
Under-5 mortality rate	112 deaths per thousand live births
Maternal mortality rate	990 deaths per 100,000 births
Average life expectancy	57 years

GDP=Gross Domestic Product
PPP=Purchasing Power Parity
Source: UNDP, 2011

1.1.2 History

Liberia, which means land of the free, was founded by the American Colonization Society (ACS) in 1820 in a drive to resettle free slaves from America back to Africa. The capital, Monrovia, was named after the U. S. President, James Monroe. Liberia became an independent state in 1847, and Joseph Jenkins Roberts, one of the freed African-Americans, was its first elected president. Until 1904, the indigenous

Africans resisted the settlers. As a result, they were refused citizenship in the new republic. To this day, descendents of the American freed slaves are referred to as Americo-Liberians, highlighting Liberia's longstanding connection with the United States of America (Guannu, 2010).

1.2 BACKGROUND ON MALARIA IN LIBERIA

Malaria is the leading cause of attendance in outpatient departments and is also the number one cause of inpatient deaths. Hospital records suggest that at least 33 percent of all inpatient deaths and 41 percent of inpatient deaths among children under age 5 are attributable to malaria (NMCP, 2009). This problem was exacerbated by 15 years of civil conflict that displaced populations and damaged health systems. Although curable and preventable, malaria remains a major public health problem in Liberia, where it takes its greatest toll on young children and pregnant women.

1.2.1 Sources of Malaria Data and Results of Previous LMIS Surveys

Three surveys have been implemented to date to help assess the government's prevention and treatment activities. In 2005, the National Malaria Control Program (NMCP) at the Ministry of Health and Social Welfare (MOHSW) implemented a nationally representative, household-based Malaria Indicator Survey (MIS). The overall objective of this survey was to update the core baseline indicators of malaria in Liberia. Data collection in 8,226 households was conducted by NMCP in close collaboration with the Bureau of Statistics of the Ministry of Planning and Economic Affairs (MPEA), now the Liberia Institute of Statistics and Geo-Information Services (LISGIS), with funding and support from several international donors, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria; the World Health Organization (WHO); and the UN Population Fund (UNFPA). The survey also included a health facility component. One of the most important findings of the survey was the fact that 66 percent of children under age 5 were infected with the malaria parasite *Plasmodium falciparum*, as measured by the rapid diagnostic test Paracheck Pf^{TM}, at the time of the survey; in addition, 87 percent of children under age 5 were anemic (NMCP, 2006).

The government of Liberia implemented the 2007 Liberia Demographic and Health Survey (LDHS). LISGIS was the national implementing agency, assisted by the Ministry of Planning and Economic Affairs (MPEA) and the MOHSW. The survey was a joint undertaking of LISGIS, MPEA, MOHSW, the National AIDS Control Program (NACP), the Liberia Institute for Biomedical Research (LIBR), UNFPA, the US Agency for International Development (USAID), the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), and Macro International (now ICF International). The survey provided information about the levels of and trends in fertility, child mortality, family planning use, and maternal and child health. With respect to malaria prevention and treatment, the 2007 LDHS showed that 30 percent of households in Liberia owned a mosquito net and that 59 percent of children under age 5 with fever were treated with antimalarial drugs, mostly chloroquine (LISGIS et al., 2008).

Finally, using a nationally representative sample of 4,500 households, a second Malaria Indictor Survey was conducted in 2009 by NMCP in collaboration with LISGIS, the laboratory at the China-Liberia Malaria Center, and USAID as part of the President's Malaria Initiative (PMI) and the MEASURE DHS project at ICF International. The survey results documented substantial improvements in key malaria prevention and treatment indicators. For example, household ownership of mosquito nets was 49 percent, nearly three times the level found in the 2005 survey. Almost all nets were insecticide-treated nets (ITNs), with 47 percent of households reporting ownership of at least one ITN. Forty-seven percent of women who had a birth in the two years before the survey reported taking SP/Fansidar two or more times during pregnancy, a dramatic increase from the 4 percent measured in the 2005 survey. Among the 44 percent of children under age 5 with a fever during the two weeks before the survey, two-thirds took some type of antimalarial drug. Thirty percent were given artemisinin-based combination therapy (ACT), the recommended combination drug, compared with 3 percent in 2005 and 9 percent in 2007. Despite these

real gains, the survey found anemia and malaria remained widespread among young children; among children age 6-59 months, nearly two-thirds (63 percent) were found to be anemic, and blood smears taken from nearly one-third tested positive for malaria in the central laboratory (NMCP et al., 2009) .

Available data on malaria from other sources is sparse. Most of the available data are based on field reports from nongovernmental organizations (NGOs). Population-based surveys, such as the MIS and DHS, are the main data sources for malaria in Liberia.

1.2.2 National Malaria Strategic Plan for 2010-2015

In an effort to reduce the malaria burden in Liberia, the MOHSW introduced a policy and strategic plan for malaria control and prevention. The plan was in line with the Abuja Declaration, which the government of Liberia signed in April 2000, as well as Roll Back Malaria (RBM) guidelines. Liberia's third National Malaria Strategic Plan for 2010-2015 addresses the need to scale-up malaria control and prevention activities to achieve the RBM target of reducing malaria morbidity and mortality by half in 2010, as well as the Millennium Development Goals (MDGs) of sustaining this progress and beginning to reverse the incidence of malaria by 2015. This six-year National Malaria Strategic Plan builds on the achievements made thus far while recognizing the challenges and addressing the essential actions to be taken to reduce the malaria morbidity and mortality trends in Liberia. The third Strategic Plan addresses gaps observed in the implementation of the first and interim Strategic Plans and also puts forth a more detailed and well-assessed strategy for dealing with the malaria situation in Liberia by these target dates.

The National Malaria Strategic Plan focuses on malaria prevention and control in four main activities: case management of malaria, management of malaria in pregnancy, integrated vector management, and advocacy and behavior change interventions. In addition, the plan aims to strengthen the NMCP program by improving program management, operational research, monitoring and evaluation, and overall health systems strengthening (NMCP, 2011).

The Malaria Case Management arm of the National Malaria Strategic Plan addresses the population's poor access to health services, health professionals' reluctance to use ACT, and the high circulation of chloroquine within Liberia. Case Management activities intend to scale up the availability and promote the use of ACT, the first-line treatment for malaria. The plan will make the fixed-dose artesunate and amodiaquine combination therapy available to all health facilities, while training the health staff in their appropriate use. Moreover, the role of general Community Health Volunteers (gCHVs) within the community will be reinforced, and gCHV's will be provided with malaria control tools and training to use these tools. To make ACT more available and more affordable in the private sector, private health care providers (pharmacies and drug/medicine stores) will dispense ACT at an agreeable price. The overall goal of the Case Management activities is to increase ACT use and subsequently reduce malaria morbidity and mortality.

The Malaria in Pregnancy section of the National Malaria Strategic Plan consists of three main interventions: intermittent prevention treatment (IPTp), use of long-lasting insecticidal nets (LLINs), and effective case management of malaria and anemia among pregnant women. IPT programs recommend that pregnant women receive at least two doses of sulphadoxine-pryimethamine (SP), with one dose received during a prenatal care visit, to protect women against malaria. The Malaria in Pregnancy interventions aim to reduce not only malaria in pregnant women but also to curb the infant's low-birth weight, which is a result of fetal malaria infection.

The National Malaria Strategic Plan also includes a three-tiered Integrated Vector Management (IVM) approach. The goal of the IVM program is to increase mosquito net ownership in the population and to protect households from contact with mosquitoes. IVM will provide LLINs through mass distribution to all family units, as well as targeted distribution to pregnant women and children under age 5 to achieve maximum results for prevention of malaria transmission. The strategy will also continue targeted indoor

residual spraying (IRS) of households and will consider other vector management strategies for environmental control.

The Behavior Change Communication component of the National Malaria Strategic Plan strives to increase support for advocacy and health education at all levels of society. To effect behavioral change, the program uses television, radio, schools, and places of worship to stress the importance of ACT therapy, LLIN use, and other forms of vector management. The role of the community in malaria control and prevention activities is emphasized.

The measures laid out in the National Malaria Strategic Plan are directed toward reducing malaria morbidity and mortality. These recommendations will help Liberia to scale-up more effective malaria control and prevention measures, from the health facility down to the community level, and to involve the private sector and all other partners that support health care delivery.

1.3 OBJECTIVES OF THE LIBERIA MALARIA INDICATOR SURVEY

Since the 2005 LMIS and the 2009 LMIS, NMCP and its partners have scaled-up malaria interventions in all parts of the country. To determine the progress made in malaria control and prevention in Liberia since 2009, the 2011 Liberia Malaria Indicator Survey (LMIS) was designed to provide data on key malaria indicators, including mosquito net ownership and use as well as prompt and effective treatment with ACT.

The key objectives of the 2011 LMIS were to

- Measure the extent of ownership, access, and use of mosquito nets
- Assess coverage of the intermittent preventive treatment program to protect pregnant women
- Identify practices used to treat malaria among children under age 5 and the use of specific antimalarial medications
- Measure the prevalence of malaria and anemia among children age 6-59 months
- Assess malaria-related knowledge, attitudes, and practices in the general population

Another objective of the survey was to transfer knowledge about best practices in survey implementation, including skills in survey design, training, budgeting, logistics, data collection, monitoring, data processing, analysis, report drafting, and data dissemination.

1.4 METHODOLOGY OF THE 2011 LIBERIA MALARIA INDICATOR SURVEY

The 2011 LMIS fieldwork was carried out from September 2011 through December 2011, using a nationally representative sample of almost 4,500 households. All women age 15-49 in these households were eligible to be individually interviewed and asked questions about malaria prevention during pregnancy and treatment of childhood fevers. In addition, using a finger prick blood sample, the survey included testing for anemia and malaria among children age 6-59 months. Results from anemia and malaria testing were available immediately and were provided to the children's parents or guardians. Thick blood smears were also made in the field and carried to the China-Liberia Malaria Center laboratory at the JFK Hospital in Monrovia, where they were tested for presence of malaria parasites.

1.4.1 Survey Organization

The 2011 LMIS was implemented by the NMCP of the MOHSW. NMCP was responsible for general administrative management of the survey, including oversight of day-to-day operations and establishing and hosting meetings of the Technical Committee. The program also designed the survey, developed the survey protocol, and ensured its approval by the University of Liberia Institutional Review Board (IRB) and the MOHSW Ethical Committee prior to the data collection. Moreover, NMCP also participated along with LISGIS in recruiting, training, and monitoring field staff. NMCP was also

responsible for providing the necessary medicines for treatment of any children who tested positive for malaria during the survey. NMCP also took primary responsibility for the data processing operation, report writing, and data dissemination. The program was also responsible for administering all funds for local costs and for keeping adequate accounts and providing office space for the survey operations and data processing.

LISGIS assisted NMCP in the design of the survey, especially in the area of sample design and selection. LISGIS headed the 2011 LMIS household listing operation and provided the geographic coordinates for each of the selected sample points. The institute also provided the necessary maps and lists of households in the selected sample points for the fieldwork. Also, it helped NMCP recruit, train, and monitor the data collection staff.

The laboratory at the China-Liberia Malaria Center, on the JFK Hospital compound in Monrovia, implemented the microscopic analysis of the thick blood smears to determine malaria parasite infection. A sample of thick smears was sent to the laboratory at the Liberia Institute of Biomedical Research (LIBR) for external quality control reading.

To maintain communication among all parties, to improve the survey design, and to broaden acceptance and ownership of the survey, NMCP organized a Technical Committee. The Technical Committee consisted of staff who met periodically to make recommendations on project design and questionnaires, monitor the progress of activities, and review survey results.

Technical assistance was provided by MEASURE DHS at ICF International using funds provided by the President's Malaria Initiative (PMI) through (USAID)/Liberia. Over the course of the project, ICF staff made 12 in-person visits to Liberia to assist with overall survey design, sample design, questionnaire design, field staff training, field work monitoring, biomarkers (anemia testing, rapid malaria testing, and making and reading thick blood smears), data processing, data analysis, report preparation, and data dissemination. DHS also provided copies of its model Malaria Indicator Survey questionnaires; model interviewer's, supervisor's and training manuals; data entry and editing programs; programs for tracking the results of the malaria blood smear testing at the laboratory, and tabulation and report plans, as well as all the supplies needed for anemia and malaria testing and some computers and related equipment for data processing.

Financial support for the survey was provided by the government of Liberia and the US President's Malaria Initiative (PMI) project.

1.4.2 Sample Design

The LMIS sample was designed to produce most of the key indicators for the country as a whole, for urban and rural areas separately, and for Monrovia and each of five regions that were formed by grouping the 15 counties. The regional groups are as follows:

1 Greater Monrovia
2 North Western: Bomi, Grand Cape Mount, Gbarpolu
3 South Central: Montserrado (outside Monrovia), Margibi, Grand Bassa
4 South Eastern A: River Cess, Sinoe, Grand Gedeh
5 South Eastern B: River Gee, Grand Kru, Maryland
6 North Central: Bong, Nimba, Lofa

Thus, the sample was not spread geographically in proportion to the population, but rather it was spread equally across the regions, with 25 sample points or enumeration areas (EAs), also known as clusters, per region. As a result, the LMIS sample is not self-weighting at the national level. Sample weighting factors have been applied to the survey records to bring them into proportion.

The 2011 LMIS sample used the same EAs as those selected for inclusion in the 2009 LMIS. The LMIS survey utilized a two-stage sample design (see Appendix A). The first stage involved selecting 150 clusters with probability proportional to size from the list of approximately 7,000 EAs covered in the March 2008 National Population and Housing Census. The EA size was the number of residential households residing in the EA as recorded in the census. Stratification was achieved by separating each county into urban and rural areas. The urban areas in each county mainly consist of the county capital. Therefore the 15 counties plus Greater Monrovia (which has only urban areas) were stratified into 31 sampling strata: 15 rural strata and 16 urban strata. Samples were selected independently in each stratum, with a predetermined number of EAs to be selected. Implicit stratification was achieved in each of the explicit sampling strata by (1) sorting the sampling frame according to districts and clan within each of the sampling strata and (2) using the probability-proportional-to-size selection procedure. Among the 150 EAs (clusters) selected, 69 were in urban areas and 81 were in rural areas.

In the second stage, for all of the selected EAs, a fixed number of households (30) was selected using an equal probability systematic sampling from a list of households in the EA. In March 2011, LISGIS, along with NMCP, recruited and trained predominantly LISGIS cartographers, mappers, and listers. They assigned them to the 15 counties to list households in selected clusters. These lists served as the sampling frame for household selection.

All women age 15-49 who were either permanent residents of the households in the sample or visitors present in a household on the night before the survey were eligible to be interviewed in the survey. In addition, all children age 6-59 months who were listed in the household were eligible for the anemia and malaria testing component.

1.4.3 Questionnaires

Two questionnaires were used in the LMIS: a Household Questionnaire and a Woman's Questionnaire for all women age 15-49 in the selected households. Both instruments were based on the model Malaria Indicator Survey questionnaires developed by the Roll Back Malaria and MEASURE DHS programs, as well as on previous surveys conducted in Liberia, including the 2005 LMIS, 2009 LMIS, and 2007 LDHS. In consultation with the Technical Committee, NMCP and ICF International staff modified the model questionnaires to reflect relevant issues of malaria in Liberia. Given that there are dozens of local languages in Liberia, most of which have no accepted written script and are not taught in the schools, and also given that English is widely spoken, it was decided not to attempt to translate the questionnaires into vernaculars. However, many of the questions were broken down into a simpler form of Liberian English that interviewers could use with respondents. All questionnaires were formally pretested in June 2011 within two clusters: an urban area in Monrovia and a rural area in Bomi County. The clusters selected for the pretest were not included in the main survey sample.

The Household Questionnaire was used to list all the usual members and visitors in the selected households. Some basic information was collected on the characteristics of each person listed, including age, sex, and relationship to the head of the household. The main purpose of the Household Questionnaire was to identify eligible women for the individual interview and children age 6-59 months for anemia and malaria testing. The Household Questionnaire also 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, roof, and walls of the house, ownership of various durable goods, and ownership and use of mosquito nets. In addition, this questionnaire was also used to record consent to anemia and malaria testing of young children and test results.

The Woman's Questionnaire was used to collect information from all women age 15-49 and covered the following topics:

- Background characteristics (age, education, religion, and dialect)
- Partial reproductive history
- Preventive malaria treatment for most recent birth
- Prevalence and treatment of fever among children under age 5
- Knowledge about malaria (symptoms, causes, ways to avoid, types of medicines, and so on).

1.4.4 Anemia and Malaria Testing

The 2011 LMIS incorporated three biomarkers which required taking finger prick blood samples from children age 6-59 months. On-the-spot testing was performed for anemia and malaria, and thick blood smears were prepared for later reading in the laboratory to determine the presence of malaria parasites. Each data collection team included two health technicians who were responsible for implementing the malaria and anemia testing and making the blood smear slides. Each field team included at least one medically trained staff person (nurse, physician's assistant, or doctor) who—in addition to either interviewing or conducting the testing—was also responsible for ensuring that medications for malaria were given in accordance with the appropriate treatment protocols. Verbal informed consent for testing of children was requested from each child's parent or guardian at the end of the household interview. The protocol for the blood specimen collection and analysis was approved by ICF International's institutional review board (IRB) as well as the University of Liberia's IRB and the MOHSW Ethical Committee.

Anemia testing. Because of the strong correlation between malarial infection and anemia, the LMIS included anemia testing for children age 6-59 months. After obtaining informed consent from the child's parent or guardian, blood samples were collected using a single-use, spring-loaded, sterile lancet to make a finger prick. Health technicians then collected a drop of blood on a microcuvette from the finger prick. Hemoglobin analysis was carried out on site using a battery-operated portable HemoCue analyzer that produces a result in less than one minute. Results were given to the child's parent or guardian verbally and in writing. Parents of children with a hemoglobin level under 8 g/dl were urged to take the child to a health facility for follow-up care and were given a referral letter with the hemoglobin reading to show to staff at the health facility. Results of the anemia test were recorded on the Household Questionnaire as well as in a brochure. The brochure, which explained the causes and prevention of anemia, was left in the household.

Rapid malaria testing. Another major objective of the LMIS was to provide information about the extent of malarial infection among children age 6-59 months. Using the same finger prick as for anemia testing, a drop of blood was tested immediately using the First Response rapid diagnostic test (RDT), which tests for *Plasmodium falciparum*. The test includes a loop applicator that comes in a sterile packet. A tiny volume 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 to the child's parent/guardian in oral form and were also recorded in the same brochure with the anemia result. This brochure also explained the causes and prevention of malaria. In addition, the result of the malaria RDT was recorded on the Household Questionnaire.

Following the National Malaria Case Management Guidelines, those who tested positive for malaria using RDT but who did not have symptoms indicative of complicated malaria, were offered a full course of medicine according to standard procedures for treating malaria in Liberia (NMCP, 2011b). To ascertain the correct dose, the nurse on each team was instructed to ask about any medications the child might already be taking. The nurse then weighed the child using a portable scale and provided the appropriate dose of ACT along with instructions on how to administer the medicines to the child. All medicines for malaria treatment were provided by NMCP. All children who tested positive for malaria using the RDT and who had taken ACT within the past two weeks were referred to a health facility. In addition, those who tested positive using the RDT and who had symptoms indicative of complicated malaria were referred to a health facility for immediate treatment.

Malaria testing: blood smears. In addition to the First Response rapid test, a thick blood smear was taken for all children tested. Each blood smear slide was given a bar code label, with a duplicate label attached to the Household Questionnaire on the line showing consent for that child. A third copy of the same bar code label was affixed to a Blood Sample Transmittal Form in order to track the blood samples from the field to the laboratory. The blood smears were dried and packed carefully in the field. They were periodically collected in the field, along with the completed questionnaires, and transported to NMCP headquarters in Monrovia for logging in, after which they were taken to the Malaria Center at the JFK hospital compound in Monrovia for microscopic reading and determination of malarial infection.

1.4.5 Recruitment and Vetting of Field Staff

Throughout March and April of 2011, NMCP and LISGIS posted public notices on their office buildings to recruit 2011 LMIS field staff. All candidates applied to NMCP by letter for the position, and they were invited to take an aptitude test. More than 550 people, mostly residents of Monrovia, applied for the field staff positions. The applicant pool consisted of individuals with experience in previous LISGIS surveys, such as the 2007 LDHS, the 2005 LMIS, and the 2009 LMIS, but it also included a large number of people who did not have survey fieldwork experience. Based on the applicant's letter, written test score, and interview, NMCP and LISGIS selected 87 people to attend the 2011 LMIS main training.

1.4.6 Training of Field Staff

Eighty-seven individuals were invited to attend a two-week training course from September 5-19, 2011, at the Catholic Archdiocesan Pastoral Center in Monrovia. Training of the interviewer/supervisor candidates consisted of reviewing how to fill out the Household and Woman's Questionnaires, mock interviewing, and sessions covering tips on interviewing, how to locate selected households, and how to code interview results. Trainers included the LMIS team (project director, assistant project director, data manager, field coordinator, and lab supervisors) and three LISGIS staff, with support from two ICF staff. Quizzes were administered daily. Selection for the different positions was strictly based on performance during training. Despite the large candidate pool, many did not qualify on the basis of their quiz scores or because of their interviewing skills. Overall, few were proficient in the major local languages. Of the 87 attendees in the interviewer/supervisor training, 12 were selected as supervisors, and 24 were selected as interviewers.

Among the 87 training participants, NMCP also identified 32 staff with either laboratory or medical experience who were trained in taking blood for the anemia and malaria testing at the same time and place as the interviewer/supervisor candidates. Of these, 24 were selected as health technicians for the biomarker data collection. The health technicians were trained by an ICF biomarker specialist on how to identify children eligible for testing, how to administer informed consent, how to conduct the anemia and malaria rapid tests, and how to make a proper thick blood smear. They were also trained on how to store the blood slides, how to record test results on the questionnaire, and how to provide results to the parents/caretakers of the children tested. Training included how to record children's anemia and malaria results on the anemia and malaria brochure, which was to be left in every household in which children were tested, and on how to fill in the referral slip for any child who was found to be severely anemic or who had reported symptoms indicative of severe malaria. Trainees participated in numerous practice sessions in the classroom.

All trainees participated in four days of field practice exercises in households close to the training site. They also received a lecture on the epidemiology of malaria in Liberia and NMCP malaria prevention programs.

1.4.7 Fieldwork

Twelve teams were organized for the data collection, each comprised of one supervisor, two interviewers, two health technicians, and one driver. Two staff from LISGIS and two from NMCP were designated as field coordinators, and each field coordinator was assigned a number of teams to monitor.

The LMIS fieldwork was implemented in three phases because of Liberia's 2011 general and presidential elections. The first phase of data collection started on September 20, 2011. To allow for maximum supervision in the first few weeks of the survey and also to allow the field teams to familiarize themselves with the task, all 12 teams started work in Monrovia. Phase One of the survey ran through October 9, 2011, and included EAs in Monrovia, as well as in rural Monserrado, Grand Cape Mount, and Gbarpolu counties. The field staff returned to Monrovia to vote after Phase One. Phase Two of the LMIS began on October 15 and continued through November 5, 2011. Phase Two included EAs within Sinoe, River Cess, Grand Bassa, Margibi, Bomi, Bong, and Lofa counties. The field staff took a temporary hiatus from fieldwork during the presidential run-off election. Nimba, Grand Geddeh, Maryland, Grand Kru, and River Gee counties were visited in Phase Three of the LMIS. Phase Three of the LMIS commenced on November 14 and ended on December 8, 2011.

1.4.8 Laboratory Testing

NMCP recruited six microscopists to read the 2011 LMIS slides at the laboratory at the China-Liberia Malaria Center on the JFK Hospital site. ICF provided the computer software for recording the laboratory test results, as well as equipment and supplies for the lab. NMCP, with the expertise of senior staff at LIBR, led a three-day refresher microscopy training, based on the USAID-funded Improving Malaria Diagnostics (IMaD) curriculum. The IMaD curriculum focuses on the epidemiology of malaria, the biology of the malaria vector and parasite, preparation of thick and thin blood films and stain films to a high standard, identification of all malaria species (*P.f., P.v., P.o., P.m.*) microscopically, including their stage of development, the quantification of malaria parasites, quality control of reagents and smear in malaria diagnosis, quality control of malaria slide reading, and basic standards of good laboratory practice. The IMaD training course had been used for NMCP trainings in 2009 and 2010 and was very successful in training microscopists to accurately read malaria slides. The lab training took place in late September 2011; however, the laboratory did not begin to stain and read slides until late October.

An ICF consultant traveled to Monrovia in December 2011 to visit the laboratory and evaluate the activities being conducted there. The consultant provided technical assistance to the laboratory on malaria microscopy to improve the quality of the malaria prevalence data. The consultant's assessment highlighted issues in the testing, including issues with staining, mounting, and misclassification of results. He conducted several troubleshooting sessions with the microscopists to help them build confidence in interpreting and reporting their results. These sessions involved review of "unreadable" slides and interpretation of results by each technician to the group. He also retrained the microscopists to properly prepare lab reagents following the LMIS standard operating procedures. He helped the microscopists to remount any smears that were assessed to have been poorly mounted. All of the remounted slides were reread by the laboratory in order to generate more accurate results. Laboratory testing continued until January 2012.

After the laboratory testing at the China-Liberia Malaria Center was completed, a random sample of 460 slides were sent to the LIBR in Margibi County for an independent quality control check.

1.4.9 Data Processing

The processing of the LMIS questionnaire data began one week after the fieldwork commenced. Completed questionnaires were returned periodically from the field to the NMCP office in Monrovia, where they were coded by data processing personnel recruited and trained for this task. The data processing staff consisted of a supervisor and an assistant from NMCP, a questionnaire administrator, five

data entry operators, and one data editor, all of whom were trained by an ICF data processing specialist. Data were entered using the CSPro computer package. All data were entered twice (100 percent verification). The concurrent processing of the data was a distinct advantage for data quality, since NMCP was able to advise field teams of errors detected during data entry. The data entry and editing phase of the survey was completed in January 2012.

1.5 RESPONSE RATES

Table 1.2 shows response rates for the 2011 LMIS. Of the 4,492 households selected in the sample, 4,237 were found occupied at the time of the fieldwork. The shortfall is due to households with members who were away for an extended period of time, dwellings that could not be found in the field, and dwellings that were found to be vacant or destroyed (see Appendix A, Table A.5). Of the existing households, 4,162 were successfully interviewed, yielding a household response rate of 98 percent.

Table 1.2 Results of the household and individual interviews

Number of households, number of interviews, and response rates, according to residence (unweighted), Liberia 2011

Result	Residence		Total
	Urban	Rural	
Household interviews			
Households selected	2,070	2,422	4,492
Households occupied	1,960	2,277	4,237
Households interviewed	1,914	2,248	4,162
Household response rate[1]	97.7	98.7	98.2
Interviews with women age 15-49			
Number of eligible women	2,032	1,982	4,014
Number of eligible women interviewed	1,986	1,953	3,939
Eligible women response rate[2]	97.7	98.5	98.1

[1] Households interviewed/households occupied
[2] Respondents interviewed/eligible respondents

In the households interviewed in the survey, a total of 4,014 eligible women were identified, of whom 3,939 were successfully interviewed, yielding a response rate of 98 percent. The households' and women's response rates are slightly lower in urban areas than in the rural areas. The principal reason for nonresponse among eligible women was the failure to find them at home despite repeated visits to the household.

CHARACTERISTICS OF HOUSEHOLDS AND WOMEN

2

Key Findings

- Seventy-two percent of Liberian households use an improved source of drinking water.
- Only 8 percent of Liberian households use an improved non-shared toilet facility, while 25 percent use a shared facility that would be considered improved if the facility were not shared. The remaining 67 percent of Liberian households use non-improved, non-shared facilities.
- Almost all Liberian households (96 percent) do not have electricity.
- Compared with the 2009 LMIS, the proportion of women with no education has decreased from 42 percent to 36 percent in the 2011 LMIS, and the proportion of women who completed secondary school or more than secondary school has increased from 6 percent in 2009 to 10 percent in 2011.

This chapter summarizes demographic and socioeconomic characteristics of the households and women interviewed in the 2011 LMIS. The survey collected information from all usual residents of a selected household (the de jure population) and from persons who stayed in the selected household the night before the interview (the de facto population). Because the difference between these two populations is very small, and comparability with other reports is desirable, all tables in this report refer to the de facto population unless otherwise specified. For the purpose of the survey, a household was defined as a person or a group of persons, related or unrelated, who live together and share a common source of food. The Household Questionnaire (see Appendix E) included a schedule to collect age, sex, and relationship to the head of the household for all usual residents and visitors who spent the night preceding the interview. The Household Questionnaire also obtained information on housing facilities, (e.g., source of water supply, sanitation facilities) and household possessions. These latter items are used to create an index of relative wealth, which is described in this chapter. A profile of the women who were interviewed in the LMIS is also presented in this chapter. Information is given on basic characteristics of these women, including age at the time of the survey, religion, residence, education, and wealth quintile.

The information presented in this chapter is intended to facilitate interpretation of the key demographic, socioeconomic, and health indicators presented later in the report. It is also intended to assist in the assessment of the representativeness of the survey sample.

2.1 HOUSEHOLD ENVIRONMENT

The physical characteristics of the dwelling in which a household lives are important determinants of the health status of household members, especially children. They can also be used as indicators of the socioeconomic status of households. LMIS household respondents were asked a number of questions about their household environment, including questions on the source of drinking water, type of toilet facility, cooking fuel, and the number of rooms in the dwelling used for sleeping. The results are presented both in terms of households and of the de jure population.

2.1.1 Drinking Water

Increasing access to improved drinking water is one of the Millennium Development Goals that Liberia along with other nations worldwide has adopted (United Nations General Assembly, 2001). Table 2.1 shows information on the source of drinking water and a household's access to drinking water. The source of drinking water is an indicator of water quality. Sources that are likely to be of suitable quality are listed under "improved source," while sources not of suitable quality are listed under "non-improved

source," reflecting the categorizations of the WHO/UNICEF Joint Monitoring Programme (JMP) for Water and Sanitation (WHO/UNICEF JMP, 2012). The improved source includes a piped source within the dwelling or plot, a public tap, a tube well or borehole, a protected well or spring, rainwater, and bottled water. However, even when water is obtained from an improved source, it may be contaminated during transport or storage.

Table 2.1 Household drinking water

Percent distribution of households and de jure population by source of drinking water and time to obtain drinking water, according to residence, Liberia 2011

	Households			Population		
Characteristic	Urban	Rural	Total	Urban	Rural	Total
Source of drinking water						
Improved source	80.4	64.0	72.1	82.0	66.1	73.9
Piped into dwelling/yard/plot	3.1	0.7	1.9	3.4	1.1	2.2
Public tap/standpipe	12.8	0.1	6.4	11.1	0.1	5.5
Tube well/borehole	1.0	0.1	0.5	1.0	0.2	0.6
Protected dug well	59.8	62.9	61.4	63.7	64.6	64.1
Protected spring	0.0	0.2	0.1	0.0	0.2	0.1
Rain water	0.5	0.0	0.2	0.5	0.0	0.2
Bottled water	3.3	0.0	1.6	2.3	0.0	1.1
Non-improved source	12.2	36.0	24.2	13.2	33.9	23.8
Unprotected dug well	8.9	5.2	7.0	10.0	5.4	7.6
Unprotected spring	0.3	5.1	2.7	0.3	5.2	2.8
Tanker truck/cart with small tank	2.8	0.0	1.4	2.6	0.0	1.3
Surface water	0.2	25.7	13.1	0.3	23.3	12.1
Other source	7.2	0.0	3.6	4.8	0.0	2.3
Missing	0.1	0.0	0.1	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Percentage using any improved source of drinking water	80.4	64.0	72.1	82.0	66.1	73.9
Time to obtain drinking water (round trip)						
Water on premises	11.8	4.9	8.3	12.5	5.4	8.9
Less than 30 minutes	70.1	84.9	77.6	67.9	84.6	76.4
30 minutes or longer	16.0	9.1	12.5	18.0	9.2	13.5
Don't know/missing	2.2	1.1	1.6	1.6	0.8	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	2,058	2,104	4,162	9,153	9,585	18,737

Almost three in four households in Liberia (72 percent) have an improved source of drinking water. Among all households, the most common single source of water is protected dug wells (61 percent). Comparison with the 2009 LMIS implies that there has been some improvement in sources of water among rural households. The proportion of rural households with improved sources of water increased from 58 to 64 percent over a two-year period. Some of this improvement is due to an increase in access to protected dug wells in rural areas. Urban households are much more likely than rural households to use an improved source of drinking water (80 versus 64 percent). Twenty-six percent of rural households get their drinking water from lakes, ponds, rivers, and streams (surface water) compared with less than 1 percent of urban households who rely on these sources.

In 8 percent of Liberian households, water is available within the dwelling or plot (on the premises). Urban households are more than twice as likely as rural households to have water on the premises. Households without water on the premises were asked how long it takes to fetch water. Nearly 8 in 10 households (70 percent of urban areas and 85 percent in rural areas) obtain drinking water in less than 30 minutes, while 13 percent (16 percent in urban areas and 9 percent in rural areas) take 30 minutes or longer to fetch drinking water.

2.1.2 Household Sanitation Facilities

Ensuring adequate sanitation facilities is another of the Millennium Development Goals that Liberia shares with other countries. A household is classified as having an improved toilet if it is used only

by members of one household (not shared) and if the facility used by the household separates the waste from human contact (WHO and UNICEF, 2010). The types of facilities considered improved are toilets that flush or pour flush into a piped sewer system, septic tank, or pit latrine; ventilated improved pit (VIP) latrines; and pit latrines with a slab.

Table 2.2 shows that 8 percent of Liberian households use an improved non-shared toilet facility, while 25 percent use a shared facility that would be considered improved if the facility were not shared. Another 67 percent of Liberian households use non-improved facilities. Urban households are 7.5 times more likely to have access to an improved non-shared facility when compared with rural households (15 percent and 2 percent, respectively). The level of "improvement" among urban households is due to the higher percentage (13 percent) of households who mentioned the use of a flush/pour flush toilet to a septic tank.

Table 2.2 Household sanitation facilities

Percent distribution of households and de jure population by type of toilet/latrine facilities, according to residence, Liberia 2011

	Households			Population		
Type of toilet/latrine facility	Urban	Rural	Total	Urban	Rural	Total
Improved, not shared facility	14.7	1.8	8.2	18.9	2.2	10.4
Flush/pour flush to piped sewer system	0.2	0.1	0.1	0.2	0.0	0.1
Flush/pour flush to septic tank	12.5	0.3	6.3	15.9	0.5	8.0
Flush/pour flush to pit latrine	1.1	0.0	0.6	1.3	0.1	0.7
Ventilated improved pit (VIP) latrine	0.3	0.2	0.3	0.6	0.3	0.5
Pit latrine with slab	0.6	1.2	0.9	0.9	1.3	1.1
Shared facility[1]	36.2	13.3	26.4	34.0	12.7	23.0
Flush/pour flush to piped sewer system	0.9	0.0	0.5	1.0	0.0	0.5
Flush/pour flush to septic tank	16.9	0.9	8.8	14.7	0.7	7.5
Flush/pour flush to pit latrine	6.0	1.8	3.9	5.8	2.1	3.9
Ventilated improved pit (VIP) latrine	4.3	4.5	4.4	4.1	4.2	4.2
Pit latrine with slab	7.7	6.0	6.8	8.0	5.6	6.7
Composting toilet	0.4	0.1	0.2	0.4	0.1	0.2
Non-improved facility	48.9	84.8	67.0	47.0	85.0	66.5
Flush/pour flush not to sewer/septic tank/pit latrine	3.2	0.2	1.7	2.9	0.1	1.5
Pit latrine without slab/open pit	15.1	20.7	17.9	15.0	20.7	17.9
Bucket	0.2	0.0	0.1	0.1	0.0	0.1
Hanging toilet/hanging latrine	10.1	2.4	6.2	9.5	2.5	5.9
No facility/bush/field	19.7	61.3	40.7	19.1	61.6	40.9
Other	0.6	0.2	0.4	0.4	0.1	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	2,058	2,104	4,162	9,153	9,585	18,737

[1] Facilities that would be considered improved if they were not shared by two or more households

Among households that use shared toilet facilities, the most common shared facilities are flush/pour flush to septic tank (9 percent) and pit latrine with slab (7 percent). Urban households are 2.7 times more likely than rural households to use a shared facility (36 percent and 13 percent, respectively). A majority of the urban households with a shared toilet facility are sharing a flush/pour toilet that flushes to a septic tank (17 percent).

Non-improved facilities account for the majority of toilet facilities within Liberian households. Among the households with non-improved facilities, the bush or field is the most commonly reported unimproved facility (41 percent). Rural households are three times more likely than urban households to report using the field or bush (61 percent and 20 percent, respectively). Eighteen percent of Liberian households report using a pit latrine without a slab/open pit, the second most common unimproved facility type. Pit latrines without a slab or open pits are more common among rural households than urban households (21 percent versus 15 percent).

There has been little improvement to household sanitation facilities in Liberia in the past four years. The 2007 Liberia Demographic and Health Survey (LDHS) showed that 1 in 10 households were

using an improved, not shared toilet facility, while 18 percent used a shared facility and almost three-quarters of Liberian households (72 percent) used a non-improved toilet facility. The current survey shows a lower proportion of households using improved toilets, a higher proportion of households sharing facilities, and a lower proportion of households using a non-improved toilet facility. It is unlikely that Liberia will reach the MDG 7, to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. To meet this target, approximately 7 in 10 Liberian households should have access to an improved, not shared toilet facility (Ministry of Planning and Economic Affairs and United Nations Development Programme, 2010).

2.1.3 Housing Characteristics

Table 2.3 presents information on a number of characteristics of the dwelling in which LMIS households live. These characteristics reflect the household's socioeconomic situation. They also may influence environmental conditions—for example, the use of biomass fuels and exposure to indoor pollution—that have a direct bearing on the health and welfare of household members.

Table 2.3 Household characteristics

Percent distribution of households by housing characteristics and percentage using solid fuel for cooking, according to residence, Liberia 2011

Housing characteristic	Residence		Total
	Urban	Rural	
Electricity			
Yes	7.2	1.0	4.1
No	92.6	99.0	95.9
Total	100.0	100.0	100.0
Flooring material			
Earth/sand/mud	15.4	72.8	44.4
Wood/planks	0.2	0.4	0.3
Parquet or polished wood	0.1	0.0	0.0
Floor mat/linoleum/vinyl	19.0	5.5	12.2
Ceramic tiles	5.5	0.1	2.8
Concrete/cement	58.5	21.1	39.6
Carpet	1.1	0.1	0.6
Other	0.1	0.0	0.0
Total	100.0	100.0	100.0
Rooms used for sleeping			
One	65.3	59.0	62.2
Two	17.6	24.7	21.2
Three or more	16.1	15.7	15.9
Missing	1.0	0.6	0.8
Total	100.0	100.0	100.0
Cooking fuel			
Electricity	0.1	0.0	0.1
Gas cylinder	0.4	0.0	0.2
Kerosene stove	0.3	0.0	0.1
Fire coal/charcoal	82.5	9.2	45.5
Wood	13.9	89.4	52.1
No food cooked in household	2.7	1.1	1.9
Total	100.0	100.0	100.0
Percentage using solid fuel for cooking[1]	96.4	98.7	97.6
Number	2,058	2,104	4,162

[1] Includes fire coal/charcoal and wood

Ninety-six percent of Liberian households do not have electricity. The 4 percent that have electricity are mostly located in the urban areas. During the Liberian civil crisis, the country's entire electric grid was destroyed. Now that grid is being redeveloped. At the time of the survey, however, only a small fraction of Monrovia's connection to the grid had been restored.

The type of material used for flooring is an indicator of the economic situation of households and therefore the potential exposure of household members to disease-causing agents. Two in five (44 percent) of households in Liberia live in dwellings with earth, sand, or mud floors, 40 percent live in dwellings with concrete or cement floors, and 12 percent live in dwellings with a floor mat, linoleum, or vinyl. Differences by urban-rural residence are very large. Over half (59 percent) of urban households have concrete or cement floors, and nearly three-quarters (73 percent) of rural households have earthen floors.

The number of rooms a household uses for sleeping is an indicator of socio-economic level. The number of rooms used for sleeping also can be used to assess crowding, which can facilitate the spread of disease. In the 2011 LMIS, household respondents were asked how many rooms were used for sleeping, regardless of whether they were bedrooms. In Liberia, 62 percent of households have only one room for sleeping, 21 percent have two rooms, and 16 percent have three or more rooms. Urban households have somewhat more crowded sleeping arrangements than rural households; they are more likely than rural households to have only one room for sleeping. Crowding within Liberian households has increased steadily since 2007, from 38 percent measured by the 2007 LDHS, to 47 percent measured in the 2009 LMIS, to 62 percent in 2011. This shows a shift following the population's resettlement after the civil crisis.

Table 2.3 also shows the distribution of households by the type of fuel used for cooking. Fifty-two percent of Liberian households use wood for fuel, while the remainder mostly use charcoal (also called fire coal). More than 8 in 10 urban households (83 percent) use charcoal for cooking, while the majority of rural households (89 percent) use wood. Almost all Liberian households (98 percent) use solid fuel for cooking.

2.2 HOUSEHOLD POSSESSIONS

The availability of durable consumer goods is a good indicator of a household's socioeconomic status. Moreover, particular goods have specific benefits. For instance, having access to a radio or a television exposes household members to innovative ideas; a refrigerator prolongs the wholesomeness of foods; and a means of transport allows greater access to many services away from the local area. Table 2.4 shows the availability of selected consumer goods by residence.

Table 2.4 Household possessions

Percentage of households possessing various household effects, means of transportation, agricultural land and livestock/farm animals, by residence, Liberia 2011

Possession	Residence		Total
	Urban	Rural	
Household effects			
Generator	20.0	2.2	11.0
Radio	62.5	44.5	53.4
Television	19.5	1.5	10.4
Mobile telephone	78.4	30.3	54.1
Refrigerator/icebox	4.6	0.8	2.7
Table	81.6	52.8	67.0
Chair	75.1	54.5	64.7
Cupboard	28.3	3.4	15.7
Mattress	91.6	59.8	75.5
Sewing Machine	3.1	0.4	1.7
Computer	5.2	0.1	2.6
Watch	45.7	19.1	32.2
Means of transport			
Bicycle	4.6	0.8	2.7
Motorcycle/scooter	6.6	4.0	5.3
Car/truck	7.4	0.3	3.8
Boat/canoe	0.3	1.0	0.6
Ownership of agricultural land	13.0	48.2	30.8
Ownership of farm animals[1]	17.4	38.6	28.1
Number	2,058	2,104	4,162

[1] Cows, pigs, goats, sheep, or chickens, ducks, or guinea fowl

Of the sixteen selected household durable goods, chairs, tables, and mattresses stand out as the most commonly owned by households; 65 percent, 67 percent, and 76 percent, respectively. Over half of Liberian households have a radio and have a mobile phone (53 percent and 54 percent, respectively) and one-third own a watch (32 percent). Only 16 percent of households have a cupboard, and about 10 percent have a generator or a television. Ownership of refrigerators, sewing machines, computers, bicycles, motorcycles, cars, and boats is very rare. There is noticeable urban-rural variation in the proportion of households owning durable goods. The largest gaps between urban and rural households are in ownership of mobile phones and mattresses. Ownership of mobile phones has dramatically increased in the last four years, from 29 percent in 2007 to 43 percent in 2009, and to 54 percent in 2011.

Table 2.4 also shows the proportion of households owning agricultural land and farm animals. Overall, 31 percent of Liberians households own agricultural land, while 28 percent mention owning farm animals such as cows, pigs, goats, sheep, chickens, ducks, or guinea fowl. Urban households are less likely to either own land or animals when compared with rural households.

2.3 WEALTH INDEX

Information on household assets was used to create an index used throughout this report to represent the wealth of the households interviewed in the 2011 LMIS. The wealth index used in this survey is a measure to indicate inequalities in household characteristics, in the use of health and other services, and in health outcomes (Rutstein et al., 2000). It serves as an indicator of the level of wealth that is consistent with expenditure and income measures (Rutstein, 1999). The index was constructed using household asset data via a principal components analysis.

In its current form, which takes better account of urban-rural differences in scores and indicators of wealth, the wealth index is created in three steps. In the first step, a subset of indicators common to urban and rural areas is used to create wealth scores for households in both areas. Categorical variables to be used are transformed into separate dichotomous (0-1) indicators. These indicators and those that are continuous are then examined using a principal components analysis to produce a common factor score for each household. In the second step, separate factor scores are produced for households in urban and rural areas using area-specific indicators. The third step combines the separate area-specific factor scores to produce a nationally applicable combined wealth index by adjusting area-specific scores through a regression on the common factor scores. This three-step procedure permits greater adaptability of the wealth index in both urban and rural areas. The resulting combined wealth index has a mean of zero and a standard deviation of one. Once the index is computed, national-level wealth quintiles (from lowest to highest) are obtained by assigning the household score to each de jure household member, ranking each person in the population by his or her score, and then dividing the ranking into five equal categories, each comprising 20 percent of the population.

Table 2.5 presents the wealth quintiles by residence and administrative regions of the country. The table shows that, according to the wealth index, urban respondents and those in Monrovia are much more likely to fall in the higher wealth quintiles. Only 1 percent of the urban population falls in the lowest wealth quintile, compared with 38 percent of the rural population. Similarly, based on the list of assets used in calculating the wealth index for Liberia, none of the residents in Monrovia falls into the poorest quintile, while over half (54 percent) fall in the highest quintile. Residents of South Eastern A, South Eastern B, and North Western regions are more likely than average to fall into the poorest wealth quintile.

Table 2.5 also shows the Gini Coefficient of wealth in Liberia, which indicates the concentration of wealth, with 0 representing an exactly equal distribution (everyone having the same amount of wealth) and 1 representing a totally unequal distribution (one person having all the wealth). The overall Gini Coefficient for Liberia is 0.34. The lowest Gini Coefficient is seen in Monrovia (0.14) where more than half of the population (54 percent) is in the highest wealth quintile. The highest Gini Coefficient—that is, the least equitable distribution of wealth—is observed in the North Western and South Eastern B regions (both at 0.41).

Table 2.5 Wealth quintiles

Percent distribution of the de jure population by wealth quintiles, and the Gini Coefficient, according to residence and region, Liberia 2011

Residence/region	Wealth quintile					Total	Number of persons	Gini coefficient
	Lowest	Second	Middle	Fourth	Highest			
Residence								
Urban	0.9	6.4	20.2	34.0	38.5	100.0	9,153	0.16
Rural	38.3	33.0	19.8	6.6	2.3	100.0	9,585	0.33
Region								
Monrovia	0.0	0.8	11.4	34.3	53.5	100.0	5,443	0.14
North Western	35.4	29.9	19.4	11.4	3.9	100.0	1,502	0.41
South Central	21.5	19.2	20.9	24.9	13.5	100.0	3,618	0.29
South Eastern A	46.7	30.4	14.0	4.3	4.6	100.0	1,474	0.38
South Eastern B	36.4	37.8	16.3	6.7	2.7	100.0	1,229	0.41
North Central	23.8	30.1	30.6	12.1	3.5	100.0	5,470	0.29
Total	20.0	20.0	20.0	20.0	20.0	100.0	18,737	0.34

2.4 POPULATION BY AGE AND SEX

Age and sex are important demographic variables and are the primary basis for demographic classification. The distribution of the de facto household population in the 2011 LMIS is shown in Table 2.6 by five-year age groups, according to sex and residence.

A total of over 18,265 people were enumerated in the survey, almost equally divided by sex; the overall sex ratio (the number of males per 100 female) is 98. The sex ratio is higher in rural areas (103) than in urban areas (93). Almost half of the total household population (49 percent) resides in urban areas; this statistic correlates closely with the proportion in urban areas from the 2008 Population and Housing Census.

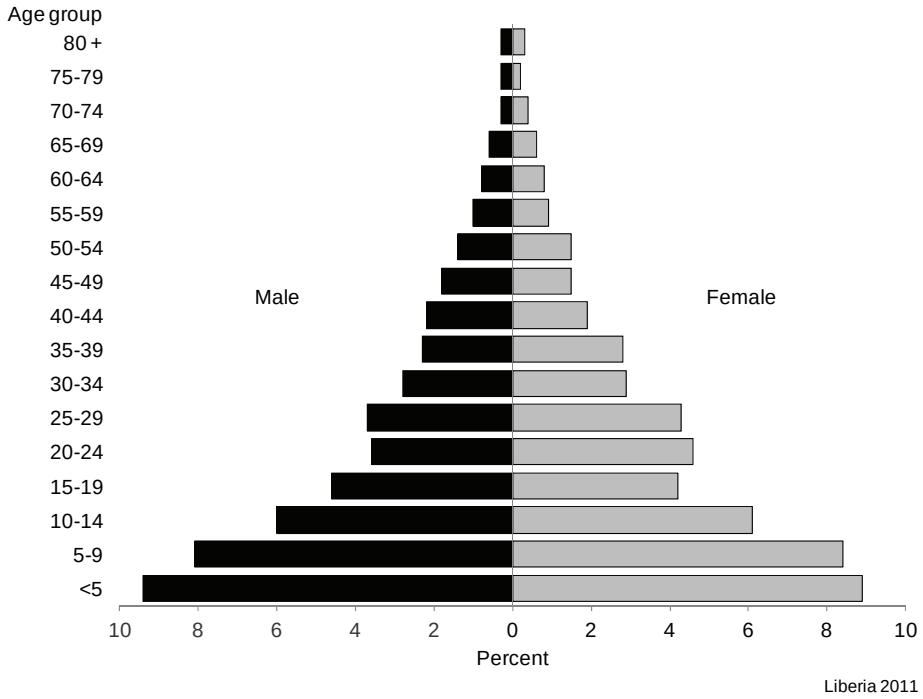
Table 2.6 Household population by age, sex, and residence

Percent distribution of the de facto household population by five-year age groups, according to sex and residence, Liberia 2011

Age	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
<5	15.6	15.2	15.4	21.9	20.2	21.1	18.9	17.7	18.3
5-9	14.6	15.6	15.1	18.0	17.5	17.8	16.3	16.5	16.4
10-14	12.2	14.5	13.4	12.1	9.7	10.9	12.2	12.1	12.1
15-19	11.5	10.0	10.7	7.2	6.6	6.9	9.2	8.3	8.8
20-24	9.5	10.2	9.8	5.4	7.8	6.6	7.3	9.0	8.2
25-29	8.8	9.3	9.1	6.4	7.8	7.1	7.5	8.6	8.1
30-34	6.3	5.6	5.9	5.1	5.9	5.5	5.6	5.7	5.7
35-39	4.8	5.2	5.0	4.6	5.8	5.2	4.7	5.5	5.1
40-44	4.3	3.8	4.0	4.8	3.9	4.3	4.5	3.8	4.2
45-49	3.2	2.7	3.0	4.0	3.3	3.7	3.7	3.0	3.3
50-54	2.7	2.5	2.6	3.1	3.5	3.3	2.9	3.0	3.0
55-59	2.1	1.5	1.8	1.7	2.1	1.9	1.9	1.8	1.9
60-64	1.5	1.1	1.3	1.8	2.2	2.0	1.6	1.6	1.6
65-69	1.0	0.9	0.9	1.4	1.7	1.5	1.2	1.3	1.2
70-74	0.6	0.8	0.7	0.7	0.9	0.8	0.7	0.9	0.8
75-79	0.4	0.3	0.3	1.0	0.4	0.7	0.7	0.4	0.5
80 +	0.4	0.6	0.5	0.7	0.7	0.7	0.6	0.6	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	4,298	4,637	8,935	4,740	4,591	9,330	9,037	9,228	18,265

The population age structure shows a substantially larger proportion of persons in younger age groups than in the older age groups for each sex (Figure 2.1). This reflects the young age structure of the population of Liberia and indicates a population with high fertility. Forty-seven percent of the population is below age 15 while 50 percent are age 15-64, and 3 percent are age 65 or older. However, there is an implausibly large drop-off between ages 10-14 and 15-19, especially for females. Examination of the distribution by single year (Appendix Table C.1) shows evidence that interviewers may have intentionally underestimated women's ages to be younger than the age cut-off of 15 so as to make them ineligible for the individual interview.

Figure 2.1 **Population pyramid**



2.5 HOUSEHOLD COMPOSITION

Information on key aspects of the composition of households, including the sex of the head of the household and the size of the household, is presented in Table 2.7. These characteristics are important because they are associated with the welfare of the household. Female-headed households are, for example, typically poorer than male-headed households. Economic resources are often more limited in larger households. Moreover, where the size of the household is large, crowding also can lead to health problems.

Table 2.7 Household composition

Percent distribution of households by sex of head of household and by household size and mean size of household, according to residence, Liberia 2011

	Residence		
Characteristic	Urban	Rural	Total
Household headship			
Male	65.6	73.3	69.5
Female	34.4	26.7	30.5
Total	100.0	100.0	100.0
Number of usual members			
0	0.0	0.1	0.1
1	14.3	11.0	12.6
2	13.9	13.0	13.5
3	15.8	13.9	14.8
4	15.2	14.8	15.0
5	12.6	15.8	14.2
6	8.2	11.0	9.6
7	6.4	8.6	7.5
8	4.7	4.7	4.7
9+	8.9	7.1	8.0
Total	100.0	100.0	100.0
Mean size of households	4.4	4.6	4.5
Number of households	2,058	2,104	4,162

Note: Table is based on de jure household members, i.e., usual residents.

Households in Liberia are predominantly male-headed (70 percent), a common feature in African countries. Nevertheless, three in ten households are headed by women, and the proportion of female-headed households is higher in urban than in rural areas.

Liberian households most commonly consist of 4.5 persons on average. This is smaller than the average household size of 5.6 persons reported in the 2009 LMIS. Overall, 8 percent of 2011 LMIS households have nine or more members, reduced from 16 percent in 2009. Rural households are slightly larger than urban households.

2.6 CHARACTERISTICS OF WOMEN RESPONDENTS

2.6.1 General Characteristics

Table 2.8 presents the distribution of women age 15-49 by age group, religion, ethnicity (based on the dialect spoken by the respondent), urban-rural residence, region, education level, and wealth quintile. The proportion of respondents in each age group generally declines as age increases, reflecting the comparatively young age structure of the population.

The overwhelming majority of Liberian women (87 percent) are Christian, while 10 percent are Muslim. The largest ethnic group in terms of dialect spoken is Kpelle (24 percent), followed by Bassa (12 percent) and Mano (10 percent).

A slightly larger proportion of women age 15-49 reside in urban areas compared with rural areas (54 percent versus 47 percent). The distribution of respondents by region shows that a little less than one-third of women live in the North Central region (Bong, Nimba, and Lofa counties), and one-third live in Greater Monrovia. Eighteen percent of women respondents live in South Central region (Grand Bassa, Margibi, and Montserrado outside of Monrovia). Regions with less than 10 percent of respondents are South Eastern A (River Cess, Sinoe, and Grand Gedeh counties), South Eastern B (River Gee, Grand Kru, and Maryland counties), and North Western (Bomi, Grand Cape Mount, and Gbarpolu counties).

Thirty-six percent of women age 15-49 have never been to school, while 3 in 10 have attended only primary school, and one-third have reached secondary school. By definition, roughly one-fifth of respondents fall into each wealth quintile.

Table 2.8 Background characteristics of respondents

Percent distribution of women age 15-49 by selected background characteristics, Liberia 2011

Background characteristic	Weighted percent	Number of Women	
		Weighted number	Unweighted number
Age			
15-19	19.0	747	743
20-24	20.2	796	772
25-29	19.4	766	745
30-34	13.1	516	530
35-39	12.8	504	506
40-44	8.8	348	362
45-49	6.7	262	281
Religion			
Christian	86.5	3,406	3,377
Muslim	10.3	407	434
Traditional religion	0.4	17	16
No religion	2.4	93	100
Other	0.1	5	2
Missing	0.3	11	10
Ethnicity			
Bassa	11.9	468	462
Gbandi	2.6	102	68
Belle	0.5	18	20
Dey	0.3	10	8
Gio	6.8	268	168
Gola	2.4	93	158
Grebo	7.8	309	662
Kissi	5.6	222	145
Kpelle	23.5	924	695
Krahn	3.0	117	214
Kru	5.6	221	396
Lorma	3.7	147	114
Mandigo	2.7	106	88
Mano	9.5	372	241
Mende	2.1	82	82
Vai	3.6	140	168
None/English only	7.2	285	201
Other/Missing	1.3	52	49
Residence			
Urban	53.5	2,106	1,986
Rural	46.5	1,833	1,953
Region			
Monrovia	32.9	1,296	689
North Western	7.0	275	497
South Central	18.3	723	673
South Eastern A	7.0	278	669
South Eastern B	5.9	231	721
North Central	28.9	1,136	690
Education			
No education	36.1	1,422	1,498
Primary	30.2	1,191	1,269
Secondary or higher	33.7	1,326	1,172
Wealth quintile			
Lowest	17.7	697	852
Second	18.8	742	952
Middle	19.2	756	790
Fourth	21.0	828	704
Highest	23.3	916	641
Total 15-49	100.0	3,939	3,939

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

2.6.2 Education Attainment of Women

Education is a key determinant of the lifestyle and status an individual enjoys in a society. Studies have consistently shown that educational attainment has a strong effect on health behaviors and attitudes. In general, the higher the level of education a woman has attained, the more knowledgeable she is about the use of health facilities, family planning methods, and the health of her children. Liberia's education system has been unstable for a little over fifteen years because of the civil crisis; however, recently a major restructuring of the infrastructure and education program is being undertaken by the government. Currently, the government of Liberia has adopted a free primary education policy in all government schools, with a special program for female education. The government is undertaking massive renovation of an infrastructure damaged during the war and is also restructuring and expanding programs in the educational system.

Table 2.9 presents an overview of the relationship between the respondent's level of education and other background characteristics. The results show that 38 percent of women age 15-49 have completed primary school, and only 10 percent have completed secondary school, while 36 percent of women have no education. Overall, the median number of years of education is 3.2.

Table 2.9 Educational attainment

Percent distribution of women age 15-49 by highest level of schooling attended or completed, and median years completed, according to background characteristics, Liberia 2011

Background characteristic	Highest level of schooling						Total	Median years completed	Number of women
	No education	Some primary	Completed primary[1]	Some secondary	Completed secondary[2]	More than secondary			
Age									
15-24	16.4	34.3	6.2	36.3	5.3	1.5	100.0	4.9	1,543
15-19	7.4	48.6	8.2	34.8	1.0	0.0	100.0	4.6	747
20-24	24.9	20.9	4.2	37.7	9.2	3.0	100.0	5.6	796
25-29	35.2	22.0	5.6	22.9	9.0	5.3	100.0	3.7	766
30-34	53.5	23.1	1.0	11.0	5.9	5.4	100.0	0	516
35-39	52.3	18.7	5.2	13.5	6.8	3.4	100.0	0	504
40-44	56.4	18.3	2.3	13.1	6.7	3.2	100.0	0	348
45-49	62.0	11.3	3.4	15.1	4.2	4.1	100.0	0	262
Residence									
Urban	22.7	21.7	5.4	33.1	11.0	6.0	100.0	5.8	2,106
Rural	51.5	29.8	3.9	13.5	1.0	0.3	100.0	0	1,833
Region									
Monrovia	20.6	19.0	5.5	32.8	13.4	8.7	100.0	6.5	1,296
North Western	49.8	26.9	4.6	15.6	2.6	0.6	100.0	0	275
South Central	45.8	26.8	3.4	19.8	3.1	1.2	100.0	0.4	723
South Eastern A	47.7	30.7	4.5	13.8	2.3	0.9	100.0	0.3	278
South Eastern B	41.6	29.4	6.0	18.5	3.9	0.6	100.0	1.9	231
North Central	40.4	29.7	4.5	22.3	2.8	0.4	100.0	2.0	1,136
Wealth quintile									
Lowest	64.2	26.4	3.2	6.0	0.1	0.0	100.0	0	697
Second	48.2	33.0	4.2	13.4	1.1	0.2	100.0	0	742
Middle	33.0	31.5	4.6	27.0	3.6	0.3	100.0	3.4	756
Fourth	26.6	24.8	5.6	32.7	7.6	2.7	100.0	4.8	828
Highest	16.2	14.4	5.6	35.9	16.4	11.5	100.0	7.7	916
Total	36.1	25.5	4.7	24.0	6.3	3.3	100.0	3.2	3,939

[1] Completed 6 grade at the primary level
[2] Completed 12 grade at the secondary level

Younger women have generally reached higher levels of schooling than older women. For example, only 7 percent of women age 15-19 have never been to school, compared with 62 percent of women age 45-49. Urban women have more education than rural women; the median number of years of school is 5.8 for urban women and 0 for rural women.

Among the regions, Monrovia has by far the largest proportion of women who have attended secondary school and above (55 percent). The educational level of women in North Western region (Bomi, Grand Cape Mount, and Gbarpolu counties) is particularly low, with 50 percent of women having no schooling at all.

Table 2.9 also shows that poorer women tend to be less educated. About one in two women in the two lowest wealth quintiles have no education, compared with less than one in five women in the highest wealth quintile. Compared with the 2009 LMIS, the proportion of women with no education has decreased from 42 percent to 36 percent. Likewise, the proportion of women who completed secondary school or more than secondary school has increased from 6 to 10 percent.

MALARIA PREVENTION 3

Key Findings

- Half of Liberian households own at least one insecticide-treated net (ITN), and almost one-fifth (17 percent) of households have at least one ITN for every two people that stayed in the house the night before the survey.
- One-third of the population has access to an ITN. This means 31 percent of Liberians could sleep under a mosquito net if every net in a household were used by two people.
- Thirty-two percent of the population slept under an ITN the night before the survey, while 37 percent of children and 39 percent of pregnant women slept under an ITN the previous night.
- Half of pregnant women received intermittent preventive treatment (IPTp) for malaria, that is, at least two doses of SP/Fansidar with at least one dose received during an antenatal care visit, which occurred during the most recent pregnancy.

The overarching goal of the Liberia National Malaria Strategic Plan for 2010-2015 is to reach Millennium Development Goal 6: to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases. Liberia has adopted four major strategies to control malaria in the country. The first strategy is to improve treatment by scaling up the availability, accessibility and use of artemisinin-based combination therapy (ACT), the first-line treatment for malaria. The second strategy is an Integrated Vector Management (IVM) approach, and the third strategy addresses malaria in pregnancy. The fourth approach to malaria prevention is to increase support for advocacy, health education, and behavior change.

NMCP collaborates with several partners to distribute mosquito nets through its three-pronged IVM program. The largest IVM distribution is to the family unit; IVM provides long-lasting insecticidal nets (LLINs) to all households through mass distribution campaigns. The second approach of the IVM program is to target pregnant women and children under age 5 by distributing LLINs during antenatal care visits. The third aim of the IVM program is to continue targeted Indoor Residual Spraying (IRS) of households within selected areas. The NMCP Strategic Plan also aims to reduce malaria morbidity and mortality in pregnant women and children by increasing intermittent preventive treatment (IPTp) in pregnant women.

This chapter presents data for assessing the implementation of malaria prevention strategies. These data include the percentage of households in surveyed areas that report having the interior walls of their dwellings sprayed with residual insecticide during the 12 months preceding the survey. In addition, information on the percentage of households possessing mosquito nets by category (any nets, insecticide-treated nets (ITNs), and LLINs), and the percentages of household members, pregnant women, and children who slept under a net the night before the survey is provided. Data are also presented showing, among women who gave birth in the two years preceding the survey, the percentage who took sulfadoxine and pyremethamine (SP), commercially available as Fansidar, during pregnancy by number of doses. Two doses of SP/Fansidar are required for effective preventive treatment of malaria in pregnancy. Also shown is the percentage of pregnant women who received IPTp as part of antenatal care.

3.1 VECTOR CONTROL

Untreated nets and window screening have long been considered useful protection methods against mosquitoes and other insects (Lindsay and Gibson, 1988). Nets reduce the human-vector contact by acting as a physical barrier and thus reducing the number of bites from infective vectors (Bradley et al., 1986). However, nets and screens are often not well fitted or are torn, thus allowing mosquitoes to enter or feed on the part of the body adjacent to the netting fabric during the night (Lines et al., 1987). The problem of ill-used nets and screens provides one of the motives for impregnating them with a fast-acting insecticide that will repel or kill mosquitoes before or shortly after feeding (Lines et al., 1987; Hossain and Curtis, 1989).

The treatment of nets has been made possible by the availability of synthetic pyrethroids, the only insecticides currently used for treatment of nets. This class of insecticides was developed to mimic the insecticidal compounds of the natural pyrethrum. Currently, ITNs are regarded as a promising malaria control tool, and when used by all or most members of the community can reduce malaria transmission. ITNs have been shown to reduce malaria transmission by as much as 90 percent under trial conditions (Lengeler, 2004). ITNs also reduce malaria morbidity and mortality. Long-lasting insecticidal nets (LLINs) are a subset of ITNs. An LLIN is a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around the fibers. The net must retain its effective biological activity without re-treatment for repeated washes, for three years of use under field conditions (WHO/Global Malaria Program, 2007). The current generation of LLINs lasts three to five years, after which point the net should be replaced. In accordance with Roll Back Malaria (RBM) Guidelines, the government of Liberia committed to achieving coverage of 80 percent of households with ITNs by 2010. The newest RBM guidelines recommend universal ITN coverage by 2015.

3.1.1 Ownership of Mosquito Nets

ITNs are a principal tool in efforts to reduce malaria transmission in Liberia. Mosquito net ownership among a population is used to estimate the proportion of households not yet reached by Vector Control Programs or ITN distribution mechanism. All households interviewed in the 2011 LMIS were asked if they owned a mosquito net and, if so, how many nets they owned. Table 3.1 provides information on the percentage of households that own at least one mosquito net (any net, an ITN, and an LLIN), the average number of nets per household, and the percentage of households with at least one net per every two people who slept in the household the previous night, according to background characteristics.

Table 3.1 Household possession of mosquito nets

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, Liberia 2011

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 net for every two persons who stayed in the household last night[1]			Number of households with at least one person who stayed in the household last night
	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)		Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	
Residence											
Urban	54.4	52.2	51.0	0.9	0.8	0.8	2,058	20.8	19.6	19.2	2,042
Rural	47.8	47.2	46.9	0.7	0.7	0.7	2,104	14.7	14.3	14.1	2,091
Region											
Monrovia	55.0	52.8	51.4	0.8	0.8	0.8	1,285	22.2	20.9	20.3	1,274
North Western	44.9	43.8	43.3	0.6	0.6	0.6	377	16.1	15.5	15.3	373
South Central	37.0	36.1	35.9	0.5	0.5	0.5	760	11.7	10.9	10.8	757
South Eastern A	62.7	61.2	59.8	1.0	0.9	0.9	307	19.5	18.7	18.2	304
South Eastern B	65.2	64.2	63.7	1.1	1.1	1.1	246	24.4	23.8	23.7	245
North Central	51.8	50.9	50.5	0.8	0.7	0.7	1,188	15.4	15.0	14.8	1,180
Wealth quintile											
Lowest	41.3	40.6	40.4	0.6	0.5	0.5	886	11.6	11.5	11.4	884
Second	54.3	53.4	52.6	0.8	0.7	0.7	851	18.6	17.5	17.1	844
Middle	50.2	49.2	48.7	0.8	0.8	0.7	784	16.1	15.8	15.7	777
Fourth	54.3	52.3	51.5	0.8	0.8	0.8	867	21.8	20.7	20.1	863
Highest	55.7	53.5	52.0	1.0	0.9	0.9	774	20.9	19.5	19.0	766
Total	51.0	49.7	48.9	0.8	0.7	0.7	4,162	17.7	16.9	16.6	4,134

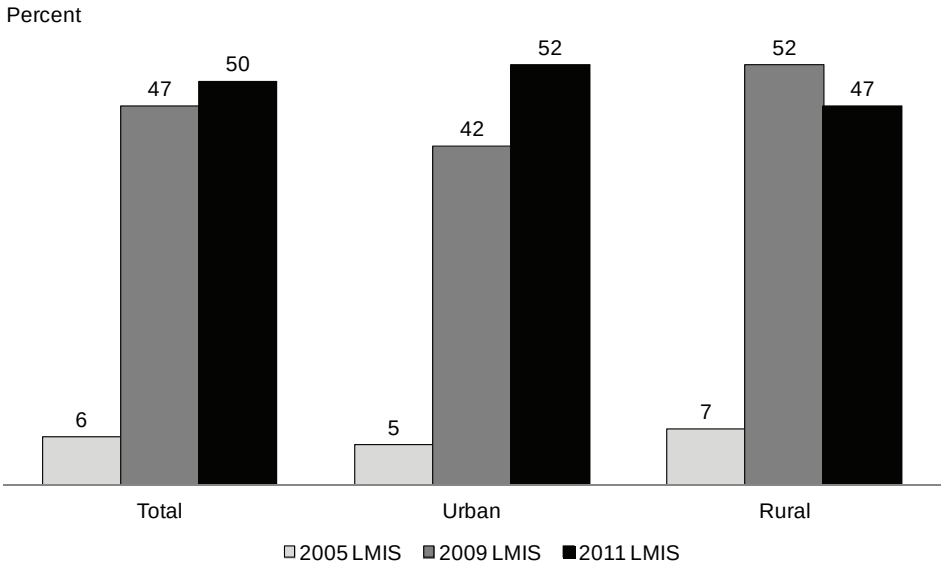
[1] De facto household members
[2] An insecticide-treated net (ITN) is a factory-treated net that does not require any further treatment (LLIN) or a net that has been soaked with insecticide within the past 12 months.

Overall, 51 percent of households in Liberia have at least one mosquito net (treated or untreated), 50 percent of households have at least one ITN, and 49 percent of households have at least one LLIN. Almost all of the nets in Liberia are LLINs.

Figure 3.1[1] compares ownership of at least one ITN among households, as measured in Liberia's three Malaria Indicator Surveys, by urban and rural residence and national total. There have been substantial gains in ITN ownership throughout the past six years in Liberia. Overall, approximately 6 percent of Liberian households reported owning at least one ITN in the first LMIS, whereas 47 percent of households reported owning at least one ITN in the 2009 LMIS. From 2009 to 2011, ownership of at least one ITN among Liberian households increased by only 6 percent on a national level (from 47 percent in 2009 to 50 percent in 2011). ITN ownership among urban households, however, increased by 24 percent between the two recent surveys (42 percent compared with 52 percent). Among rural households, ITN ownership has decreased between the two surveys, from 52 percent in the 2009 LMIS to 47 percent in the 2011 LMIS. Liberia has not yet reached the RBM target of ITN ownership in 80 percent of households.

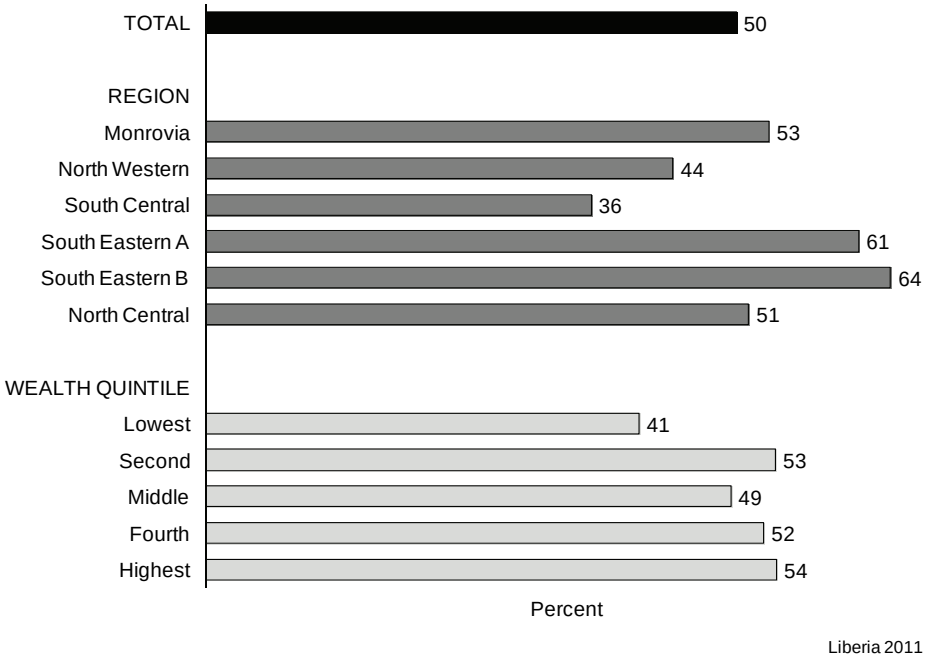
[1] The 2005 LMIS presents ITN ownership as a percentage of households with nets that own an ITN. To make the data between 2005, 2009, and 2011 comparable, ITN ownership as presented in the 2005 LMIS has been recalculated.

Figure 3.1 **Trends in ownership of ITNs: percent of households with at least one ITN**



As shown in Table 3.1 and Figure 3.2, urban households (52 percent) are only slightly more likely than rural households (47 percent) to own an ITN. Household ownership of at least one ITN varies from a low of 36 percent in the South Central region to a high of 64 percent in the South Eastern B region. Households in the lowest wealth quintile (41 percent) are the least likely to own an ITN compared with other households. ITN ownership and LLIN ownership across background characteristics are similar. On average, a Liberian household owns 0.7 ITNs.

Figure 3.2 **Percentage of households with at least one ITN**



Although mosquito net ownership is an important indication of the success of a Vector Control Program, it is also important to determine if a household has a sufficient number of nets for those sleeping within the home. By assuming that each net is shared by two people in the household, universal net coverage within the population can be measured. Table 3.1 also shows the percentage of households with at least one mosquito net for every two persons who stayed in the household the night before interview.

Seventeen percent of Liberian households have reached universal ITN coverage; that is, less than one-fifth of households have at least one ITN for every two people who slept in the household the previous night. Households in urban areas are more likely than households in rural areas to own at least one ITN for every two persons who stayed in the household the night before the survey (20 percent and 14 percent, respectively). Nearly one-quarter of those residing in South Eastern B region (24 percent) have at least one ITN for every two people. By wealth quintile, a larger proportion of households in the highest two quintiles have reached universal ITN coverage when compared with those in other quintiles.

Households without nets were asked why they did not have one. Responses shown in Table 3.2 indicate that the most common reason given was that nets are not available (72 percent). Eight percent of households interviewed without mosquito nets said that they did not like to use mosquito nets, 3 percent reported that nets are too expensive, and 2 percent said that there were no mosquitoes. Fewer than two in ten people (18 percent) mentioned some other reason for not owning a mosquito net. Lack of availability was most common among rural households (78 percent), those living in the South Eastern A and South Eastern B regions (79 percent and 81 percent, respectively), and households in the lowest wealth quintile (83 percent). Households in urban areas, in Monrovia, and the in highest wealth quintile are also more likely than other households to mention “don’t like to use nets” as reasons for not owning a net.

Table 3.2 Reason for not having mosquito nets

Among household without mosquito nets, percentage reporting various reasons for not owning a net, by background characteristics, Liberia 2011

Background characteristic	Reason for not owning a net					Number of households without nets
	No mosquitoes	Not available	Don't like to use nets	Too expensive	Other	
Residence						
Urban	3.2	64.2	14.4	2.9	17.1	939
Rural	0.9	78.0	2.3	2.3	18.0	1,099
Region						
Monrovia	4.2	57.7	19.8	3.3	16.6	578
North Western	1.8	77.1	2.4	2.6	21.5	207
South Central	0.6	76.9	4.7	3.5	17.1	479
South Eastern A	1.1	79.2	2.3	1.4	18.5	114
South Eastern B	0.0	80.8	4.3	1.3	14.5	86
North Central	1.4	76.5	2.1	1.5	17.8	572
Wealth quintile						
Lowest	1.0	83.0	1.6	1.6	14.1	520
Second	0.7	73.5	2.9	3.1	21.7	389
Middle	1.1	73.2	4.3	4.1	18.3	390
Fourth	1.9	71.7	11.8	1.3	14.2	396
Highest	6.0	50.4	22.5	3.2	21.4	343
Total	2.0	71.7	7.9	2.6	17.6	2,037

Note: Percentages may sum to more than 100 because more than one reason can be given.

3.1.2 Cost of Mosquito Nets

As part of its program to curtail malaria, NMCP widely distributes mosquito nets, mostly free of charge. In the 2011 LMIS, households that owned nets were asked whether they obtained their net for free or purchased the net. For all nets, households were also asked where the net was obtained and for purchased nets, households were asked the cost of those nets. Table 3.3 shows information on the proportion of nets obtained for free and those purchased, while Table 3.4 shows information on the source of nets and the average cost.

Table 3.3 Purchased and free mosquito nets

Percent distribution of mosquito nets, by whether purchased or obtained free of charge, by background characteristics, Liberia 2011

Background characteristic	For all nets reported by households				Number of nets
	Bought	Obtained free	Don't know	Total	
Residence					
Urban	14.0	85.6	0.2	100.0	1,751
Rural	6.5	92.9	0.5	100.0	1,433
Region					
Monrovia	16.3	83.4	0.0	100.0	1,083
North Western	10.7	89.0	0.3	100.0	219
South Central	16.5	82.9	0.4	100.0	412
South Eastern A	4.0	95.6	0.4	100.0	300
South Eastern B	1.1	98.7	0.0	100.0	269
North Central	6.0	93.1	0.9	100.0	900
Wealth quintile					
Lowest	5.5	93.4	1.1	100.0	488
Second	5.9	93.5	0.4	100.0	651
Middle	10.1	89.5	0.2	100.0	607
Fourth	15.2	84.6	0.2	100.0	696
Highest	14.1	85.3	0.1	100.0	743
Total	10.6	88.9	0.4	100.0	3,184

Overall, 89 percent of mosquito nets were obtained free of charge, while 11 percent of nets were reported as purchased. This shows an increase in nets reported as free since the 2009 LMIS, when 78 percent of nets were reported to have been free of charge. Rural households are more likely than urban households to have free mosquito nets (93 percent and 86 percent, respectively). Obtaining mosquito nets free of charge is inversely proportional to a household's wealth quintile. For example, more than 9 in 10 households in the lowest quintile report that the household's nets were obtained free of charge, compared with 85 percent of those in the highest wealth quintile. The opposite is true for households that purchased their nets. Those in the lowest wealth quintile are the least likely to have purchased nets when compared with other households; urban households are twice as likely as rural households to have bought their mosquito nets (14 percent versus 7 percent);

Table 3.4 shows the percent distribution of where households received free mosquito nets and, for purchased nets, the mean cost. More than 4 in 10 free mosquito nets (43 percent) were obtained at an Extended Program for Immunization (EPI) campaign, the mass mosquito net distribution campaign sponsored by the Liberia NMCP. One in five free nets (22 percent) were received from an NGO. Three percent of free nets were obtained from an ANC visit, a government support avenue of free net distribution, and only 1 percent of free nets were received at a UNHCR distribution. The remaining nets (16 percent) were either received from other places or they respondent did not know where the free net was obtained (14 percent). There is little variation for each reported place by background characteristics.

Table 3.4 Source and cost of mosquito nets

Percent distribution of mosquito nets by where the free net was obtained, and for purchased nets, the mean cost, by background characteristics, Liberia 2011

Background characteristic	For nets that were free								For nets that were bought	
	EPI Campaign	ANC Visit	UNHCR Distribu-tion	NGO Distribu-tion	Other	Don't know/ missing	Total	Number of free nets	Mean cost	Number of nets bought
Residence										
Urban	41.9	3.3	0.8	17.0	18.2	18.7	100.0	1,499	275	245
Rural	45.0	2.6	1.4	27.7	13.8	9.5	100.0	1,331	185	92
Region										
Monrovia	39.7	2.5	0.2	13.9	22.7	21.0	100.0	903	294	177
North Western	35.0	3.6	7.4	31.1	14.4	8.6	100.0	195	(196)	24
South Central	38.5	4.7	2.3	23.0	18.7	12.8	100.0	342	168	68
South Eastern A	37.7	4.6	0.0	33.2	13.3	11.2	100.0	287	(294)	12
South Eastern B	35.1	3.2	0.8	24.1	27.7	9.1	100.0	265	*	3
North Central	55.7	2.1	0.6	23.9	5.8	11.9	100.0	838	(228)	54
Wealth quintile										
Lowest	45.5	3.3	1.1	24.4	16.0	9.6	100.0	456	(180)	27
Second	40.2	3.0	2.2	27.0	15.1	12.5	100.0	609	(255)	39
Middle	49.0	2.6	0.4	23.0	11.8	13.1	100.0	543	(218)	61
Fourth	47.8	3.8	1.8	14.4	16.4	15.8	100.0	589	221	106
Highest	35.9	2.3	0.0	21.7	20.8	19.3	100.0	634	317	105
Total	43.3	3.0	1.1	22.0	16.2	14.4	100.0	2,830	249	337

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

For households that purchased mosquito nets, the majority (81 percent) report having purchased the net in a local market (data not shown). The mean cost per net was 249 Liberian dollars (approximately US$3.50).

3.1.3 Indoor Residual Spraying

Indoor residual spraying (IRS), another component of efforts to control malaria transmission, is the third strategy of NMCP's Vector Control Program in Liberia. IRS is the spraying of the interior walls and ceilings of a dwelling with long-lasting insecticide. It reduces the transmission of malaria by killing adult female mosquitoes when they rest on the walls of the dwelling after feeding. In Liberia, IRS implementation started in 2009 and has been incrementally rolled out into select areas. IRS target areas include Mamba-Kaba district in Margibi County; all districts in Grand Bassa except Buchanan City; Careysburg district in Montserrado County; Fuamah, Kokoyah, and Panta-Kpaai districts in Bong County; and Arcelor Mittal concession area in Yekepa, Nimba County. To obtain information on the prevalence of indoor residual spraying, all households interviewed in the 2011 LMIS were asked whether the interior walls of their dwelling had been sprayed to protect against mosquitoes during the 12-month period before the survey and, if so, who had sprayed the dwelling. The percentage of households with IRS in the past 12 months is presented in Table 3.5.

Table 3.5 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, and the percentage of households with at least one ITN and/or IRS in the past 12 months, by background characteristics, Liberia 2011

Background characteristic	Percentage of households with IRS[1] in the past 12 months	Percentage of households with at least one ITN[2] and/or IRS in the past 12 months	Number of households
Residence			
Urban	4.9	54.5	2,058
Rural	12.1	53.9	2,104
Region			
Monrovia	1.4	53.2	1,285
North Western	0.0	43.8	377
South Central	32.6	56.5	760
South Eastern A	0.5	61.5	307
South Eastern B	2.9	64.8	246
North Central	6.8	53.0	1,188
Wealth quintile			
Lowest	13.8	50.4	886
Second	8.8	57.9	851
Middle	9.4	52.6	784
Fourth	5.6	54.5	867
Highest	4.8	55.7	774
Total	8.6	54.2	4,162

[1] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.
[2] An insecticide-treated 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.

Nine percent of Liberian households have been sprayed in the past 12 months. Compared with urban areas, households in rural areas were more than two times as likely to have had IRS (5 percent versus 12 percent). Among the regions, those living in the South Central region reported the highest percentage of IRS (33 percent). NMCP has targeted its IRS program to rural areas within the South Central region (parts of Margibi, Bassa, and Montserrado).

Table 3.5 also shows which households are covered by vector control. Households are considered to be covered if they own at least one ITN, have been sprayed by IRS at any time in the past 12 months, or both. Overall, 54 percent of households in Liberia are covered; that is, they reported either ownership of at least one ITN and/or IRS of their dwelling places in the 12 months preceding the survey. There is little difference between vector control coverage among the urban and rural populations or among wealth quintiles. The percentage of households with at least one ITN and/or sprayed by IRS in the past 12 months ranges from a low of 44 percent in the North Western region to a high of 65 percent in the South Eastern B region.

3.1.4 Access to Mosquito Nets

The 2011 LMIS presents the proportion of the population that could sleep under an ITN if each ITN in the household were used by up to two people. This population is referred to as having access to an ITN. Coupled with mosquito net usage, ITN access can provide useful information on the magnitude of the behavioral gap in ITN ownership and use, or, in other words, the population with access to an ITN but not using it. If the difference between these indicators is substantial, the program may need to focus on behavior change and how to identify the main drivers/barriers to ITN use in order to design an appropriate intervention. This analysis helps ITN programs determine whether they need to achieve higher ITN coverage, promote ITN use, or both. Table 3.6 shows the percent distribution of the de facto household population by the number of ITNs the household owns, according to the number of persons who stayed in the household the night before the survey.

Table 3.6 Access to an insecticide-treated net (ITN)

Percent distribution of the de facto household population by number of ITNs the household owns, according to number of persons who stayed in the household the night before the survey, Liberia 2011

	Number of persons who stayed in the household the night before the survey								
Number of ITNs	1	2	3	4	5	6	7	8+	Total
0	61.7	55.2	51.4	46.7	47.6	45.3	48.2	42.8	47.2
1	36.3	38.9	39.4	37.4	32.5	30.5	21.1	17.4	28.6
2	1.4	5.3	7.5	13.6	15.4	17.7	16.8	15.2	13.7
3	0.6	0.6	1.7	2.3	4.4	6.4	12.6	17.9	8.5
4	0.0	0.0	0.0	0.1	0.0	0.0	1.3	3.1	1.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.5
6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.6	0.5
7+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	581	1,177	1,826	2,354	2,822	2,291	2,099	5,115	18,265
Percent with access to an ITN[1]	38.3	44.8	35.4	34.6	29.8	28.4	27.8	26.2	30.8

[1] Percentage of the de facto household population who could sleep under an ITN if each ITN in the household were used by up to two people

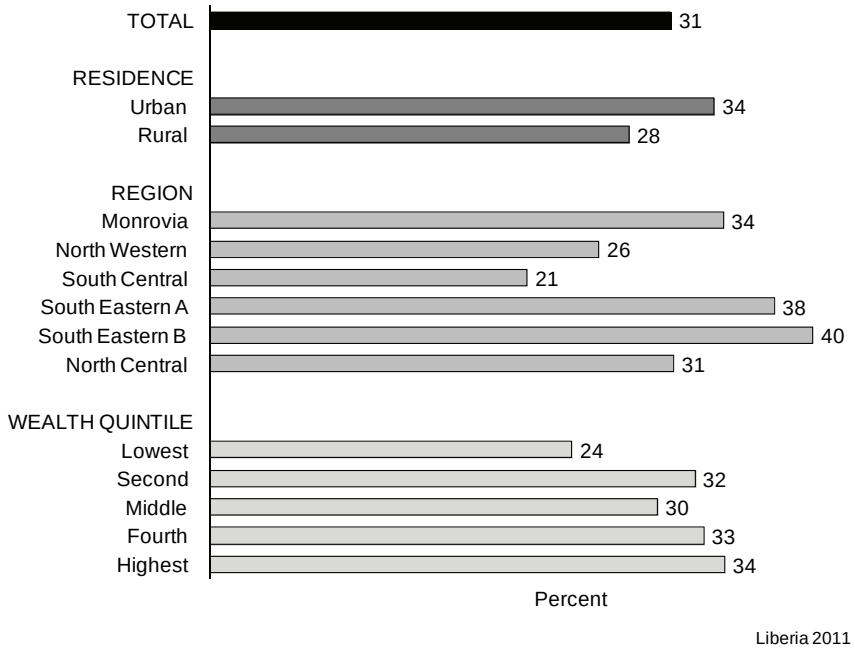
As shown in Table 3.6, the majority of the Liberian population does not have access or has limited access to ITNs. Almost half of the population (47 percent) slept in homes with no ITN the night before the survey and therefore were not able to use an ITN. Three in ten individuals (29 percent) stayed in households that own at least one ITN, 14 percent of Liberians slept in households that own two ITNs, and 9 percent of the population slept in a home with three ITNs. Very few individuals slept in homes with more than four ITNs.

Nationally, one-third of Liberians (31 percent) have access to an ITN. As expected, the proportion of persons with access to an ITN is inversely proportional to the number of nets found within a household.

ITN access tends to decrease as household size increases. For example, 45 percent of people that slept in households where two persons slept the night before the survey had access to an ITN, whereas 26 percent of people that slept in households where more than eight people stayed had access to an ITN.

Figure 3.3 shows the percentage of the population with access to an ITN in the household, by background characteristics. Those living in urban areas are more likely than those living in rural areas to have access to an ITN (34 percent and 28 percent, respectively). Residents of the South Eastern B region are the most likely to have access to an ITN when compared with individuals living in other regions of Liberia. ITN access, in general, increases as one's household wealth quintile increases.

Figure 3.3 **Percentage of the de facto population with access to an ITN in the household**



3.2 USE OF MOSQUITO NETS

Community level protection against malaria helps reduce the spread of the disease and offers an additional level of protection against malaria for those most vulnerable: children under age 5 and pregnant women. This section of chapter 3 describes use of mosquito nets among all persons in the household, among children under age 5, and among pregnant women.

3.2.1 Use of Mosquito Nets by Persons in the Household

Mosquito net coverage of the entire population is necessary to accomplish large reductions in the malaria burden. Although vulnerable groups, such as children under age 5 and pregnant women, should still be prioritized, the equitable and communal benefits of wide-scale ITN use by older children and adults should be promoted and evaluated by national malaria control programs (Killeen, 2007). The 2011 LMIS asked about use of mosquito nets by household members during the night before the survey.

One-third of the Liberian population (32 percent) reports that they slept under an ITN the night before the survey. Those age 35-49 (40 percent) report the highest use of ITNs, followed by children under 5 (37 percent). Women, urban dwellers, those living in the South Eastern A region, and those in the fourth wealth quintile are more likely than their counterparts to report having slept under an ITN the night before the survey.

Among households with at least one ITN, net utilization is high. Nearly two-thirds (61 percent) of those in households that own at least one ITN slept under the ITN the previous night. Net usage among the population that owns at least one ITN is twice that of the general population, indicating that ITN ownership increases the likelihood of net usage. Variations in ITN use among those households that own at least one ITN, however, are similar to those within the general population.

Table 3.7 Use of mosquito nets by persons in the household

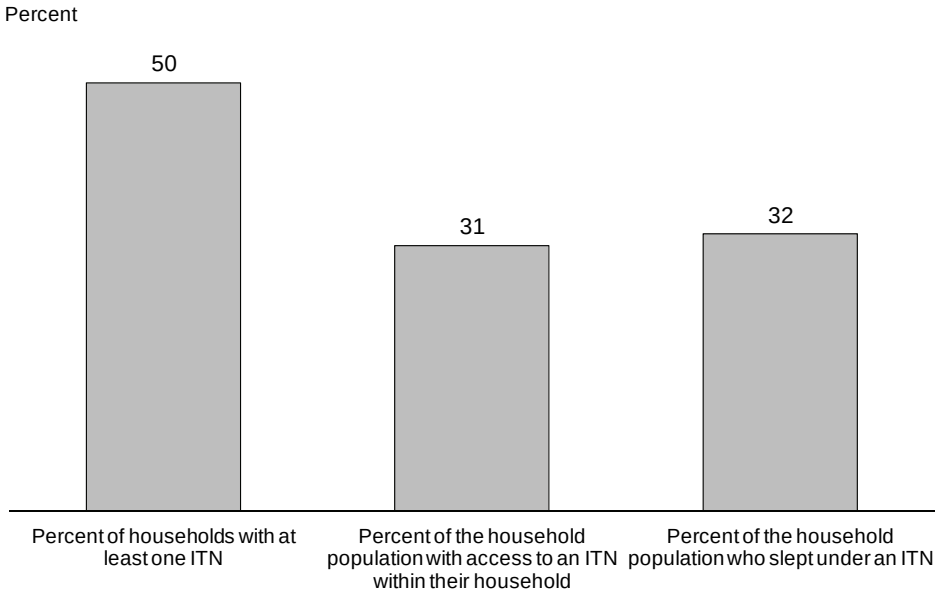
Percentage of the de facto household population who slept the night before the survey under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among the de facto household population in households with at least one ITN, the percentage who slept under an ITN the night before the survey, by background characteristics, Liberia 2011

	Household population					Household population in households with at least one ITN[1]	
Background characteristic	Percentage who slept under any net last night	Percentage who slept under an ITN[1] last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN[1] last night or in a dwelling sprayed with IRS[2] in the past 12 months	Number	Percentage who slept under an ITN[1] last night	Number
Age (in years)							
<5	38.1	37.1	36.7	42.9	3,352	68.0	1,827
5-14	24.7	24.1	23.8	30.5	5,210	46.0	2,734
15-34	33.1	32.2	31.8	37.7	5,586	61.9	2,909
35-49	40.7	39.7	39.0	45.5	2,318	74.5	1,237
50+	37.1	36.0	35.6	41.3	1,742	69.8	898
Sex							
Male	31.6	30.9	30.5	36.7	9,037	59.0	4,736
Female	34.3	33.3	32.8	39.1	9,228	62.7	4,899
Residence							
Urban	35.7	34.2	33.5	37.5	8,935	61.9	4,935
Rural	30.3	30.1	29.9	38.3	9,330	59.8	4,701
Region							
Monrovia	36.5	34.8	33.7	36.2	5,351	62.4	2,983
North Western	29.3	28.7	28.5	28.7	1,451	60.9	685
South Central	22.6	22.3	22.2	44.3	3,554	59.5	1,331
South Eastern A	41.7	40.8	40.0	41.1	1,440	62.9	935
South Eastern B	36.5	36.3	36.2	37.2	1,193	55.6	779
North Central	34.1	33.6	33.6	37.1	5,276	60.7	2,922
Wealth quintile							
Lowest	27.6	27.3	27.2	37.1	3,650	62.3	1,601
Second	35.3	34.8	34.6	40.0	3,615	61.2	2,059
Middle	32.8	32.2	31.8	36.8	3,637	61.7	1,899
Fourth	36.7	35.8	35.6	39.8	3,666	67.0	1,958
Highest	32.4	30.4	29.1	35.8	3,697	53.0	2,119
Total	32.9	32.1	31.7	37.9	18,265	60.9	9,636

[1] An insecticide-treated 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.
[2] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.
Note: Total includes cases for which age is missing.

Figure 3.4 presents ownership of, access to, and use of ITNs in Liberia. As shown in column 1, half of Liberian households own at least one ITN. Among the population, however, only 31 percent of individuals have access to an ITN (column 2). Three in ten Liberians slept under a mosquito net the night before the survey (column 3). When comparing column one and column two, the graph shows that Liberian households do not have a sufficient number of nets to be used by the number of people sleeping in the household; ITN coverage for individuals is lower than it appears on the household level. When comparing column 2 and column 3, on the other hand, net access is similar to net usage. This implies that those who have access to a mosquito net are sleeping under a net, and in some cases, more than two people are sharing a net.

Figure 3.4 **Ownership of, access to, and use of ITNs**



Liberia 2011

3.2.2 Use of Mosquito Nets by Children under Age 5

Those living in areas of high malaria transmission naturally acquire immunity to the disease over time (Doolan et al., 2009). Acquired immunity is not the same as sterile immunity—that is, acquired immunity does not prevent *P. falciparum* infection but rather protects against severe disease and death. Age is an important factor in determining levels of acquired immunity to malaria. For about six months following birth, antibodies acquired from the mother during pregnancy protect children born in areas of endemic malaria. This immunity is gradually lost and children start to develop their own immunity to malaria. The pace at which immunity develops depends on the exposure to malarial infection, and in high malaria-endemic areas, children are thought to attain a high level of immunity by their fifth birthday. Such children may experience episodes of malaria illness but usually do not suffer from severe, life-threatening malaria. Immunity in areas of low malaria transmission is acquired more slowly, and malaria illness affects all age groups of the population. Malaria transmission is heavy throughout Liberia, and the Liberian government recognizes children under age 5 as a high-risk group and recommends that they be protected by sleeping under insecticide-treated nets.

Table 3.8 shows the percentage of children younger than age 5 who slept under various categories of mosquito nets the night before the survey. Nationally, 37 percent of children under age 5 slept under an ITN the previous night. ITN utilization, among children, tends to decrease with age. For example, 45 percent of children less than 12 months old slept under an ITN the night before the survey, while only 30 percent of children age 48-59 months slept under an ITN. ITN utilization does not vary by child's sex but does vary by a child's residence. Children living in urban areas are more likely than children in rural areas to have slept under an ITN the previous night (40 percent versus 35 percent). Those living in the counties within the South Eastern A region and those in the forth and second wealth quintiles are more likely than others to have slept under an ITN (Figure 3.5).

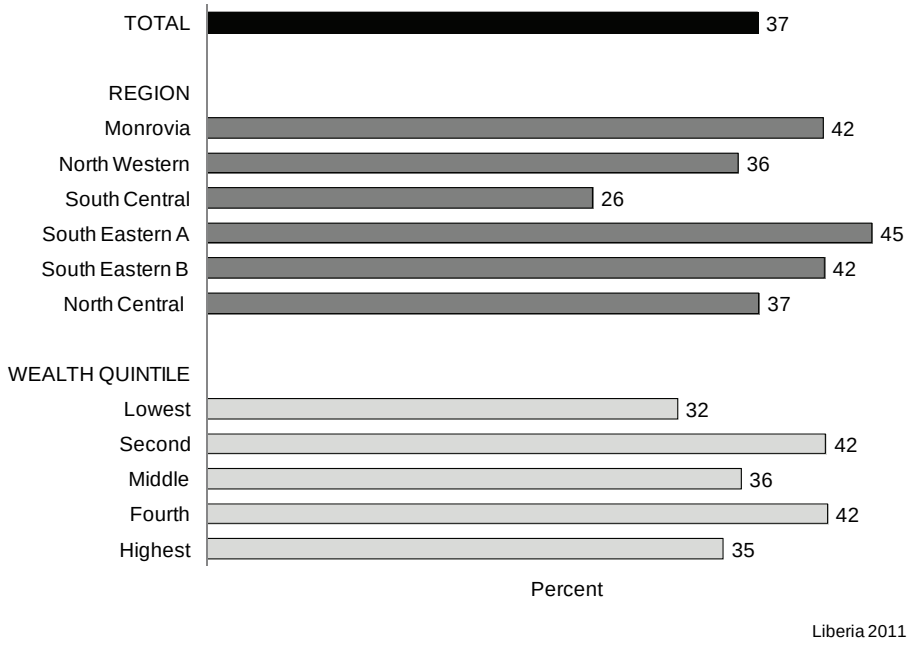
Table 3.8 Use of mosquito nets by children

Percentage of children under five years of age who, the night before the survey, slept under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under 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 under an ITN the night before the survey, by background characteristics, Liberia 2011

	Children under age five in all households					Children under age five in households with at least one ITN[1]	
Background characteristic	Percentage who slept under any net last night	Percentage who slept under an ITN[1] last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN[1] last night or in a dwelling sprayed with IRS[2] in the past 12 months	Number of children	Percentage who slept under an ITN[1] last night	Number of children
Age (in months)							
<12	46.3	45.3	45.1	48.7	622	76.1	370
12-23	40.4	38.1	37.4	44.7	713	72.8	374
24-35	37.6	37.2	37.2	44.3	631	68.1	345
36-47	36.7	35.6	35.5	41.6	698	65.1	381
48-59	30.0	29.8	29.2	35.5	687	57.4	357
Sex							
Male	37.7	36.7	36.5	42.8	1,719	67.7	931
Female	38.5	37.5	37.0	42.9	1,633	68.2	897
Residence							
Urban	42.3	40.2	39.6	44.1	1,377	69.5	798
Rural	35.1	34.8	34.7	42.0	1,974	66.8	1,030
Region							
Monrovia	44.4	41.5	40.4	43.1	748	70.7	438
North Western	36.4	35.8	35.3	35.8	290	72.3	144
South Central	26.3	26.0	25.9	50.7	609	66.4	238
South Eastern A	45.6	44.8	44.4	45.0	317	66.1	215
South Eastern B	41.7	41.6	41.5	43.0	250	62.2	167
North Central	37.7	37.2	37.2	39.6	1,138	67.8	625
Wealth quintile							
Lowest	31.9	31.7	31.5	40.5	863	69.6	392
Second	42.3	41.7	41.7	46.6	793	68.9	480
Middle	36.3	36.0	35.3	40.8	652	66.8	351
Fourth	42.7	41.8	41.7	46.0	574	73.3	328
Highest	39.0	34.8	33.6	39.8	470	59.1	276
Total	38.1	37.1	36.7	42.9	3,352	68.0	1,827

Note: Table is based on children who stayed in the household the night before the interview.
[1] An insecticide-treated 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.
[2] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.

Figure 3.5 **Percentage of children under age 5 who slept under an ITN the night before the survey**



Among households with at least one ITN, nearly 7 in 10 children slept under an ITN the night before the survey. Variations in ITN utilization by children in households with at least one ITN by background characteristics are similar to those found in all households.

3.2.3 Use of Mosquito Nets by Pregnant Women

In malaria-endemic areas, adults usually have acquired some degree of immunity to severe, life-threatening malaria. However, pregnancy leads to a depression of the immune system so that pregnant women, especially those in their first pregnancy, have a higher risk of malarial infection. Moreover, malaria among pregnant women may be asymptomatic. Malaria during pregnancy is a major contributor to low birth weight, maternal anemia, infant mortality, spontaneous abortion, and stillbirth. Pregnant women can reduce the risk of the adverse effects of malaria by sleeping under insecticide-treated mosquito nets.

Table 3.9 shows the use of mosquito nets by pregnant women by background characteristics. Four in 10 pregnant women (39 percent) slept under an ITN the night before the survey. ITN utilization is highest among pregnant women in the South Eastern A and South Eastern B regions (55 percent and 50 percent, respectively). Pregnant women residing in both areas show an increase in ITN use when compared with use in recorded in the 2009 LMIS. Among pregnant women, those with secondary education or higher and those in the second wealth quintile are more likely than their counterparts to have slept under an ITN the previous night. There is no difference in ITN usage among pregnant women in rural and urban areas.

Not surprisingly, ITN use is higher for pregnant women who live in households that own ITNs than for pregnant women in all households. Thirty nine percent of pregnant women age 15-49 in all households slept under an ITN the previous night, compared with 77 percent of pregnant women age 15-49 in all households that own at least one ITN.

Table 3.9 Use of mosquito nets by pregnant women

Percentages of pregnant women age 15-49 who, the night before the survey, slept under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among pregnant women age 15-49 in households with at least one ITN, the percentage who slept under an ITN the night before the survey, by background characteristics, Liberia 2011

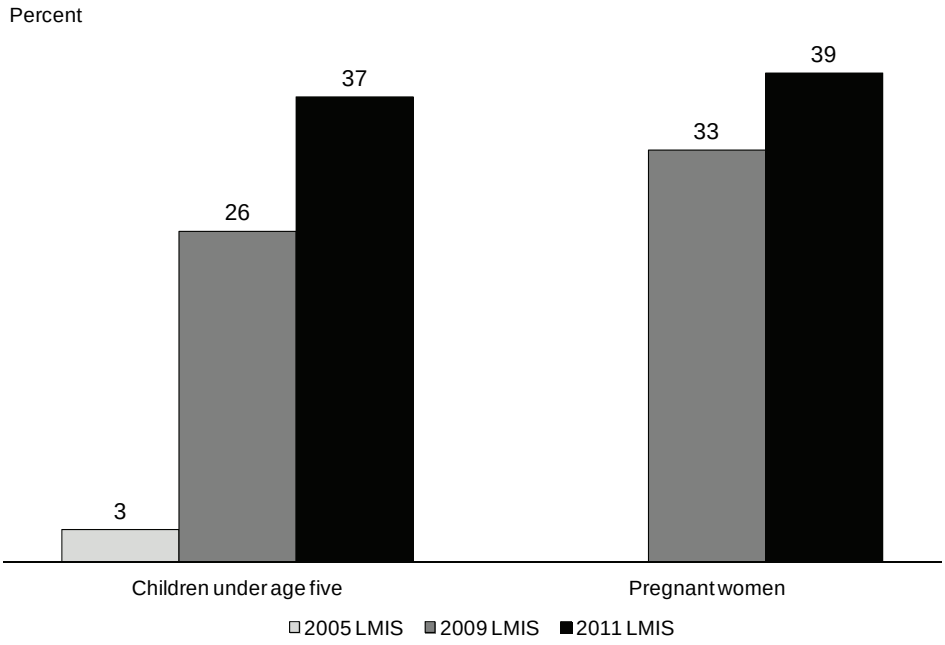
	Among pregnant women age 15-49 in all households					Among pregnant women age 15-49 in households with at least one ITN[1]	
Background characteristic	Percentage who slept under any net last night	Percentage who slept under an ITN[1] last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN[1] last night or in a dwelling sprayed with IRS[2] in the past 12 months	Number of women	Percentage who slept under an ITN[1] last night	Number of women
Residence							
Urban	41.9	39.3	39.3	43.4	160	87.5	72
Rural	38.8	38.8	38.8	47.0	203	70.8	111
Region							
Monrovia	41.7	39.5	39.5	39.5	101	*	43
North Western	(36.2)	(36.2)	(36.2)	(36.2)	29	*	12
South Central	27.3	26.0	26.0	57.6	72	*	26
South Eastern A	54.7	54.7	54.7	54.7	25	(74.3)	18
South Eastern B	50.3	50.3	50.3	51.7	24	(73.9)	16
North Central	42.8	41.9	41.9	41.9	112	(69.4)	68
Education							
No education	38.8	38.8	38.8	48.3	130	78.4	64
Primary	39.8	37.2	37.2	43.1	126	71.9	65
Secondary or higher	42.3	41.5	41.5	44.5	108	82.8	54
Wealth quintile							
Lowest	37.6	37.6	37.6	47.4	85	77.1	41
Second	47.2	47.2	47.2	52.5	87	73.2	56
Middle	40.7	39.3	39.3	42.1	71	(78.4)	35
Fourth	(41.0)	(39.5)	(39.5)	(43.6)	63	(83.2)	30
Highest	(31.7)	(27.7)	(27.7)	(37.8)	58	*	20
Total	40.2	39.0	39.0	45.4	363	77.4	183

Note: Figures in parentheses are based on 25-49 unweighted cases. An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.
[1] An insecticide-treated net (ITN) is (1) 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
[2] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization

Figure 3.6[2] shows trends in ITN use among children under five and pregnant women, as measured in the LMIS surveys. ITN use among children increased dramatically between 2005 and 2009. Since 2009, ITN use among children has increased by 42 percent, from 26 percent in 2009 to 37 percent in 2011. ITN use among pregnant women has increased as well. In the 2009 LMIS, one-third of pregnant women reported that they slept under an ITN the previous night, whereas in the current survey, nearly 4 in 10 women (39 percent) report ITN use. This shows an 18 percent increase in ITN use among pregnant women in Liberia within the past three years.

[2] ITN use among pregnant women was not measured in the 2005 LMIS.

Figure 3.6 **Trends in use of ITNs**



3.3 INTERMITTENT PREVENTIVE TREATMENT OF MALARIA IN PREGNANCY

As explained previously, in areas of high malaria transmission, by the time an individual reaches adulthood, she or he has acquired immunity that protects against severe disease. However, pregnant women—especially those pregnant for the first time—frequently regain their susceptibility to malaria. Although malaria in pregnant women may not manifest itself as either febrile illness or severe disease, it is frequently the cause of mild to severe anemia. In addition, malaria during pregnancy can interfere with the maternal-fetus exchange that occurs at the placenta, leading to the delivery of low-birth-weight infants.

In Liberia, NMCP Malaria in Pregnancy policy and guidelines require that pregnant women receive intermittent prevent treatment for malaria in pregnancy (IPTp). Specifically, IPTp is prophylactic treatment with the antimalarial drugs SP/Fansidar once at the beginning of the second trimester of pregnancy and once at the beginning of the third trimester. It is preferably that women receive IPTp during routine antenatal care. Pregnant women who take malaria medicine only to treat an existing case of malaria are not considered to have received IPTp. IPTp using SP/Fansidar was introduced as a replacement to chloroquine prophylaxis, which was no longer effective due to high levels of chloroquine resistance. The NMCP National Malaria Strategic Plan for 2010-2015 highlights the RBM goal of achieving IPTp among 80 percent of all Liberian pregnant women by 2010. To help reach the RBM goal, the National Malaria Strategic Plan for 2010- 2015 outlines the government's main IPTp strategies. The primary focus of the Malaria in Pregnancy program is to increase the availability of SP/Fansidar to Liberian women. The program will focus on improving the supply chain and management system within the MOHSW, at both the central level and the health facility level. Additionally, the program will extend IPTp outside health facilities to trained traditional midwives (TTMs), making IPTp readily available at the community level. The secondary focus of the Malaria in Pregnancy program within NMCP is to integrate the IPTp into national reproductive health and EPI campaigns, which also include ITN distribution.

In the 2011 LMIS, women who had a live birth in the two years preceding the survey were asked several questions regarding the time they were pregnant with their most recent birth. They were asked if anyone told them during their pregnancy that pregnant women need to take medicine to keep them from getting malaria. They were also asked if they had taken any drugs to prevent getting malaria during that pregnancy and, if so, which drug. If the respondent did not know the name of the drug she took, interviewers were instructed to show her some examples of common antimalarials. They also were

instructed to probe to see if she took three big, white tablets at the health facility (indicative of SP/Fansidar). If respondents had taken SP/Fansidar, they were further asked how many times they took it and whether they had received it during a prenatal care visit. IPTp data is presented in Table 3.10.

Table 3.10 Prophylactic use of antimalarial drugs and use of intermittent preventive treatment (IPTp) by women during pregnancy

Percentage of women age 15-49 with a live birth in the two years preceding the survey who, during the pregnancy preceding the last birth, took any antimalarial drug for prevention, who took one dose of SP/Fansidar, and who received intermittent preventive treatment (IPTp)[1], by background characteristics, Liberia 2011

		SP/Fansidar		Intermittent preventive treatment[1]		
Background characteristic	Percentage who took any antimalarial drug	Percentage who took any SP/Fansidar	Percentage who received any SP/Fansidar during an ANC visit	Percentage who took 2+ doses of SP/Fansidar	Percentage who took 2+ doses of SP/Fansidar and received at least one during ANC visit	Number of women with a live birth in the two years preceding the survey
Residence						
Urban	74.9	63.0	61.6	44.5	44.3	540
Rural	73.2	63.4	62.4	54.8	53.8	689
Region						
Monrovia	75.1	59.8	58.2	40.1	40.1	312
North Western	75.8	63.4	61.9	52.4	50.8	112
South Central	64.2	50.1	49.8	38.8	38.8	207
South Eastern A	72.6	64.5	62.8	56.6	55.5	120
South Eastern B	82.5	74.2	71.7	64.1	61.8	79
North Central	76.2	70.1	69.2	58.9	58.3	400
Education						
No education	68.0	55.7	54.8	45.7	45.1	498
Primary	77.3	67.1	65.3	55.4	54.4	399
Secondary or higher	78.7	69.8	68.9	50.9	50.8	333
Wealth quintile						
Lowest	77.0	63.3	62.2	55.2	54.3	304
Second	70.5	65.0	64.0	56.5	55.8	282
Middle	73.8	63.4	62.2	50.8	49.6	234
Fourth	71.4	63.5	62.3	40.2	40.2	227
Highest	77.5	59.7	58.3	44.2	44.2	183
Total	73.9	63.2	62.0	50.3	49.6	1,230

[1] IPTp: intermittent preventive treatment during pregnancy is preventive treatment with two or more doses of SP/Fansidar.

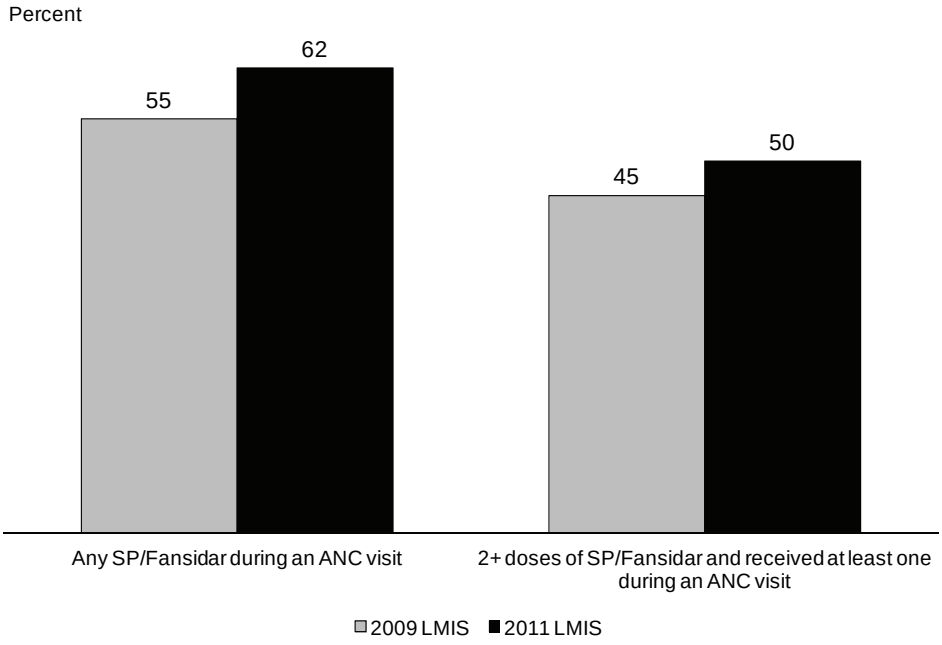
Table 3.10 shows that almost three-quarters of women (74 percent) took an antimalarial drug during their last pregnancy. The majority of pregnant women who took any antimalarial drug—63 percent of women—took at least one dose of SP/Fansidar during their pregnancy. Half of women reported taking two or more doses of SP/Fansidar during their last pregnancy, or received IPTp. Almost all of the women who took at least two doses of SP/Fansidar received at least one dose during an antenatal care (ANC) visit.

There is little difference between the percentage of urban woman and rural women who took an antimalarial during pregnancy. Across the regions, use of antimalarial drugs is highest among pregnant women in the South Eastern B region (83 percent) and lowest among women in South Eastern A (73 percent). Use of an antimalarial drug is less common among women with no education (68 percent) and in the second and fourth wealth quintiles (71 percent each).

IPTp received during ANC is higher among women living in rural areas (54 percent) compared with women in urban areas (44 percent). Women with primary education are more likely than other women to have received IPTp during an ANC visit. IPTp received during an ANC visit generally decreases as wealth increases in Liberia. A higher proportion of those in the lowest wealth quintile received IPTp during an ANC visit (54 percent), compared with those in the fourth wealth quintile (40 percent). Of the regions, South Eastern B (62 percent) has the highest proportion of pregnant women that received two or more does of SP/Fansidar, with at least one received at an ANC visit. This is a dramatic increase from the 2009 LMIS, where only 22 percent of pregnant women in South Eastern B region received IPTp during an ANC visit.

Figure 3.7 compares IPTp trends across the 2009 LMIS and the 2011 LMIS. Overall, there has been a general increase in IPTp. The percentage of women who received at least one dose of SP/Fansidar during an ANC visit has increased by 13 percent in the past three years, from 55 percent measured in 2009 to 62 percent measured in the current LMIS. There has also been a similar increase in the percentage of women that received two or more doses of SP/Fansidar with at least one dose received during an ANC visit. In the 2009 LMIS, 45 percent of pregnant women reported that they received at least one of their two doses of SP/Fansidar during an ANC, whereas in the 2011 LMIS, half of women report that they received two or more doses of SP/Fansidar during their last pregnancy, with at least one dose received during an ANC visit. This shows an 11 percent increase in IPTp among pregnant women in Liberia within the past three years.

Figure 3.7 **Trends in use of intermittent preventive treatment of malaria in pregnancy**



FEVER MANAGEMENT AND MALARIA IN CHILDREN

4

Key Findings

- Nearly half of Liberian children under five years had fever in the two weeks preceding the survey. Of these children, 60 percent sought treatment, and 33 percent had a blood sample taken for testing.
- Nearly three-fifths (57 percent) of children with fever received an antimalarial drug to treat the fever.
- Of the children that received an antimalarial drug, 7 in 10 took ACT.
- Eight percent of Liberian children are severely anemic.
- Rapid diagnostic testing revealed that 45 percent of children age 6-59 months in Liberia had malaria. Analysis of blood smears by microscopy revealed a somewhat lower prevalence: 28 percent of children age 6-59 months.

Prior to 2003, the Liberian government recommended chloroquine and SP/Fansidar, the least expensive malaria treatment options, as the first-line and second-line drugs for treatment of uncomplicated malaria. Various studies conducted in Liberia between 1993 and 2000 showed chloroquine and SP resistance within *P. falciparum* infected individuals (Massaquoi et al., 2003). In 2003, a consensus was reached on the need for a policy change for antimalarial treatment. International nongovernmental organizations (NGOs) working in southeastern Liberia introduced artemisinin-based combination therapy (ACT) where chloroquine resistance had been noted. The new policy recommended the use of ACT instead of chloroquine for the treatment of uncomplicated malaria and reserved SP/Fansidar for use by pregnant women as IPTp. Since 2003, ACT, specifically a combination of artesunate and amodiaquine (ASAQ), has been the approved first-line drug for treatment of malaria in Liberia. No resistance to ACT has been reported to date in Liberia.

The first strategy of Liberia's National Malaria Strategic Plan for 2010-2015 focuses on the availability, accessibility, and promotion of ACT, the first-line treatment for malaria. To make treatment more accessible to families, the Liberia NMCP strategy has three main objectives. The first is to make the fixed-dose artesunate and amodiaquine (ASAQ) combination therapy available to all health facilities and to train health staff in its use. Second, the program plans to reinforce the role of community members and volunteers for community case management of malaria by providing malaria control tools and training for workers. Finally, through a well-structured private sector initiative, NMCP aims to make ACT available and affordable in the private sector.

This chapter of the 2011 LMIS presents data for assessing the implementation of the program's malaria treatment ventures and also presents health outcome information. Data that are presented show the prevalence of fever in household members and the cost of treatment as well as the prevalence, diagnosis, and treatment of fever in children. Data are also presented showing the prevalence of severe anemia and malaria in children age 6-59 months.

4.1 PREVALENCE OF FEVER AMONG THE HOUSEHOLD POPULATION AND COST OF MALARIA TREATMENT

Malaria is one of the leading causes of death in Liberia. Malaria not only presents Liberian families with a burden of illness and disease but also presents a financial burden to families. The cost of treatment can be considerable, especially with payments for medicine and transport to a hospital or clinic.

Illness may cause further losses because of an inability to work or a need to look after other family members, thereby preventing attendance at work. The effects of malaria on the community include substantial financial loss due to payment of treatment/consultation costs and vector control measures at the household level. Patients with malaria overburden an already over-stretched health service.

The 2011 LMIS provides basic data on malaria-related health care costs among household members. Tables 4.1 and 4.2 present these data, which can be used to estimate the national calculations related to fever treatment. The LMIS Household Questionnaire included four questions to be asked of every household member: whether he or she had been sick with fever at any time in the previous four weeks and, if so, whether he or she got any treatment for the fever and where and how much the treatment cost (including provider fees and costs for drugs and tests). Fever in this context was used as a proxy for malaria. When interpreting the results, it is important to remember that, although interviewers were instructed to consult any and all household members in collecting information, they were not required to make callbacks to interview everyone in the household. Consequently, the information in many cases was reported by someone other than the household member with the reported fever episode, which may lead to some inaccuracies.

Table 4.1 Prevalence of fever among household population

Percent distribution of de facto household population by whether people reported having fever in the four weeks before the survey and percent distribution of those reported to have had fever by whether they sought treatment for the fever, according to selected background characteristics, Liberia, 2011

	Household population with fever in past four weeks					Household population with fever who sought treatment				
Background characteristic	Yes	No	Don't know/ missing	Total	Number of people	Yes	No	Don't know/ missing	Total	Number of people with fever
Age										
0-4	55.7	43.7	0.7	100.0	3,340	79.3	20.4	0.3	100.0	1,859
5-9	40.4	58.9	0.7	100.0	3,004	79.4	20.6	0.0	100.0	1,214
10-14	26.4	72.5	1.1	100.0	2,219	80.3	19.4	0.3	100.0	585
15-19	24.4	74.9	0.8	100.0	1,602	76.5	23.5	0.0	100.0	390
20-29	34.5	64.6	0.9	100.0	2,964	74.6	25.1	0.3	100.0	1,023
30-39	38.0	61.1	0.9	100.0	1,969	75.6	24.3	0.1	100.0	748
40-49	41.1	58.6	0.4	100.0	1,370	75.0	25.0	0.0	100.0	562
50-59	38.7	60.9	0.4	100.0	881	74.1	25.9	0.0	100.0	341
60+	48.0	51.7	0.3	100.0	861	72.8	27.2	0.0	100.0	413
Sex										
Male	36.9	62.3	0.8	100.0	9,037	76.9	23.0	0.1	100.0	3,333
Female	41.5	57.8	0.7	100.0	9,228	77.5	22.3	0.2	100.0	3,826
Residence										
Urban	38.0	61.2	0.9	100.0	8,935	81.2	18.5	0.2	100.0	3,391
Rural	40.4	59.0	0.6	100.0	9,330	73.6	26.3	0.1	100.0	3,768
Region										
Monrovia	38.4	60.9	0.6	100.0	5,351	82.2	17.6	0.2	100.0	2,056
North Western	43.2	56.4	0.4	100.0	1,451	76.0	24.0	0.0	100.0	627
South Central	45.6	53.8	0.6	100.0	3,554	77.3	22.7	0.0	100.0	1,621
South Eastern A	38.4	61.2	0.4	100.0	1,440	74.2	25.6	0.3	100.0	553
South Eastern B	38.4	60.7	0.9	100.0	1,193	77.6	22.3	0.1	100.0	459
North Central	34.9	63.9	1.2	100.0	5,276	72.8	26.9	0.3	100.0	1,843
Wealth quintile										
Lowest	45.1	54.5	0.4	100.0	3,650	66.0	33.9	0.1	100.0	1,648
Second	41.2	57.8	1.0	100.0	3,615	75.2	24.7	0.1	100.0	1,491
Middle	36.4	63.1	0.5	100.0	3,637	82.4	17.3	0.3	100.0	1,325
Fourth	39.8	59.1	1.1	100.0	3,666	80.0	20.0	0.0	100.0	1,459
Highest	33.5	65.7	0.8	100.0	3,697	85.8	14.0	0.2	100.0	1,237
Total	39.2	60.0	0.8	100.0	18,265	77.2	22.6	0.2	100.0	7,159

Note: Data are based on reports from the respondent to the Household Questionnaire and not necessarily the household member him/herself.
Total includes cases for which age is missing.

As shown in Table 4.1, 4 in 10 Liberians (39 percent) were reported as having fever in the four weeks before the survey. The proportion with fever is highest among children under 5 (56 percent), after which it declines rapidly to only about 24 percent of those age 15-19 and then increases. Fever is somewhat more common among women (42 percent) than men (37 percent). There is little difference in the proportion of people with fever among rural and urban residents. The 2011 LMIS shows that fever is most common in South Central (46 percent) and North Western regions (43 percent) and least common in

North Central region (35 percent). Fever is highest in the lowest income group (45 percent) and lowest in the highest income group (34 percent).

More than three-quarters of those with fever reported seeking treatment for the fever (77 percent). Treatment-seeking behavior tends to decrease with age. For example, children younger than age 15 are more likely than the elderly, those age 60 or older, to have sought treatment for their fever (80 percent and 73 percent, respectively). There is no difference between the proportion of men and women reported to have sought treatment. Those living in urban areas and within Monrovia are more likely to have sought treatment compared with their counterparts residing elsewhere. Health-seeking behavior also increases with wealth. Only 66 percent of individuals in the lowest wealth quintile were reported to have sought treatment, compared with 86 percent of those in the highest wealth quintile.

Table 4.2 shows the percent distribution of those who sought treatment by the place where they were treated (column 1). Approximately one-quarter of those with fever who sought treatment went to a government health clinic (24 percent), approximately one-quarter went to a private hospital or clinic (23 percent), and nearly one-fifth (17 percent) sought treatment from a medicine store. Twelve percent of people with fever sought treatment from a government hospital and 8 percent from a "black bagger" or drug peddler. Column 3 shows that people are most likely to receive free fever treatment from government-supported facilities, such as government hospitals, health centers, or clinics. On average, two in five people received treatment free of charge.

Table 4.2 Cost of malaria treatment

Among those with fever in the four weeks before the survey who sought treatment for the fever, percent distribution by place of treatment and mean cost of treatment, by place of treatment, Liberia, 2011

Place of treatment	Percent distribution by place of treatment	Mean cost (including those with free treatment)	Percentage receiving free treatment	Number of people receiving treatment from source	Mean cost (excluding those with free treatment)	Number of people paying for treatment from source
Government hospital	11.8	79	84.0	650	490	103
Government health center	5.1	57	91.4	282	666	24
Government health clinic	23.5	21	89.7	1,299	204	134
Private hospital/clinic	22.9	851	17.7	1,265	1,034	974
Pharmacy	5.6	313	2.2	309	320	285
Private doctor	2.9	404	9.4	161	447	140
Mobile clinic	(0.5)	(182)	(23.9)	29	(239)	22
Medicine store	17.4	204	0.7	962	205	934
Traditional practitioner	0.9	48	*	52	*	18
Black bagger/drug peddler	8.0	177	0.8	441	179	428
Other	0.8	274	*	44	*	22
Don't know	*	*	*	21	*	10
Total	100.0	289	42.2	na	500	na
Number	na	na	na	5,529	na	3,098

Note: Data are based on reports from the respondent to the Household Questionnaire and not necessarily the household member himself/herself. Costs are in Liberian dollars. Figures in parentheses are based on 25-49 unweighted cases. An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.
na = Not applicable

The mean cost of treatment is 289 Liberian dollars (approximately US$4), a 78 percent increase in the mean cost of treatment compared with the 2009 LMIS. This cost included those individuals who did not pay for treatment (column 3). Excluding them, the mean cost for those who paid for treatment of fever is 500 Liberian dollars (approximately US$7), up 93 percent from the cost of fever treatment as measured in the 2009 LMIS.

4.2 MALARIA CASE MANAGEMENT AMONG CHILDREN

Fever is a major manifestation of malaria in young children, although it also accompanies other illnesses. Most malarial fevers and convulsions occur at home, and prompt and effective malaria treatment is important to prevent the disease from becoming severe and complicated. The 2011 LMIS asked mothers whether their children under age 5 had had a fever in the two weeks preceding the survey and, if so,

whether any treatment was sought. Questions were also asked about blood testing, the types of drugs given to the child, and how soon and for how long the drugs were taken.

Table 4.3 shows the percentage of children under age 5 who had fever in the two weeks preceding the survey and, among those children under age 5 with fever, the percentage for whom advice or treatment was sought from a health facility, provider, or pharmacy, the percentage of such children who had a drop of blood taken from a finger- or heel-prick (presumably for a malaria test), the percentage who took ACT or any antimalarial drugs, and the percentage who took drugs on the same or next day. Table 4.4 depicts the type and timing of antimalarial drugs used among children under age 5 with fever in the two weeks preceding the survey and the percentage of children who took specific antimalarial drugs the same or the next day after developing fever, by the various background characteristics.

Table 4.3 Prevalence, diagnosis, and prompt treatment of children with fever

Percentage of children under age five with fever in the two weeks preceding the survey; and among children under age five with fever, the percentage for whom advice or treatment was sought from a health facility, provider, or pharmacy, the percentage who had blood taken from a finger or heel, the percentage who took artemisinin-based combination therapy (ACT), the percentage who took ACT the same or next day following the onset of fever, the percentage who took antimalarial drugs, and the percentage who took the drugs the same or next day following the onset of fever, by background characteristics, Liberia 2011

	Among children under age five:		Among children under age five with fever:						
Background characteristic	Percentage with fever in the two weeks preceding the survey	Number of children	Percentage for whom advice or treatment was sought from a health facility, provider or pharmacy[1]	Percentage who had blood taken from a finger or heel for testing	Percentage who took ACT	Percentage who took ACT same or next day	Percentage who took antimalarial drugs	Percentage who took antimalarial drugs same or next day	Number of children
Age (in months)									
<12	47.8	581	62.8	31.2	28.0	16.4	45.8	28.8	278
12-23	55.3	628	62.0	34.8	34.0	21.7	54.3	33.6	347
24-35	54.6	551	57.9	30.5	44.0	26.4	59.4	36.3	301
36-47	43.2	557	58.6	34.9	46.6	28.8	61.5	35.7	241
48-59	44.6	559	56.1	35.3	48.9	30.7	66.5	41.7	249
Sex									
Male	49.8	1,494	58.2	31.8	40.6	25.2	57.5	35.5	744
Female	48.7	1,382	61.3	34.9	38.8	23.7	56.6	34.5	672
Residence									
Urban	49.6	1,175	68.2	37.9	35.8	17.9	59.3	33.0	583
Rural	49.0	1,701	53.7	30.0	42.4	29.0	55.5	36.4	833
Region									
Monrovia	44.8	624	75.6	43.8	29.6	13.5	62.2	36.2	280
North Western	54.4	256	68.9	34.1	41.5	27.2	57.0	36.3	139
South Central	54.8	528	49.5	25.7	39.9	24.8	54.5	31.1	290
South Eastern A	49.2	270	50.3	22.8	36.8	21.5	47.4	28.5	133
South Eastern B	48.1	215	57.6	32.3	38.5	27.1	56.7	34.9	103
North Central	48.0	982	56.8	34.6	46.1	30.2	58.5	38.1	471
Mother's education									
No education	50.4	1,294	53.7	29.7	39.2	25.9	51.5	33.0	652
Primary	49.6	900	57.8	33.4	40.8	23.5	58.5	33.3	446
Secondary or higher	46.6	681	74.6	40.4	39.3	22.8	66.6	41.4	317
Wealth quintile									
Lowest	47.3	751	47.3	29.4	41.9	31.9	53.0	37.0	355
Second	52.3	699	57.2	27.5	40.2	27.5	53.7	33.9	366
Middle	51.7	543	61.2	32.6	43.5	21.4	60.7	35.9	281
Fourth	50.4	498	68.7	38.7	35.8	14.9	58.7	26.4	251
Highest	42.3	384	75.6	47.6	33.4	21.5	65.0	44.9	162
Total	49.2	2,876	59.7	33.3	39.7	24.5	57.1	35.0	1,416

[1] Excludes market, shop, and traditional practitioner

As shown in Table 4.3, nearly half of children under age 5[1] (49 percent) had a fever in the two weeks preceding the survey. Prevalence of fever is quite uniform across sex and residence. Children age 12-35 months and those residing in North Western and South Central regions (about 55 percent) are more likely than other children to have had fever. Mothers with at least some secondary education and those in the highest wealth quintile are the least likely to report that their child had fever in the past two weeks.

Among children with fever, three-fifths (60 percent) sought treatment from a health facility, provider, or pharmacy, and one-third (33 percent) had blood taken from a finger or heel for testing. Children in the youngest two cohorts, those younger than 24 months, are the most likely to have been taken to a health facility, provider, or pharmacy for treatment or advice. Female children are only slightly more likely than male children to have been taken for treatment or advice (61 percent and 58 percent, respectively), while those living in urban areas are 1.3 times more likely than rural children to have sought treatment or advice (68 percent versus 54 percent). Treatment-seeking behavior is more prevalent among children of women with secondary education or higher and also increases with household wealth. Similar patterns are observed for children with fever who had blood taken from their finger or heel for testing.

Fifty-seven percent of children under 5 with fever in the two weeks preceding the survey took some type of antimalarial drug, and 40 percent took ACT. The proportion of children with fever who are given antimalarial drugs is somewhat higher among children in urban areas (59 percent), those whose mothers are better educated (67 percent), and those in the highest wealth quintile (65 percent). It is also relatively higher among children in Monrovia (62 percent). There is no variation by sex in the proportion of children that took an antimalarial drug. In general, a similar pattern is observed for children that received ACT. However, contrasting with antimalarial drug use, ACT use is slightly more common in rural areas than urban areas (42 percent and 36 percent, respectively). Of the children with fever, more than one-third (35 percent) were given an antimalarial drug the same day or the next day after getting the fever, while one-quarter were given ACT the same or next day following the onset of fever.

Details on the types and timing of antimalarial drugs given to children to treat fever are shown in Table 4.4. In interpreting the data, it is important to remember that the information is based on reports from the mothers of the ill children, many of whom may not have known the specific drug given to the child. The drug newly recommended by national policy—artesunate plus amodiaquine (or ACT for artemisinin combination therapy)—is commonly called the "new malaria medicine" in Liberia, so that was the name put on the list of codes in the questionnaire. However, it is also often referred to simply as "amodiaquine," making it difficult to distinguish use of the single drug and the combination therapy. In an effort to distinguish between the single drug and the combination therapy, interviewers were trained to further probe by asking the mother to see the medication or asking the mother to describe how the drugs looked.

Table 4.4 presents the percentage of children that took each type of antimalarial drug and the percentage of children that took the specific drug the same or next day. Among those children under age 5 that took an antimalarial drug, 7 in 10 children received ACT, or the "new malaria medicine," while 12 percent took chloroquine and 10 percent each took amodiaquine or quinine. SP/Fansidar accounts for less than 1 percent of the antimalarial drugs given to children with fever. Adherence to the recommended malaria treatment, ACT, is highest in children in rural areas (76 percent), those living in the North Central region (79 percent), those whose mothers have no education (76 percent), and children from households in the lowest wealth quintile (79 percent). By age, older children that received an antimalarial are more likely to have taken ACT compared with younger children less than 24 months.

[1] The results shown here differ from those shown in Table 4.1 for several reasons. First, the data in Table 4.1 refer to all children under age 5 listed in the household schedule, whereas Table 4.3 is based only on children whose mothers were interviewed. Second, Table 4.1 refers to fevers in the four weeks before the survey, while Table 4.3 refers to children with fever in the two weeks before the survey.

Table 4.4 Type and timing of antimalarial drugs used

Among children under age 5 with fever in the two weeks preceding the survey who took any antimalarial medication, the percentage who took specific antimalarial drugs, and the percentage who took each type of drug the same or next day after developing fever, by background characteristics, Liberia 2011

Background characteristic	Percentage of children who took drug:						Percentage of children who took drug the same or next day:						Number of children with fever who took anti-malarial drug
	SP/ Fansidar	Chloro-quine	Amodia-quine	Quinine	ACT	Other anti-malarial	SP/ Fansidar	Chloro-quine	Amodia-quine	Quinine	ACT	Other anti-malarial	
Age (in months)													
<12	0.0	27.8	7.7	7.6	61.2	3.4	0.0	21.6	1.4	5.7	35.9	2.0	127
12-23	0.0	10.1	12.3	16.0	62.6	1.5	0.0	7.5	6.1	9.2	39.9	0.3	189
24-35	0.0	10.5	9.4	5.9	74.0	0.8	0.0	7.1	7.1	2.9	44.5	0.0	179
36-47	0.9	8.0	10.2	9.4	75.8	0.3	0.9	3.6	4.0	4.2	46.8	0.3	148
48-59	0.0	8.4	9.2	7.6	73.6	2.2	0.0	6.1	5.5	4.7	46.2	1.3	166
Sex													
Male	0.0	11.5	11.3	7.2	70.5	2.3	0.0	7.8	6.5	4.2	43.7	1.1	428
Female	0.4	13.1	8.3	12.1	68.5	0.7	0.4	9.6	3.5	6.8	41.8	0.3	380
Residence													
Urban	0.4	15.0	12.8	13.1	60.4	1.8	0.4	10.5	7.7	7.2	30.3	0.7	345
Rural	0.0	10.2	7.8	6.8	76.4	1.4	0.0	7.3	3.1	4.1	52.2	0.7	463
Region													
Monrovia	0.0	21.6	13.5	18.6	47.7	1.3	0.0	16.2	8.2	12.5	21.8	0.0	174
North Western	0.0	11.3	11.9	6.2	72.9	4.4	0.0	7.9	5.2	3.9	47.6	1.6	79
South Central	0.0	9.7	9.9	8.1	73.2	0.3	0.0	6.0	2.8	3.2	45.5	0.3	158
South Eastern A	0.0	13.7	1.9	3.6	77.5	3.2	0.0	11.7	0.7	0.5	45.3	1.8	63
South Eastern B	0.0	18.2	10.6	2.4	67.9	2.1	0.0	7.0	3.9	1.2	47.7	1.7	59
North Central	0.5	6.5	8.8	8.4	78.9	1.1	0.5	5.2	5.7	4.7	51.7	0.7	275
Mother's education													
No education	0.0	7.7	9.7	7.1	76.0	1.2	0.0	6.5	3.8	4.8	50.3	0.4	336
Primary	0.5	17.5	7.0	9.6	69.7	1.0	0.5	11.2	3.0	3.8	40.2	0.8	261
Secondary or higher	0.0	13.0	13.9	13.2	59.1	2.9	0.0	8.9	9.8	8.4	34.2	1.2	211
Wealth quintile													
Lowest	0.0	11.2	9.5	2.1	79.1	1.3	0.0	7.8	2.8	1.6	60.2	0.1	188
Second	0.0	9.8	8.5	7.4	74.8	1.7	0.0	6.1	3.4	2.2	51.2	1.3	197
Middle	0.8	7.6	9.3	12.9	71.7	0.9	0.8	6.2	8.3	9.7	35.2	0.8	170
Fourth	0.0	13.9	13.4	12.7	61.0	3.7	0.0	8.7	6.6	4.3	25.4	1.2	147
Highest	0.0	23.9	9.5	16.8	51.4	0.0	0.0	18.6	4.7	12.7	33.0	0.0	106
Total	0.2	12.3	9.9	9.5	69.6	1.6	0.2	8.6	5.1	5.4	42.8	0.7	808

ACT = Artemisinin-based combination therapy

There has been a steady increase in ACT use in the past four years[2]: ACT accounted for 15 percent of antimalarial drugs given to children as reported in the 2007 LDHS, while the 2009 LMIS showed that ACT accounted for 44 percent of antimalarial drugs given to children with fever. The current survey shows that 70 percent of children who received antimalarial drugs took an ACT. Following the shift in drug policy in Liberia, the data also show a decrease in use of chloroquine for fever treatment. The 2007 LDHS showed that three-quarters (73 percent) of children who took an antimalarial drug were taking chloroquine. Two years later, the 2009 LMIS showed that use of chloroquine had dropped to 42 percent. The 2011 LMIS shows that 12 percent of children who received an antimalarial drug to treat their fever received chloroquine.

The majority of children with fever who received treatment with antimalarial drugs took the medication within the recommended timeframe, the same or next day after the onset of the fever. For example, 70 percent of children with fever that took an antimalarial drug took an ACT and 4 in 10 children (43 percent) with fever that took an antimalarial drug took the ACT the same or next day. This means that among children that took an ACT, six in ten (62 percent) took the ACT the same or next day, as recommended.

[2] The 2007 LDHS and the 2009 LMIS present the proportion of children that took a specific antimalarial drug among all children with fever. To compare these data with the 2011 LMIS, the estimates have been recalculated to present the proportion of children who took a specific drug among all children with fever that took an antimalarial drug.

4.3 ANEMIA AND MALARIA PREVALENCE AMONG CHILDREN

Anemia—a low level of hemoglobin in the blood—decreases the amount of oxygen reaching the tissues and organs of the body, thus reducing their capacity to function. It is associated with impaired cognitive and motor development in children. Although there are many causes of anemia, inadequate intake of iron, folate, vitamin B12, or other nutrients usually accounts for the majority of cases in many populations. Malaria accounts for a significant proportion of anemia in children under age 5 in malaria-endemic areas. Other causes of anemia include thalassemia, sickle cell disease, and intestinal worms. Promotion of the use of insecticide-treated nets and deworming every six months for children under age 5 are important measures to reduce anemia prevalence among children.

As mentioned previously, malaria is the leading cause of sickness and death among children under 5 in Liberia. In areas of constant and high malaria transmission, partial immunity develops within the first two years of life. Many people, including children, may have malaria parasites in their blood without showing any outward signs of infection. Such asymptomatic infection not only contributes to further transmission of malaria but also takes a toll on the health of individuals by contributing to anemia. Anemia is a major cause of morbidity and mortality associated with malaria, making prevention and treatment of malaria among children and pregnant women very important.

Table 4.5 Coverage of testing for anemia and malaria in children

Percentage of eligible children age 6-59 months who were tested for anemia and for malaria, by background characteristics (unweighted), Liberia 2011

Background characteristic	Percentage tested for: Anemia	Malaria with RDT	Malaria by microscopy	Number of children eligible
Age (in months)				
6-8	89.1	88.6	82.9	175
9-11	96.6	97.3	94.6	149
12-17	98.7	98.7	94.5	384
18-23	99.7	97.9	94.4	338
24-35	98.4	97.8	95.3	681
36-47	98.7	97.6	95.2	749
48-59	98.8	98.5	94.8	753
Sex				
Male	98.2	97.7	94.1	1,640
Female	98.1	97.3	94.4	1,589
Mother's interview status				
Interviewed	98.1	97.5	94.2	2,485
Not interviewed[1]	98.1	97.4	94.6	744
Residence				
Urban	97.1	96.3	94.8	1,261
Rural	98.8	98.3	94.0	1,968
Region				
Monrovia	94.3	94.0	93.1	335
North Western	98.9	98.1	97.4	469
South Central	97.7	97.3	96.6	524
South Eastern A	97.9	97.3	94.9	629
South Eastern B	98.9	98.8	93.4	662
North Central	99.3	98.0	90.8	610
Mother's education[2]				
No education	99.0	98.4	95.2	1,218
Primary	97.2	96.8	92.8	792
Secondary or higher	97.5	96.4	93.7	475
Wealth quintile				
Lowest	98.5	98.1	96.8	963
Second	98.8	98.5	93.2	940
Middle	98.3	97.4	91.2	605
Fourth	97.0	96.1	94.9	432
Highest	95.8	94.8	94.8	289
Total	98.1	97.5	94.3	3,229

RDT = Rapid Diagnostic Test First Response Malaria AG HRP2
[1] Includes children whose mothers are deceased.
[2] Excludes children whose mothers were not interviewed.

All children age 6-59 months living in the households selected for the 2011 LMIS were eligible for hemoglobin and malaria testing. In the 2011 LMIS, the HemoCue system was used to measure the concentration of hemoglobin in the blood, and the First Response Malaria AG HRP2 rapid diagnostic test (RDT) was used to detect malaria within the field. In addition, thick blood smears were also collected and analyzed in a lab to detect the presence of malaria parasites. As shown in Table 4.5, of the 3,229 children age 6-59 months eligible for testing, 98 percent were tested for anemia and 98 percent were tested for malaria with RDT. Additionally, 94 percent of the children were tested for malaria by microscopy. The coverage levels were uniformly high across background characteristics.

4.3.1 Anemia Prevalence among Children

Table 4.6 shows the percentage of children age 6-59 months classified as having severe anemia (hemoglobin concentration of less than 8.0 grams per deciliter) by background characteristics. A hemoglobin level below 8.0 g/dl is often associated with malaria infection in malaria-endemic regions. Eight percent of Liberian children age 6-59 months are severely anemic, indicating that anemia is a critical public health problem in Liberia. There is little variation in the proportion of children with severe anemia when presented by sex, residence, region, and wealth. However, children of women with a primary education are more likely than children of women with no education or at least some secondary education to be severely anemic (10 percent versus 7 percent). Severe anemia is more prevalent in children age 9-35 months more than younger children age 6-8 months or older children age 36-59 months.

Table 4.6 Hemoglobin <8.0 g/dl in children

Percentage of children age 6-59 months with hemoglobin lower than 8.0 g/dl, by background characteristics, Liberia 2011

Background characteristic	Hemoglobin <8.0 g/dl	Number of children
Age (in months)		
6-8	6.0	128
9-11	11.8	137
12-17	10.1	390
18-23	10.0	316
24-35	10.1	616
36-47	6.6	683
48-59	3.4	672
Sex		
Male	8.1	1,502
Female	7.1	1,440
Mother's interview status[1]		
Interviewed	8.2	2,246
Not interviewed	5.9	697
Residence		
Urban	7.0	1,160
Rural	8.1	1,782
Region		
Monrovia	6.4	597
North Western	6.3	267
South Central	8.9	546
South Eastern A	4.7	274
South Eastern B	8.2	222
North Central	8.8	1,035
Mother's education[2]		
No education	7.4	1,084
Primary	10.1	680
Secondary or higher	7.4	481
Wealth quintile		
Lowest	7.6	775
Second	8.2	703
Middle	8.7	604
Fourth	7.0	474
Highest	5.8	386
Total	7.7	2,942

Note: Table is based on children who stayed in the household the night before the interview. Hemoglobin levels are adjusted for altitude using CDC formulas (CDC, 1998). Hemoglobin is measured in grams per deciliter (g/dl).
[1] Includes children whose mothers are deceased.
[2] Excludes children whose mothers were not interviewed.

4.3.2 Malaria Prevalence among Children

Malaria prevalence among children age 6-59 months was measured in the 2011 LMIS in two ways (Table 4.7). In the field, health technicians used the First Response Malaria AG HRP2 RDT to diagnose malaria from finger-prick blood samples. Children who tested positive for the presence of *P. falciparum* by the RDT were screened by a nurse or other medical professional for symptoms of complicated malaria. If the RDT-positive child presented symptoms indicative of severe malaria, the child was referred to a health facility. If the RDT positive child did not show symptoms of complicated malaria and had not taken antimalarial medication in the past two weeks, the parent or adult responsible for the child was offered treatment with ACT. In addition, health technicians prepared thick blood smears that were brought back to Monrovia for microscopic examination in the laboratory.[3] Blood smears in which parasites were identified were classified as "slide positives."

Table 4.7 shows the results of both tests. Using the RDT, 45 percent of children age 6-59 months in Liberia tested positive for malaria. Analysis of blood smears by microscopy revealed a lower

[3] All slides were read twice, first by any of the six microscopists specially trained as part of the survey, and then one of the six microscopists who did not know the result of the first reading (blinded). In the roughly 15 percent of cases with discordant results from these two readings, the slide was examined a third time by another blinded, independent reader.

prevalence: 28 percent of children age 6-59 months tested positive. Regardless of which diagnostic test was used, malaria prevalence increased with age (see also Figure 4.1) and prevalence was slightly higher among boys than girls. Figure 4.2 shows malaria prevalence estimates by residence and region. As seen in Figure 4.2, malaria prevalence is higher in rural areas (35 percent by microscopy) than urban areas (17 percent by microscopy). It is highest in the South Eastern B region (49 percent by microscopy) and lowest in Monrovia (7 percent by microscopy). Malaria prevalence decreases with the mother's education level and, in general, with increasing levels of household wealth (Table 4.7 and Figure 4.3).

Table 4.7 Prevalence of malaria in children

Percentage of children age 6-59 months classified in two tests as having malaria, by background characteristics, Liberia 2011

Background characteristic	Malaria prevalence according to RDT		Malaria prevalence according to microscopy	
	RDT positive	Number of children tested	Microscopy positive	Number of children tested
Age (in months)				
6-8	15.2	128	9.6	120
9-11	35.5	137	18.9	132
12-17	31.3	390	16.2	373
18-23	40.8	310	24.9	301
24-35	45.4	612	27.7	591
36-47	50.9	673	33.4	658
48-59	54.9	670	35.4	640
Sex				
Male	46.5	1,494	29.3	1,424
Female	42.8	1,426	26.3	1,390
Mother's interview status[1]				
Interviewed	44.7	2,228	27.2	2,148
Not interviewed	44.5	692	29.6	666
Residence				
Urban	29.5	1,149	16.7	1,137
Rural	54.5	1,770	35.3	1,677
Region				
Monrovia	15.3	595	7.1	589
North Western	49.3	265	29.0	263
South Central	49.6	545	26.2	538
South Eastern A	55.3	272	32.6	261
South Eastern B	70.5	221	49.2	212
North Central	49.5	1,021	35.0	952
Mother's education[2]				
No education	50.0	1,076	30.6	1,030
Primary	47.6	677	29.7	649
Secondary or higher	28.9	475	16.3	469
Wealth quintile				
Lowest	54.0	771	35.8	761
Second	54.1	701	36.8	649
Middle	50.4	595	29.5	555
Fourth	33.4	470	17.7	466
Highest	13.6	383	6.4	383
Total	44.7	2,920	27.8	2,815

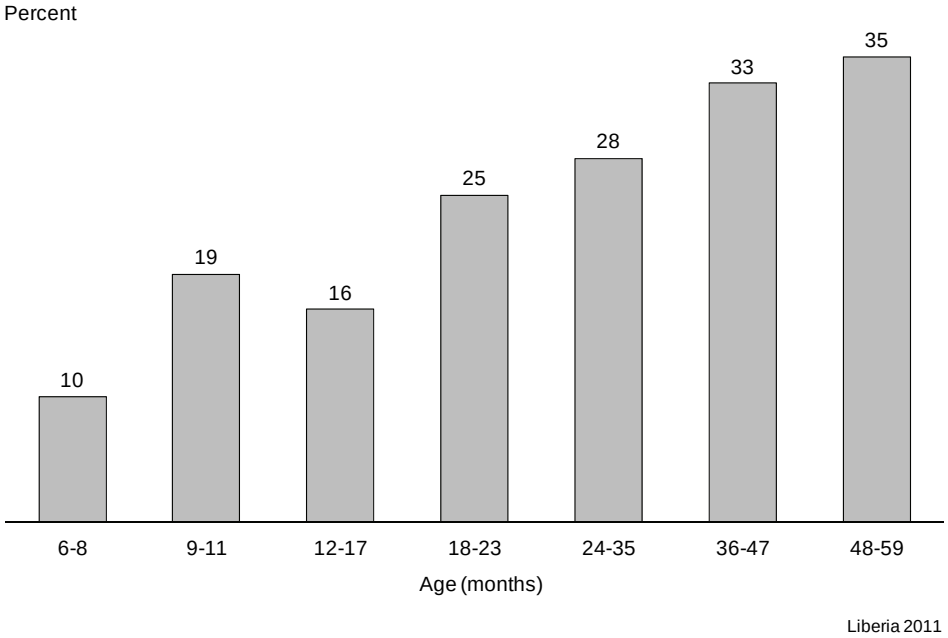
[1] Includes children whose mothers are deceased.
[2] Excludes children whose mothers were not interviewed.

The differences in malaria prevalence observed between the First Response Malaria RDT and microscopy are not unexpected. Microscopic analysis of blood smears for malaria parasites has long been considered the gold standard of malaria diagnosis; when performed under optimal conditions, it is highly sensitive. For example, when a thick smear is read by an experienced microscopist, of the detection limit is approximately 50 parasites per microliter of blood. Many studies, however, have shown a much lower detection limit, resulting in a lower sensitivity (Moody, 2002). Under field conditions, thick smears are difficult to make. Moreover, extended exposure to heat and humidity naturally autofix the blood sample to the slide, which causes the slides to be more difficult to read. An external quality control analysis of a

subsample of 460 field-prepared slides showed a larger proportion of the slides to be "unreadable" (22 percent) compared with the proportion of slides deemed "unreadable" in the primary reading (3 percent; data not presented). Unreadable slides were excluded from the malaria prevalence calculation. Caution should be used when interpreting the malaria prevalence according to microscopy in Table 4.7 and Figures 4.1, 4.2, and 4.3.

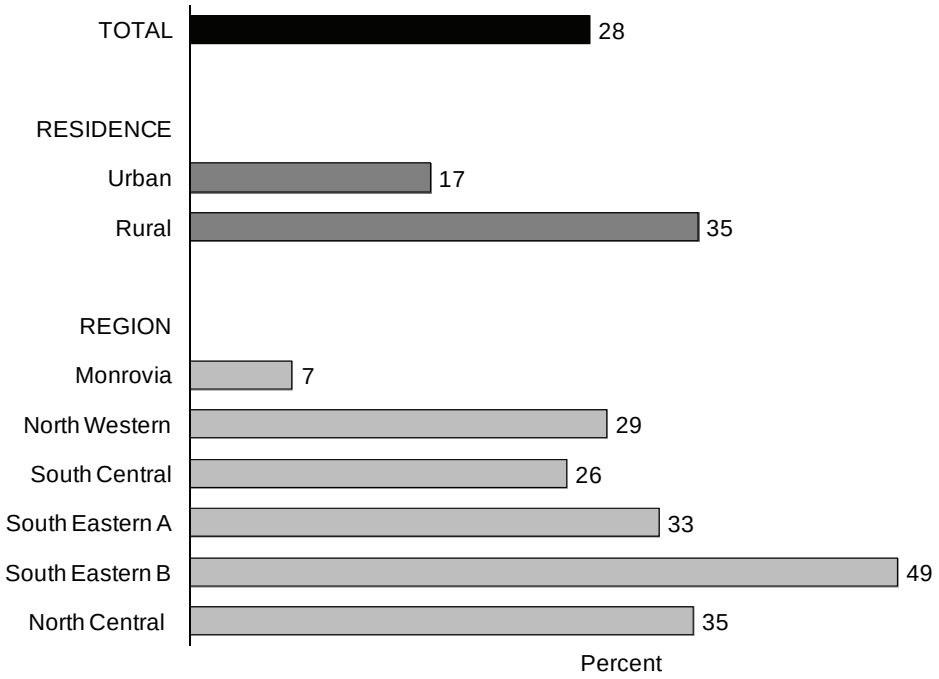
In comparison with microscopy performed under ideal conditions, RDTs have the advantage of being quick and easy to use, but they can be less sensitive. The First Response Malaria RDT, however, is very sensitive.[4] Like many other commercially available RDTs, the First Response Malaria RDT detects the *P. falciparum*-specific protein HRP-2 rather than the parasite itself. Because HRP-2 remains in the blood for up to a month following parasite clearance with antimalarials, in areas highly endemic for *P. falciparum* malaria, its persistence could account for the observation that a higher malaria prevalence was detected using RDTs than with microscopy.

Figure 4.1 **Malaria prevalence among children 6-59 months by age of the child, according to microscopy**



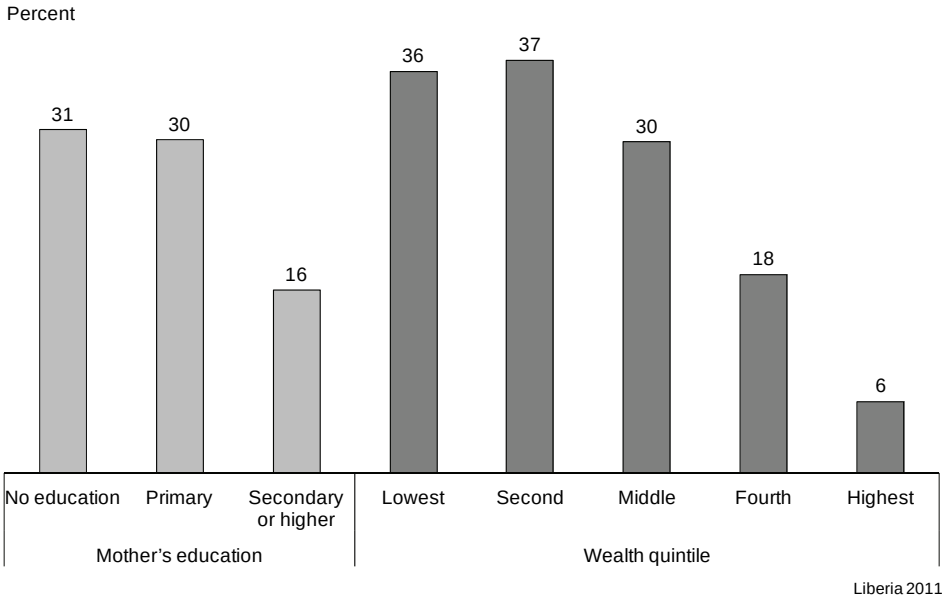
[4] The First Response RDT was recently evaluated by WHO (WHO, 2008). In samples with high parasitemia, the test's detection rate was nearly 100 percent; in samples with low parasitemia, the detection rate was similar.

Figure 4.2 **Malaria prevalence among children 6-59 months by residence and region, according to microscopy**



Liberia 2011

Figure 4.3 **Malaria prevalence among children 6-59 months by mother's education and wealth quintile, according to microscopy**



Liberia 2011

MALARIA KNOWLEDGE 5

Key Findings

- Almost all Liberian women have heard of malaria.
- Eight in 10 women (83 percent) cite mosquitoes as the cause of malaria, while 30 percent mention dirty surroundings, and 16 percent say that dirty water causes malaria.
- Ninety-two percent of women who have heard of malaria say that malaria can be avoided, and 97 percent of women say that malaria can be treated.
- Four in 10 women report that they have seen or heard a message about malaria in the past few months.

A key aim of NMCP National Malaria Strategy Plan 2010-2015 is to increase support for advocacy, health education and Behavior Change Communication (BCC) at all levels of society. The target of the program's BBC activities is to improve the knowledge and behavior regarding prevention and treatment of malaria among the general population to at least 80 percent by December 2013 and to sustain this level through 2015 (NMCP, 2011). The BCC program utilizes television and radio shows, as well as community gatherings, schools, and places of worship to provide information on the importance of ACT therapy, LLIN use and other vector management. NMCP also trains government community health volunteers (gCHV) and peer-educators to disseminate malaria messages and stimulate behavior change within communities. In conjunction with the Ministry of Education, the BCC program also incorporates malaria prevention messages into the Liberian education system, by training educators to use and understand malaria messages and by integrating malaria prevention strategies into the school curriculum. Through all of its activities, the BCC program emphasizes the role of the community in malaria control and prevention.

In June 2011, NMCP, in conjunction with Rebuilding Basic Health Services, a USAID-funded project that supports MOHSW activities, launched a multi-media campaign addressing malaria case management. The "Healthy Baby Happy Mother" campaign addressed early detection of malaria, home management, prompt referral, and full treatment compliance. Approximately 30,000 posters and 50,000 brochures were printed and distributed to various facilities, gCHVs, and primary and secondary students. The campaign also included a variety of radio messages, in English and 10 Liberian languages, which aired over 175 hours in Monrovia and on community radio stations. In addition, the campaign included themed dialogue on vector management and malaria treatment in 26 episodes of the radio drama "Baby by Choice, Not by Chance," a nationally broadcasted program.

This chapter discusses the basic knowledge of malaria among women in Liberia; the findings can be used to assess the success of NMCP's BCC programs. To evaluate basic knowledge about malaria, all women who were interviewed in the 2011 LMIS were asked if they had ever heard of the sickness called malaria. If they responded yes, they were asked if they could name any signs or symptoms of malaria. They were also asked to identify the group of people most likely to get malaria, the cause of malaria, and whether malaria can be prevented and treated. They were then asked to name the medicines used to treat malaria and their source of malaria information.

5.1 KNOWLEDGE OF MALARIA AND SYMPTOMS OF MALARIA

Table 5.1 presents the percentage of women who have heard of malaria and, among these women, the percentage that reported specific signs or symptoms of malaria, by background characteristics.

Table 5.1 Knowledge of malaria symptoms

Among women age 15-49, the percentage who have heard of malaria, and among those who have heard of malaria, the percentage who reported specific signs or symptoms of malaria infection, by background characteristics, Liberia 2011

	All women		Among women who have heard of malaria, percentage who reported specific signs or symptoms of malaria										
Background characteristic	Percentage who have heard of malaria	Number of women	Fever	Chills	Headache	Joint pain	Poor appetite	Body pain	Vomiting	Weakness	Other	Does not know any	Number of women who have heard of malaria
Age													
15-19	94.5	747	49.4	53.4	27.9	4.8	16.5	13.7	8.1	17.9	7.2	2.2	705
20-24	97.8	796	58.1	60.3	26.5	6.2	17.8	13.0	6.9	15.7	7.8	1.5	779
25-29	98.7	766	57.3	59.4	19.2	6.2	24.3	12.3	8.2	16.4	11.9	1.1	755
30-34	96.8	516	58.4	65.7	26.3	8.2	24.7	12.5	8.7	14.7	9.7	0.2	499
35-39	97.4	504	58.5	61.0	24.3	10.7	25.1	17.7	8.2	13.8	12.4	0.8	491
40-44	99.0	348	57.8	53.7	26.9	12.7	25.1	20.3	9.1	11.4	11.0	1.1	344
45-49	98.4	262	54.7	61.8	23.4	15.9	22.2	20.1	7.3	15.2	8.5	0.3	258
Residence													
Urban	98.2	2,106	51.2	55.3	23.6	9.4	27.2	14.6	9.3	19.9	10.3	0.9	2,069
Rural	96.3	1,833	61.9	63.7	26.3	6.4	15.1	14.7	6.4	10.3	8.9	1.5	1,764
Region													
Monrovia	98.2	1,296	46.4	53.5	24.5	10.4	29.8	14.9	10.6	19.1	9.9	1.1	1,272
North Western	97.5	275	46.6	62.7	16.6	6.1	23.3	18.6	4.3	20.5	10.5	1.4	268
South Central	98.3	723	60.1	63.1	22.0	5.1	20.0	12.5	4.7	15.1	10.9	2.0	710
South Eastern A	96.9	278	51.1	58.7	23.1	10.4	18.6	17.4	6.2	20.2	11.6	2.3	269
South Eastern B	91.6	231	59.0	45.4	25.3	7.7	20.3	23.4	5.3	20.0	16.4	1.3	211
North Central	96.9	1,136	67.9	65.1	29.4	7.1	13.8	12.5	9.0	8.3	6.6	0.2	1,102
Education													
No education	96.6	1,422	55.4	62.2	24.1	7.3	19.1	17.3	5.6	10.8	10.4	1.2	1,374
Primary	95.9	1,191	60.0	59.6	23.9	5.9	18.2	11.9	7.8	15.1	8.4	1.4	1,142
Secondary or higher	99.4	1,326	53.7	55.5	26.4	10.6	27.2	14.3	10.6	20.6	10.0	0.8	1,317
Wealth quintile													
Lowest	95.2	697	57.5	61.5	24.6	6.3	14.2	17.9	3.4	10.3	9.2	2.0	663
Second	97.3	742	63.0	61.6	24.7	7.2	15.9	14.3	9.7	12.1	9.1	1.3	722
Middle	97.1	756	62.8	66.2	27.9	6.7	18.9	12.5	7.0	13.2	8.8	0.5	735
Fourth	98.0	828	51.4	55.3	23.4	7.9	27.7	15.9	7.9	18.7	12.1	0.6	811
Highest	98.5	916	48.6	53.2	24.0	11.2	28.4	13.2	10.8	20.8	9.0	1.5	902
Total	97.3	3,939	56.2	59.2	24.8	8.0	21.6	14.7	8.0	15.5	9.7	1.2	3,833

Note: Percentages may add to more than 100 since multiple responses were allowed.

Nearly all Liberian women (97 percent) report that they have heard of malaria, showing that knowledge of malaria is almost universal. There is little variation by background characteristics.

When women were asked about the symptoms of malaria, three-fifths (59 percent) mentioned chills and more than half (56 percent) cited fever. One-quarter (25 percent) of women reported headache as a malaria symptom, while one-fifth (22 percent) mentioned poor appetite. Other commonly mentioned malaria symptoms include weakness (16 percent), body pain (15 percent), joint pain, and vomiting (8 percent each). Ten percent of women cited other symptoms, whereas only 1 percent of women did not know any symptoms. In reporting malaria signs or symptoms by background characteristics, in general, the differences are small. Sizeable variations, however, are seen among the regions. Women in North Central were most likely to cite fever, chills, and headache as malaria symptoms, while those in Monrovia were most likely to cite poor appetite and vomiting as symptoms of malaria. Women in South Eastern B were more likely than women in any other regions to say that body pain is a sign of malaria, while joint pain was mentioned by an equal proportion of women in South Eastern A region and Monrovia. Women residing in the North Western region, on the other hand, were most likely to cite weakness as a malaria symptom.

5.2 KNOWLEDGE OF GROUPS MOST AFFECTED BY MALARIA

Certain groups of people within a population have a much higher risk of contracting malaria and suffering or dying from the infection, compared with other groups. Those with a higher risk of becoming infected with malaria include pregnant women, individuals with a compromised immune system, such as people with HIV/AIDS, and nonimmune travelers. In areas of high malaria transmission, such as Liberia, children under age 5 are also considered a high-risk group. Women who have heard of malaria were asked which groups of people are most likely to get a case of malaria. Table 5.2 presents their responses.

Table 5.2 Knowledge of group most affected by malaria

Among women age 15-49 who have heard of malaria, the percentage who cite specific groups of people as most likely to get a case of malaria, by background characteristics, Liberia 2011

Background characteristic	Children	Pregnant women	Adults	Elderly	Everyone	Does not know	Number of women
Age							
15-19	61.1	23.7	11.2	7.4	25.7	12.3	705
20-24	68.3	29.2	13.3	5.4	18.6	9.3	779
25-29	68.0	26.3	14.1	5.5	21.8	7.6	755
30-34	65.3	30.8	11.8	5.3	26.0	6.6	499
35-39	67.2	26.8	13.4	6.1	22.1	9.1	491
40-44	60.6	27.6	13.9	4.7	29.1	9.4	344
45-49	59.3	19.5	13.9	7.2	25.9	12.4	258
Residence							
Urban	64.7	24.2	15.4	6.0	22.9	10.0	2,069
Rural	65.6	29.8	10.1	5.8	24.0	8.6	1,764
Region							
Monrovia	64.7	23.7	16.6	6.8	22.3	10.0	1,272
North Western	67.5	28.7	13.4	9.1	21.9	7.2	268
South Central	66.1	28.6	15.4	3.6	21.8	10.0	710
South Eastern A	52.1	23.2	8.5	6.4	29.3	15.1	269
South Eastern B	74.8	36.9	9.4	8.9	14.1	6.8	211
North Central	65.7	27.5	8.8	5.0	26.3	7.8	1,102
Education							
No education	62.7	27.7	11.7	6.4	22.2	11.8	1,374
Primary	62.5	27.4	12.4	5.6	24.8	9.4	1,142
Secondary or higher	69.8	25.2	14.9	5.7	23.3	6.9	1,317
Wealth quintile							
Lowest	67.1	28.7	7.9	5.7	21.9	8.7	663
Second	65.2	28.0	13.1	7.2	21.5	10.4	722
Middle	64.3	30.4	12.7	6.5	27.8	8.2	735
Fourth	64.5	24.9	16.3	5.4	23.2	10.0	811
Highest	64.7	22.9	13.9	5.1	22.5	9.5	902
Total	65.1	26.7	13.0	5.9	23.4	9.4	3,833

Note: Percentages may add to more than 100 since multiple responses were allowed.

Sixty-five percent of women age 15-49 reported that children are most likely to be affected by malaria, while 27 percent mentioned that pregnant women are most likely to acquire the illness. Twenty-three percent said that everyone is likely to be affected by malaria, while 13 percent cited adults as the group of people most likely to get malaria, and 6 percent mentioned the elderly. One in 10 women did not know a group of individuals likely to get malaria.

Large differences by background characteristics are not evident, except for women in the oldest age cohort, and those in the South Eastern B region. Older women, age 45-49, were less likely than their younger counterparts to cite pregnant women among the specific group of people at risk of getting malaria. Compared with women living in other regions, the residents of South Eastern B region were most likely to mention children and pregnant women as more vulnerable to malaria.

5.3 KNOWLEDGE OF CAUSES OF MALARIA

Lack of knowledge on how malaria is spread inhibits women's ability to take appropriate preventive measures. When asked what causes malaria, 8 in 10 women (83 percent) age 15-49 who have

heard of malaria said it is caused by mosquitoes, while about one-third (30 percent) said it is caused by dirty surroundings, and 16 percent cited dirty water. Three percent of women mentioned food as the cause of malaria, and less than one percent said that malaria is caused by beer. Six percent of respondents mentioned some other causes, and nearly 1 in 10 women (9 percent) did not know any cause of malaria.

Table 5.3 Knowledge of causes of malaria

Among women age 15-49 who have heard of malaria, the percentage who cite specific causes of malaria, by background characteristics, Liberia 2011

Background characteristic	Mosquitoes	Dirty water	Dirty surroundings	Beer	Certain food	Other	Does not know any	Number of women
Age								
15-19	80.5	12.7	28.0	0.3	4.5	7.0	9.2	705
20-24	85.5	16.0	30.3	0.1	2.7	5.0	5.5	779
25-29	83.7	15.8	31.0	0.3	2.1	6.9	8.7	755
30-34	84.5	20.9	31.2	0.7	3.3	7.7	7.8	499
35-39	83.4	17.8	32.9	0.0	1.9	6.2	7.9	491
40-44	80.0	12.6	26.1	0.1	2.8	4.5	12.0	344
45-49	75.9	17.0	26.5	0.1	1.6	7.6	14.4	258
Residence								
Urban	86.9	16.7	34.0	0.4	3.2	5.7	5.3	2,069
Rural	77.7	15.2	24.9	0.1	2.4	7.2	12.5	1,764
Region								
Monrovia	85.3	18.6	36.9	0.5	4.1	5.5	5.4	1,272
North Western	79.7	16.4	31.1	0.0	1.5	8.5	8.8	268
South Central	77.7	13.7	25.1	0.3	1.9	7.2	12.0	710
South Eastern A	80.8	22.2	26.8	0.0	0.8	6.2	10.9	269
South Eastern B	85.0	18.5	25.6	0.3	2.3	7.2	8.9	211
North Central	83.7	12.4	25.9	0.1	2.9	6.2	9.5	1,102
Education								
No education	72.1	15.4	26.6	0.2	2.3	8.4	15.9	1,374
Primary	83.9	15.1	25.4	0.1	3.9	7.6	7.5	1,142
Secondary or higher	92.6	17.4	37.1	0.5	2.5	3.2	2.0	1,317
Wealth quintile								
Lowest	70.2	16.9	22.0	0.3	2.0	9.4	15.3	663
Second	79.9	13.5	24.5	0.1	4.4	6.7	11.5	722
Middle	85.6	16.7	31.8	0.0	2.2	5.8	6.2	735
Fourth	88.8	15.3	33.4	0.2	2.7	5.4	5.6	811
Highest	86.2	17.4	35.0	0.7	2.8	5.2	6.1	902
Total	82.7	16.0	29.8	0.3	2.8	6.4	8.6	3,833

Note: Percentages may add to more than 100 since multiple responses were allowed.

Overall, there is little variation in women's responses by background characteristic. However, patterns emerge among those women that cited mosquitoes as a causative agent of malaria. Urban women are more likely than rural women to say that mosquitoes cause malaria. Among the regions, women living in the South Central region (78 percent) are the least likely to report that malaria is caused by mosquitoes. The proportion of women that cite mosquitoes as malaria's causative agent increases as both education and wealth increase. For example, 72 percent of women with no education mention mosquitoes as the cause of malaria, compared with 93 percent of those with secondary or higher education. Likewise, a higher proportion of urban women, those with more education, and those in higher wealth quintiles are more likely than other women to mention dirty surroundings as a cause of malaria.

5.4 KNOWLEDGE OF WAYS TO AVOID MALARIA

Knowledge of how to avoid malaria is an important trigger to behavioral change. Women who had heard of malaria were asked if there were ways to avoid getting malaria, and if so, they were asked to cite them. The results are presented in Table 5.4.

Table 5.4 Knowledge of ways to avoid malaria

Among women age 15-49 who have heard of malaria, the percentage who say there are ways to avoid getting malaria, and among those, the percentage who cite specific ways of avoiding malaria, by background characteristics, Liberia 2011

Background characteristic	Women who have heard of malaria		Among women who have heard of malaria and who say there are ways to avoid getting malaria, percentage who cite specific ways to avoid malaria									
	Percentage who say there are ways to avoid malaria	Number of women who have heard of malaria	Sleep under mosquito net	Use mosquito coils	Use insecticide spray	Keep door and windows closed	Use insect repellent	Keep surroundings clean	Cut the grass	Other	Does not know any	Number of women
Age												
15-19	89.9	705	78.7	12.7	12.8	6.1	1.4	36.6	3.5	11.0	3.9	634
20-24	94.0	779	80.3	7.5	10.3	4.5	1.8	43.2	4.6	8.9	1.9	732
25-29	92.2	755	82.8	7.1	14.9	7.4	2.2	41.8	3.3	12.2	3.0	697
30-34	93.3	499	80.0	10.6	9.9	5.5	1.3	47.8	5.7	10.1	2.1	466
35-39	92.9	491	78.5	6.4	10.2	5.9	0.5	47.3	4.0	11.4	1.3	456
40-44	89.0	344	79.4	9.0	12.1	4.7	1.3	38.2	6.1	11.0	2.4	307
45-49	83.6	258	79.7	7.3	7.9	5.7	0.0	42.4	4.0	12.1	4.0	216
Residence												
Urban	94.6	2,069	81.0	9.9	16.9	5.9	1.9	45.1	2.2	10.9	1.7	1,957
Rural	87.9	1,764	79.0	7.3	4.9	5.6	0.8	38.9	7.0	10.6	3.7	1,551
Region												
Monrovia	95.2	1,272	78.6	12.3	21.2	6.5	2.6	46.5	1.6	11.4	2.2	1,211
North Western	92.3	268	76.6	4.2	4.6	6.2	0.1	46.8	4.5	12.9	3.0	248
South Central	89.1	710	75.3	12.9	14.0	4.1	1.7	40.2	3.9	10.9	2.8	632
South Eastern A	88.3	269	80.2	7.9	3.7	4.4	0.6	41.0	10.3	10.3	2.9	238
South Eastern B	86.4	211	87.6	3.3	5.8	3.4	0.5	40.5	11.5	9.6	1.5	182
North Central	90.5	1,102	84.5	4.1	3.2	6.6	0.5	38.3	5.0	9.7	3.0	997
Education												
No education	87.0	1,374	72.9	8.9	6.9	6.2	0.9	38.2	6.8	13.1	3.9	1,195
Primary	90.2	1,142	81.4	9.5	7.5	5.1	0.4	37.8	3.6	11.6	2.9	1,030
Secondary or higher	97.4	1,317	85.8	8.0	19.3	5.9	2.7	49.9	2.5	7.9	1.2	1,284
Wealth quintile												
Lowest	86.2	663	73.4	8.2	3.0	2.9	0.1	36.0	10.2	13.4	5.7	572
Second	87.6	722	79.3	5.6	4.1	6.5	0.6	39.4	4.7	9.9	2.5	632
Middle	93.5	735	84.6	7.2	10.6	6.1	1.8	42.9	4.4	9.8	1.6	687
Fourth	93.7	811	82.7	11.3	16.5	8.4	1.5	43.1	1.8	10.9	1.0	760
Highest	95.0	902	79.4	10.3	19.4	4.6	2.5	47.7	2.2	10.4	2.9	857
Total	91.5	3,833	80.1	8.7	11.6	5.8	1.4	42.4	4.3	10.8	2.6	3,508

Note: Percentages may add to more than 100 since multiple responses were allowed.

Ninety-two percent of women interviewed said there are ways to avoid getting malaria. Urban women, women in Monrovia, those with more education, and those in higher wealth quintiles are more likely than other women to say that malaria is avoidable. Women in the oldest age cohort, age 45-49, are least likely,(84 percent) to say that there are ways to avoid malaria.

When asked about the main ways to avoid getting malaria, among women who had heard of malaria and said there were ways to avoid getting it, 8 in 10 said sleeping under a mosquito net, while 4 in 10 (42 percent) said keeping the surroundings clean. Twelve percent mentioned the use of insecticide spray, and 9 percent of women mentioned using mosquito coils as ways of avoiding malaria. Six percent of women mentioned that keeping the windows and doors closed can prevent malaria, while 4 percent mentioned cutting the grass. One percent of those interviewed cited use of insect repellent as a way to avoid malaria. Eleven percent mentioned other ways to avoid malaria. In general, the percentages of women citing specific malaria prevention methods differ little by background characteristics, with the exception of those citing use of insecticide spray. Use of insecticide spray was most commonly cited by women with secondary education or higher, urban women, and those in the wealthiest households.

5.5 KNOWLEDGE OF MALARIA TREATMENT

The 2011 LMIS also asked women whether malaria can be treated. Women who reported that malaria could be treated were asked to cite specific drugs used to treat malaria. Table 5.5 presents information on the respondents' knowledge of malaria treatment.

Table 5.5 Knowledge of ways to treat malaria

Among women age 15-49 who have heard of malaria, the percentage who say malaria can be treated, and among those, the percentage who cite specific drugs for malaria treatment, by background characteristics, Liberia 2011

Background characteristic	Women who have heard of malaria		Among women who have heard of malaria and who say that malaria can be treated, percentage who cite specific drugs for treatment of malaria								
	Percentage who say malaria can be treated	Number of women who have heard of malaria	SP/ Fansidar	Chloro-quine	Quinine	Amodia-quine	New malaria drug/ACT	Aspirin, panadol, para-cetemol	Other	Does not know any	Number of women who say malaria can be treated
Age											
15-19	96.5	705	3.2	25.1	17.3	9.1	52.3	29.2	3.9	12.2	680
20-24	97.6	779	5.9	26.8	23.4	8.8	63.7	28.8	3.8	5.3	760
25-29	96.7	755	5.9	33.3	25.9	11.0	67.7	23.4	4.4	4.5	730
30-34	97.4	499	6.7	36.5	29.7	10.9	61.8	35.2	2.9	2.2	487
35-39	97.6	491	5.5	40.6	28.3	7.1	59.9	24.5	4.3	5.5	479
40-44	96.3	344	7.3	36.3	31.9	9.3	60.9	19.5	4.2	6.0	332
45-49	96.8	258	2.6	37.5	22.1	5.7	60.1	23.5	6.3	8.2	250
Residence											
Urban	98.6	2,069	7.1	36.3	29.0	11.7	60.7	25.5	4.1	5.5	2,040
Rural	95.2	1,764	3.2	27.6	19.9	6.2	61.7	28.6	4.1	7.2	1,679
Region											
Monrovia	98.6	1,272	8.3	40.8	31.3	12.8	55.6	27.1	5.4	5.6	1,255
North Western	94.8	268	2.7	19.5	21.8	14.0	66.6	22.8	1.4	4.2	254
South Central	97.5	710	4.1	27.9	22.4	7.8	63.1	29.3	4.0	6.7	692
South Eastern A	96.8	269	3.0	22.7	14.8	4.4	63.3	21.2	5.1	10.5	260
South Eastern B	94.6	211	3.3	31.6	16.5	13.0	62.4	20.6	2.4	6.3	200
North Central	96.0	1,102	4.2	31.0	23.8	5.1	64.5	28.6	3.3	6.3	1,057
Education											
No education	94.3	1,374	2.7	27.9	19.8	6.7	58.3	26.0	5.2	8.1	1,296
Primary	97.6	1,142	4.2	30.5	22.1	8.1	58.8	27.6	4.1	7.7	1,114
Secondary or higher	99.4	1,317	9.0	38.4	32.3	12.6	66.0	27.2	3.0	3.3	1,309
Wealth quintile											
Lowest	93.8	663	2.9	22.8	16.2	7.5	63.4	20.6	3.1	8.3	622
Second	95.5	722	2.1	27.7	18.7	6.5	59.1	27.2	5.4	7.2	689
Middle	97.7	735	5.5	32.3	25.4	7.3	61.5	31.7	3.2	7.6	718
Fourth	98.5	811	5.4	35.0	30.1	8.6	65.9	30.5	4.2	4.3	799
Highest	98.8	902	9.3	40.4	30.6	14.5	56.7	23.9	4.3	5.0	891
Total	97.0	3,833	5.3	32.4	24.9	9.2	61.2	26.9	4.1	6.3	3,719

Note: Percentages may add to more than 100 since multiple responses were allowed.

Overall, almost all Liberian women (97 percent) who have heard of malaria say that the illness can be treated. The percentage of women who have heard of malaria and who say malaria can be treated ranges from 94 to 99 percent, showing universal knowledge among those that have heard of malaria.

When asked what drugs are used to treat malaria, three-fifths (61 percent) of women mentioned the "new malaria drug," or ACT, as a drug to treat malaria. One-third (32 percent) of women cited chloroquine as a malaria treatment drug, down from 50 percent of women in the 2009 LMIS. One-quarter of women mentioned quinine, 9 percent mentioned amodiaquine, and 5 percent of women reported SP/Fansidar as drugs used to treat malaria. Twenty-seven percent of women mentioned aspirin, panadol, or paracetemol, as malaria treatment drugs, and 4 percent of women cited some other form of treatment. Six percent of women did not know any type of drug used to treat malaria.

Knowledge of ACT is quite uniform across background characteristics, although it is slightly lower among the youngest cohort (52 percent) of women interviewed, age 15-19, and among women in Monrovia (56 percent). The proportion of women who mentioned ACT as a malaria treatment is almost identical in urban and rural areas (61 and 62 percent, respectively).

5.6 EXPOSURE TO MALARIA MESSAGES

A crucial element in the fight to eliminate malaria is the ability to reach the population with informational and educational messages. To assess coverage of communication programs, women

interviewed during the 2011 LMIS were asked if they had seen or heard any messages about malaria in the few months before the survey. If so, they were asked which messages they had seen or heard and where they had seen or heard these messages. Tables 5.6 and 5.7 present their responses.

Table 5.6 Exposure to malaria messages

Among women age 15-49 who have heard of malaria, percentage who have seen or heard a message about malaria in the past few months, and among those who have, the percentage who cite specific messages, by background characteristics, Liberia 2011

	Women who have heard of malaria		Among women who have heard of malaria and who have seen or heard a malaria message, percentage who heard/saw specific messages						
Background characteristic	Percentage who have seen or heard a message about malaria	Number of women who have heard of malaria	If have fever, go to health facility	Sleep under mosquito bed nets	Pregnant women should take drugs to prevent malaria	Malaria kills	Other	Does not know any	Number of women who saw or heard a malaria message
Age									
15-19	40.7	705	16.2	60.1	9.7	39.9	10.2	2.6	287
20-24	39.1	779	16.6	59.6	10.7	40.2	12.7	0.8	305
25-29	40.4	755	18.2	58.8	10.4	41.5	11.7	1.3	305
30-34	44.0	499	14.8	62.3	11.2	38.8	8.8	1.1	220
35-39	43.5	491	12.6	61.6	7.4	37.5	17.4	0.2	214
40-44	43.7	344	14.7	48.6	5.5	40.3	15.1	0.7	151
45-49	42.1	258	18.8	55.6	8.9	43.1	18.0	0.5	109
Residence									
Urban	42.9	2,069	13.5	62.5	10.8	36.7	14.1	1.1	887
Rural	39.9	1,764	19.2	54.3	7.8	44.2	11.1	1.2	703
Region									
Monrovia	44.1	1,272	10.3	62.0	13.5	37.9	14.4	1.3	561
North Western	51.6	268	27.3	61.7	6.5	33.5	12.2	1.0	139
South Central	43.7	710	12.1	53.1	8.4	43.1	15.3	0.3	311
South Eastern A	37.9	269	19.6	51.7	10.1	43.4	17.8	0.6	102
South Eastern B	45.2	211	26.6	42.5	8.2	59.2	11.4	0.7	95
North Central	34.7	1,102	19.9	63.9	5.8	37.5	7.5	1.8	382
Education									
No education	34.2	1,374	19.3	53.3	8.5	41.4	13.6	1.7	470
Primary	41.5	1,142	15.8	55.4	7.6	41.9	10.6	1.4	473
Secondary or higher	49.1	1,317	13.8	65.4	11.6	37.7	13.7	0.5	647
Wealth quintile									
Lowest	35.9	663	20.0	48.2	7.7	52.4	8.2	0.2	238
Second	38.0	722	19.7	50.0	7.6	42.6	15.1	2.6	274
Middle	39.8	735	20.7	64.7	8.1	41.6	10.6	0.1	292
Fourth	46.5	811	16.2	60.4	9.3	36.3	11.0	1.7	377
Highest	45.2	902	7.8	65.4	13.0	33.4	17.0	0.8	408
Total	41.5	3,833	16.0	58.9	9.5	40.0	12.7	1.1	1,590

Note: Percentages may add to more than 100 since multiple responses were allowed.

Table 5.6 shows that 4 in 10 women (42 percent) said they had seen or heard a message about malaria in the past few months. Differences in exposure to malaria messages were not large among age categories or rural and urban residence. Women residing in counties within the North Central region (35 percent) are the least likely to have seen or heard a malaria message compared with women in other parts of the country. Exposure to malaria messages increases with education and wealth; those in the no education and those in the lowest wealth quintiles are the least likely to report having seen or heard a malaria message.

When asked about the content of the message, the most commonly mentioned message was to sleep under mosquito bed nets, which was noted by 59 percent of women. The second most common message seen or heard was that malaria is a deadly disease ("Malaria kills"), cited by 40 percent of women with reported exposure to a malaria message. Sixteen percent of women reported seeing or hearing a message encouraging treatment-seeking behavior for fever, while 10 percent of women cited having seen or heard a message encouraging pregnant women to take malaria prophylaxis.

Differences in the exposure to specific malaria-related messages are observed by region. Messages about the importance of going for treatment when having a fever were more prevalent among women in North Western and South Eastern B regions (27 percent for both), while they were less common in

Monrovia (10 percent). Exposure to the message about sleeping under a mosquito bed net was highest among women in the North Central region (64 percent) and lowest by women in the South Eastern B region (43 percent). Messages that encourage pregnant women to take malaria prevention drugs were more widespread in Monrovia (14 percent), while those living in the South Eastern B region (59 percent) report greater exposure to messages about the deadliness of malaria ("Malaria kills"). Women's exposure to specific messages about malaria vary by residence, educational attainment, and wealth quintile level.

Table 5.7 shows the places women said they saw or heard malaria messages. The most commonly cited source is radio (58 percent), followed by community health workers (41 percent). Five percent of women exposed to a message reported that they saw or heard the message on a billboard, while 4 percent mentioned a poster, and 3 percent each mentioned a peer educator or a school as the source of the malaria message. Less than 1 percent of women exposed to a malaria message reported seeing or hearing the message on TV, in a video club, on a T-shirt, or in a leaflet, fact sheet, or brochure.

Table 5.7 Source of malaria messages

Among women age 15-49 who have seen or heard a malaria message in the few months before the survey, the percentage who cite specific places where they saw/heard a message, by background characteristics, Liberia 2011

Background characteristic	Place where malaria message was seen or heard											Number of women who have seen or heard a malaria message
	Radio	Billboard	Poster	T-Shirt	Leaflet/ fact sheet/ brochure	Tele-vision	Video club	School	Com-munity health worker	Peer edu-cators	Other	
Age												
15-19	61.5	4.0	4.3	0.5	0.1	1.2	0.8	11.8	32.1	3.6	9.2	287
20-24	53.4	6.9	2.9	1.8	0.3	1.4	0.0	4.3	45.2	1.5	9.2	305
25-29	59.1	5.3	4.8	0.1	0.1	0.0	0.1	0.1	41.5	3.9	12.5	305
30-34	57.5	6.1	3.1	0.7	0.4	0.0	0.0	0.1	48.9	4.0	10.9	220
35-39	60.5	4.6	2.2	0.0	1.3	2.7	0.0	0.2	37.6	2.6	9.8	214
40-44	54.8	3.0	6.6	0.5	0.0	0.1	0.0	0.0	40.6	5.0	10.4	151
45-49	62.5	4.6	5.6	0.0	3.1	0.2	0.0	0.0	40.7	5.2	9.8	109
Residence												
Urban	65.3	3.8	3.6	0.7	0.6	1.5	0.3	4.4	36.6	3.3	8.9	887
Rural	49.3	6.8	4.5	0.4	0.5	0.1	0.0	1.3	46.3	3.6	12.1	703
Region												
Monrovia	65.8	5.0	4.5	0.7	0.8	2.3	0.4	5.5	35.0	3.5	10.0	561
North Western	55.0	7.4	2.7	1.9	0.0	0.0	0.0	1.5	36.3	0.8	13.2	139
South Central	64.8	0.9	3.2	0.0	0.4	0.0	0.0	1.8	37.6	4.0	10.9	311
South Eastern A	25.0	3.7	1.4	0.9	0.0	0.0	0.0	3.0	60.6	6.0	18.0	102
South Eastern B	32.3	2.5	7.4	1.1	3.0	0.9	0.2	4.2	60.3	0.8	21.2	95
North Central	58.3	8.9	4.2	0.2	0.0	0.0	0.0	0.7	43.8	3.8	4.5	382
Education												
No education	51.3	5.4	4.8	0.3	0.6	0.0	0.0	0.1	46.2	4.3	11.7	470
Primary	54.7	3.2	4.5	0.8	0.2	0.5	0.0	2.4	46.0	3.0	11.0	473
Secondary or higher	65.9	6.3	3.0	0.7	0.8	1.8	0.4	5.6	33.2	3.1	8.8	647
Wealth quintile												
Lowest	36.4	4.1	7.5	0.7	0.3	0.2	0.0	2.8	58.8	3.9	14.3	238
Second	48.0	6.9	5.2	0.3	0.9	0.0	0.0	1.2	43.0	4.7	10.3	274
Middle	61.3	5.1	2.8	0.6	0.3	0.1	0.1	0.5	46.4	3.7	11.0	292
Fourth	68.3	3.7	1.7	0.7	0.0	0.1	0.0	3.1	35.3	2.3	10.4	377
Highest	66.4	5.9	4.1	0.6	1.1	3.2	0.6	6.1	30.2	3.1	7.4	408
Total	58.2	5.1	4.0	0.6	0.5	0.9	0.2	3.0	40.9	3.4	10.3	1,590

Note: Percentages may add to more than 100 since multiple responses were allowed.

Urban women reported greater exposure to malaria messages from the radio than rural women (65 percent and 49 percent, respectively). In contrast, rural women more often cited community health workers as the source of malaria messages compared with urban women (46 percent of rural women compared with 37 percent of urban women). Women living in the South Eastern A and South Eastern B regions reported greater exposure to malaria messages from community health workers (61 percent and 60 percent, respectively) compared with their counterparts in other regions. Exposure to radio messages was highest among women in Monrovia (66 percent), among women with secondary or higher education (66 percent), and among those in the fourth and highest wealth quintiles (69 percent and 66 percent).

REFERENCES

African Economic Outlook. *Liberia: Overview*. http://www.africaneconomicoutlook.org/en/countries/west-africa/liberia (accessed May 30, 2012).

Bradley, A. K., B. M. Greenwood, A. M. Greenwood, K. Marsh, P. Byass, S. Tulloch, and R. Hayes. 1986. Bed Nets (Mosquito Nets) and Morbidity from Malaria. *The Lancet* 328: 204-207.

Doolan, D. L., C. Dobaño, and J. K. Baird. 2009. Acquired Immunity to Malaria. *Clinical Microbiology Review* 22(1):13-36. doi: 10.1128/CMR.00025-08.

Guannu, Joseph Saye. 2010. *Liberian History Up to 1847*. Fourth Edition. Monrovia, Liberia: Star Books, Sedco Longman, pp 17-26.

Hossain, M. I., and C. F. Curtis. 1989. Permethrin Impregnated Bed Nets: Behavioural and Killing Effects on Mosquitoes. *Medical and Veterinary Entomology* 3: 367-376.

Killeen, G. F., T. A. Smith, H. M. Ferguson, H. Mshinda, S. Abdulla, C. Lengeler, S. P. Kachur. 2007. Preventing Childhood Malaria in Africa by Protecting Adults from Mosquitoes with Insecticide-Treated Nets. *PLoS Medicine* 4(7):e229-1258. doi: 10.1371/journal.pmed.0040229.

Lengeler, C. 2004. Insecticide-treated Bed Nets and Curtains for Preventing Malaria. Cochrane Database of Systematic Reviews 2004, Issue 2. Art. No.: CD000363. doi: 10.1002/14651858.CD000363.pub2.

Liberia Institute of Statistics and Geo-Information Services (LISGIS). (2008). *2008 National Population and Housing Census, Preliminary Results*. Monrovia, Liberia: LISGIS.

Liberia Institute of Statistics and Geo-Information Services (LISGIS), Ministry of Health and Social Welfare (MOHSW) [Liberia], National AIDS Control Program [Liberia], and Macro International Inc. 2008. *Liberia Demographic and Health Survey 2007*. Monrovia, Liberia: Liberia Institute of Statistics and Geo-Information Services (LISGIS) and Macro International Inc.

Lindsay, S. W., and M. E. Gibson. 1988. Bed Nets Revisited: Old Idea, New Angle. *Parasitology Today* 4: 270-272.

Lines, J. O., J. Myamba, and C. F. Curtis. 1987. Experimental Hut Trials of Permethrin-Impregnated Mosquito Nets and Eave Curtains against Malaria Vectors in Tanzania. *Medical and Veterinary Entomology* 1: 37-51.

Massaquoi, M. B. F., and S. B. Kennedy. 2003. Evaluation of Chloroquine as a Potent Antimalarial Drug: Issues of Public Health Policy and Healthcare Delivery in Post-War Liberia. *Journal of Evaluation in Clinical Practice* 9: 83–87. doi: 10.1046/j.1365-2753.2003.00391.x.

Ministry of Health (MOH) [Liberia]. 2001. *Roll Back Malaria Situation Analysis, Liberia*. Monrovia, Liberia: MOH.

Ministry of Planning and Economic Affairs and United Nations Development Programme (UNDP). 2010. *Millennium Development Goals 2010 Report: Republic of Liberia*. Monrovia, Liberia: Ministry of Planning and Economic Affairs.

Moody, A. 2002. Rapid Diagnostic Tests for Malaria Parasites. *Clinical Microbiology Review* 15: 66-78.

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare (MOHSW), 2006. *Liberia Malaria Indicator Survey 2005*. Monrovia, Liberia: MOHSW.

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare (MOHSW). 2009. *Health Facility Survey*. Monrovia, Liberia: MOHSW.

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare (MOHSW). 2011a. *National Malaria Strategic Plan 2010-2015*. Monrovia, Liberia: Sabanoh Printing Press.

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare (MOHSW). 2011b. *Technical Guidelines on Malaria Case Management*. Edition 4. Monrovia, Liberia: MOHSW (unpublished).

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare (MOHSW), Liberia Institute of Statistics and Geo-Information Services (LISGIS), and ICF Macro. 2009. *Liberia Malaria Indicator Survey 2009*. Monrovia, Liberia: MOHSW, LISGIS, and ICF Macro.

Rutstein, S. 1999. *Wealth versus Expenditure: Comparison between the DHS Wealth Index and Household Expenditures in Four Departments of Guatemala*. Calverton, Maryland, USA: ORC Macro (unpublished).

Rutstein, S., K. Johnson, and D. Gwatkin. 2000. *Poverty, Health Inequality, and Its Health and Demographic Effects.* Paper presented at the 2000 Annual Meeting of the Population Association of America, Los Angeles, California.

United Nations Development Program (UNDP). 2011. Human Development Report 2011. *Sustainability and Equity: A Better Future for All*. New York: United Nations Development Program. http://www.undp.org/content/undp/en/home/librarypage/hdr/human_developmentreport2011.html

United Nations General Assembly. 2001. *Road Map towards the Implementation of the United Nations Millennium Declaration: Report of the Secretary-General*. New York: United Nations General Assembly.

WHO/Global Malaria Program. 2007. Insecticide-Treated Mosquito Nets: A WHO Position Statement. Geneva, Switzerland: WHO. http://www.who.int/malaria/publications/atoz/itnspospaperfinal/en/index.html

WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. 2010. *Progress on Sanitation and Drinking Water: 2010 Update*. Geneva and New York: WHO/UNICEF.

WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. *Types of Drinking-Water Sources and Sanitation.* http://www.wssinfo.org/definitions-methods/watsan-categories (accessed 12 January 2012).

World Health Organization (WHO). 2008. *Malaria Rapid Diagnostic Test Performance: Results of WHO Product Testing of Malaria RDTs: Round 1*. Geneva: WHO.

SAMPLE DESIGN

Appendix A

A.1 INTRODUCTION

The 2011 Liberia Malaria Indicator Survey (2011 LMIS) is the third of its kind following the ones conducted in 2005 (2005 LMIS) and 2009 (2009 LMIS). The 2011 LMIS repeats the 2009 survey using the same sampled clusters but with independent household selection to strengthen the capability of measuring trends in key indicators between the two surveys. The survey is a nationwide survey, calling for a nationally representative sample of approximately 4,500 households, which was expected to yield approximately 4,400 completed interviews of women age 15-49 and 3,800 children under age 5. It is designed to provide information on key malaria control indictors, such as the proportion of households having at least one insecticide-treated net (ITN); the proportion of children under 5 who slept under an ITN the previous night; the proportion of pregnant women who slept under an ITN the previous night, the proportion of pregnant women who received intermittent preventive treatment (IPT) for malaria during their last pregnancy; and the malaria prevalence estimate among children under age 5, based on on-site malaria testing and laboratory testing.

In Liberia, there are 15 counties. Each county consists of districts, and each district consists of clans. The counties are grouped to form five geographical regions and each region consists of three counties. The survey estimates are reported for the country as a whole, for the capital city of Greater Monrovia, for the other urban areas, for all the rural areas, and for each of the five geographical regions. In total, there are eight report domains, with domain composition as follows:

- The capital city of Liberia: Greater Monrovia
- The other urban areas of Liberia
- The rural areas of Liberia
- North Western: Bomi, Grand Cape Mount, Gbarpolu
- South Central: Montserrado (without Monrovia), Margibi, Grand Bassa
- North Central: Bong, Nimba, Lofa
- South Eastern A: River Cess, Sinoe, Grand Gedeh
- South Eastern B: River Gee, Grand Kru, Maryland

A.2 SAMPLING FRAME

The sampling frame used for the 2009 LMIS, and therefore for the 2011 LMIS, is the National Population and Housing Census conducted in March 2008 (NPHC 2008). A total of 7,021 enumeration areas (EAs) were constructed for the census to have complete coverage of the country. A list of EAs is available from the Liberia Institute of Statistics and Geo-Information Service (LISGIS). In this list, each EA contains its identification information and the number of households and male and female population from the summary sheets of the census. So the frame was the preliminary frame of the NPHC 2008. Table A.1 below shows the distribution on number of EAs and on average EA size (number of residential households residing in EA) by county and by type of residence. After removing 10 repetitions and 51 empty clusters, the frame has a total of 6,960 non-empty EAs; 3,160 are in urban EAs, and 3,800 are in rural EAs. On average, an EA has 99 households, with 107 in urban areas and 93 in rural areas. This is adequate as a survey cluster, with a sample take around 30 households per cluster. Therefore, a 2011 LMIS cluster corresponds to a census EA.

Table A.1 Distribution on number of EAs and on average EA size, by county and by type of residence (NPHC 2008)

		Urban		Rural		Total	
Region	County	Average EA size	Number of EAs	Average EA size	Number of EAs	Average EA size	Number of EAs
Greater Monrovia	Monrovia	109	1934			109	1934
North Western	Bomi	72	54	82	215	80	269
	Gbarpolu	110	15	98	134	99	149
	Grand Cape Mount	88	23	91	251	90	274
South Central	Grand Bassa	95	128	109	340	105	468
	Margibi	122	146	93	285	103	431
	Montserrado	110	100	104	181	106	281
North Central	Bong	82	255	73	672	76	927
	Lofa	113	133	95	366	100	499
	Nimba	120	172	104	606	107	778
South Eastern A	Grand Gedeh	92	72	119	101	108	173
	River Cess	102	5	101	144	101	149
	Sinoe	116	23	68	195	73	218
South Eastern B	Grand Kru	60	9	69	122	68	131
	Maryland	115	64	125	107	121	171
	River Gee	92	27	96	81	95	108
Total		107	3160	93	3800	99	6960

Table A.2 below shows the residential population distribution by county and by urban and rural population areas. In Liberia, 47 percent of the residential population lives in the urban area; they represent 49 percent of the households. Another 28 percent of the residential population lives in the capital city of Monrovia. The sample allocation of the 2009 LMIS and therefore the sample allocation of the 2011 LMIS were based on these distributions.

Table A.2 Residential population distribution by county and by urban or rural residence (NPHC 2008)

		Population by residence			Population Total	
Region	County	Urban	Rural	Percent Urban	County	Percent in Country
Greater Monrovia	Monrovia	949381		100.0	949381	27.8
North Western	Bomi	15512	66036	19.0	81548	2.4
	Gbarpolu	7440	73274	9.2	80714	2.4
	Grand Cape Mount	8359	119729	6.5	128088	3.8
South Central	Grand Bassa	57248	166766	25.6	224014	6.6
	Margibi	82824	115283	41.8	198107	5.8
	Montserrado	54997	77993	41.4	132990	3.9
North Central	Bong	100951	225591	30.9	326542	9.6
	Lofa	80478	187458	30.0	267936	7.9
	Nimba	108768	358063	23.3	466831	13.7
South Eastern A	Grand Gedeh	40358	85447	32.1	125805	3.7
	River Cess	2280	63427	3.5	65707	1.9
	Sinoe	14451	90238	13.8	104689	3.1
South Eastern B	Grand Kru	3309	53708	5.8	57017	1.7
	Maryland	44619	91615	32.8	136234	4.0
	River Gee	16908	50329	25.1	67237	2.0
Total		1587883	1824957	46.5	3412840	100.0

A.3 SAMPLING PROCEDURE AND SAMPLE ALLOCATION

The sample for the 2011 LMIS is a stratified sample selected in two stages. First, 150 EAs had been selected with a stratified probability proportional to size (PPS) sampling from the sampling frame. The EA size is the number of residential households residing in the EA recorded in the census. Stratification was achieved by separating every county into urban and rural areas. The urban areas in each county mainly consist of the county capital. Therefore the 15 counties plus Greater Monrovia, which has only urban areas, were stratified into 31 sampling strata: 15 rural strata and 16 urban strata. Samples were selected independently in every stratum, with a predetermined number of EAs to be selected as given in Table A.3. Implicit stratification should have been achieved in each explicit sampling stratum by sorting the sampling frame according to districts and clan within each sampling stratum and by using the probability proportional to size selection procedure.

A household listing operation was carried out in all of the selected clusters before the main survey. The household listing operation consisted of visiting each of the 150 selected EAs; to draw a location map and a detailed sketch map; and to record on the household listing forms all residential households found in the EA with the address and the name of the head of the households. The resulting list of households was served as the sampling frame for the selection of households in the second stage.

At the second stage, a fixed number of 30 households was selected from the newly established household listing for each selected EA. Household selection was performed in a central office prior to the main survey. The survey interviewers were asked to interview only the pre-selected households. No replacements and no changes of the pre-selected households were allowed in the implementing stages in order to prevent bias. All women age 15-49 and their young children under 5 years of age in the selected households were eligible for the interview.

Table A.3 below shows the sample allocation of clusters by county and by urban or rural designation. Because of the budget and implementing constraints, the sample allocation was an equal size allocation at the regional level with 25 clusters by region. The 25 clusters of each region were then allocated to each county and to its urban or rural areas, with small modifications made by referencing the size of the county and its urban proportion. Among the 150 clusters selected, 69 clusters are in urban areas and 81 clusters are in rural areas. Table A.4 below shows the number of households selected and the expected number of interviewed women by region, by county, and by type of residence. These calculations are based on the results obtained from the 2009 LMIS. Because of the small sample size, sample allocation was not proportional at the regional level or at the county level because otherwise the smallest county would have received a too small sample. The adopted allocations will strengthen the power of comparisons of survey results across regions.

Table A.3 Sample allocation of clusters by region, by county, and by type of residence (LMIS 2011)

Region	County	Number of EA urban	Number of EA rural	Number of EA in county	Number of EA in region
Greater Monrovia	Monrovia	25		25	25
North Western	Bomi	2	7	9	25
	Gbarpolu	2	4	6	
	Grand Cape Mount	2	8	10	
South Central	Grand Bassa	3	7	10	25
	Margibi	5	4	9	
	Montserrado	3	3	6	
North Central	Bong	3	6	9	25
	Lofa	3	3	6	
	Nimba	3	7	10	
South Eastern A	Grand Gedeh	4	5	9	25
	River Cess	2	6	8	
	Sinoe	2	6	8	
South Eastern B	Grand Kru	2	4	6	25
	Maryland	6	7	13	
	River Gee	2	4	6	
Total		69	81		150

Table A.4 Number of households selected and the expected number of women interviewed by county and by region (LMIS 2011)

		Number of households		Women interviewed	
Region	County name	County	Region	County	Region
Greater Monrovia	Monrovia	750	750	853	853
North Western	Bomi	270	750	194	537
	Gbarpolu	180		126	
	Grand Cape Mount	300		217	
South Central	Grand Bassa	300	750	254	634
	Margibi	270		228	
	Montserrado	180		152	
North Central	Bong	270	750	197	840
	Lofa	180		328	
	Nimba	300		315	
South Eastern A	Grand Gedeh	270	750	280	779
	River Cess	240		249	
	Sinoe	240		249	
South Eastern B	Grand Kru	180	750	185	772
	Maryland	390		401	
	River Gee	180		185	
Total		4500		4414	

A.4 SAMPLING WEIGHT FOR HOUSEHOLD AND INDIVIDUAL SURVEY

Because of the nonproportional allocation of the sample to the different reporting domains, sampling weights are required for any analysis using 2011 LMIS data to ensure the actual representativeness of the sample. Because the 2011 LMIS sample is a two-stage stratified cluster sample, sampling weights will be calculated based on sampling probabilities, which will be calculated separately for each sampling stage and for each cluster. We use the following notations:

P_{1hi}: first stage's sampling probability of the i^{th} cluster in stratum h
P_{2hi}: second-stage's sampling probability within the i^{th} cluster (households)
P_{hi}: overall sampling probability of any households of the i^{th} cluster in stratum h

Let a_h be the number of clusters selected in stratum h, M_{hi} the number of households according to the sampling frame in the i^{th} cluster, and $\sum M_{hi}$ the total number of structures in the stratum h. The probability of selecting the i^{th} cluster in stratum h is calculated as follows:

$$P_{1hi} = \frac{a_h M_{hi}}{\sum M_{hi}}$$

Let g_{hi} (g_{hi}=30 for all h and i for 2011 LMIS) be the number of households selected in the i^{th} cluster in stratum h. The second stage's selection probability for each household in the cluster is calculated as follows:

$$P_{2hi} = \frac{g_{hi}}{M_{hi}}$$

The overall selection probability of each household in cluster i of stratum h is therefore the production of the selection probabilities:

$$P_{hi} = P_{1hi} \times P_{2hi} = \frac{a_h g_{hi}}{\sum M_{hi}}$$

The sampling weight for each household in cluster *i* of stratum *h* is the inverse of its selection probability:

$$W_{hi} = 1 / P_{hi}$$

A spreadsheet containing all sampling parameters and selection probabilities was constructed to facilitate the calculation of sampling weights. Household sampling weights and the individual sampling weights are obtained by adjusting the above calculated weight to compensate for household nonresponse and individual nonresponse, respectively. These weights are further normalized at the national level to produce unweighted cases equal to weighted cases for both households and individuals at the national level. The normalized weights are valid for estimation of proportions and means at any aggregation levels, but they are not valid for estimation of totals.

A.5 SURVEY RESULTS

Table A.5 Sample implementation

Percent distribution of households and eligible women by results of the household and individual interviews, and household, eligible women and overall women response rates, according to urban-rural residence and region (unweighted), Liberia 2011

	Residence		Region						
Result	Urban	Rural	Monrovia	North Western	South Central	South Eastern A	South Eastern B	North Central	Total
Selected households									
Completed (C)	92.5	92.8	90.4	88.4	92.1	94.5	96.3	94.3	92.7
Household present but no competent respondent at home (HP)	1.7	1.1	2.9	2.8	1.3	0.5	0.5	0.1	1.4
Postponed (P)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Refused (R)	0.3	0.1	0.4	0.0	0.4	0.1	0.1	0.1	0.2
Dwelling not found (DNF)	0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.3	0.1
Household absent (HA)	2.0	2.3	1.9	3.9	2.5	2.0	0.9	1.6	2.1
Dwelling vacant/address not a dwelling (DV)	2.4	2.1	3.1	2.1	1.9	1.6	1.7	3.2	2.3
Dwelling destroyed (DD)	0.3	1.1	0.5	2.1	0.7	0.7	0.3	0.0	0.7
Other (O)	0.6	0.5	0.7	0.7	0.9	0.5	0.1	0.4	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of sampled households	2,070	2,422	750	750	750	742	750	750	4,492
Household response rate (HRR)[1]	97.7	98.7	96.3	96.9	98.0	99.3	99.3	99.4	98.2
Eligible women									
Completed (EWC)	97.7	98.5	96.5	96.1	98.1	99.0	99.3	99.3	98.1
Not at home (EWNH)	1.9	0.9	3.4	2.7	1.6	0.6	0.0	0.4	1.4
Postponed (EWP)	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Refused (EWR)	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Partly completed (EWPC)	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Incapacitated (EWI)	0.1	0.4	0.0	0.8	0.3	0.1	0.3	0.1	0.2
Other (EWO)	0.0	0.2	0.1	0.2	0.0	0.0	0.4	0.0	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of women	2,032	1,982	714	517	686	676	726	695	4,014
Eligible women's response rate (EWRR)[2]	97.7	98.5	96.5	96.1	98.1	99.0	99.3	99.3	98.1
Overall women's response rate (ORR)[3]	95.4	97.3	92.9	93.2	96.2	98.3	98.6	98.7	96.4

[1] Using the number of households falling into specific response categories, the household response rate (HRR) is calculated as:

$$\frac{100 * C}{C + HP + P + R + DNF}$$

[2] The eligible women's response rate (EWRR) is equivalent to the percentage of interviews completed (EWC)
[3] The overall women's response rate (OWRR) is calculated as:

OWRR = HRR * EWRR/100

ESTIMATES OF SAMPLING ERRORS *Appendix* B

The estimates from a sample survey are affected by two types of errors: nonsampling errors and sampling errors. Nonsampling errors are the results of mistakes made in implementing data collection and data processing, such as failure to locate and interview the correct household, misunderstanding of the questions by either interviewer or respondent, and data entry errors. Although numerous efforts were made during the implementation of the 2011 Liberia Malaria Indicator Survey (2011 LMIS) to minimize this type of error, nonsampling errors are impossible to avoid and difficult to evaluate statistically.

Sampling errors, on the other hand, can be evaluated statistically. The sample of respondents selected in the 2011 LMIS is only one of many samples that could have been selected from the same population, using the same design and expected size. Each of these samples would yield results that differ somewhat from the results of the actual sample selected. Sampling errors are a measure of the variability among all possible samples. Although the degree of variability is not known exactly, it can be estimated from the survey results.

A sampling error is usually measured in terms of the *standard error* for a particular statistic (mean, percentage, etc.), which is the square root of the variance. The standard error can be used to calculate confidence intervals within which the true value for the population can reasonably be assumed to fall. For example, for any given statistic calculated from a sample survey, the value of that statistic will fall within a range of plus and minus two times the standard error of that statistic in 95 percent of all possible samples of identical size and design.

If the sample of respondents had been selected as a simple random sample, it would have been possible to use straightforward formulas for calculating sampling errors. However, the 2011 LMIS sample is the result of a multi-stage stratified design, and, consequently, it was necessary to use more complex formulae. The computer software used to calculate sampling errors for the 2011 LMIS is an SAS procedure. This procedure used the Taylor linearization method of variance estimation for survey estimates that are means or proportions.

The Taylor linearization method treats any percentage or average as a ratio estimate, $r = y/x$, where y represents the total sample value for variable y, and x represents the total number of cases in the group or subgroup under consideration. The variance of r is computed using the formula given below, with the standard error being the square root of the variance:

$$SE^2(r) = var(r) = \frac{1}{x^2}\sum_{h=1}^{H}\left[\frac{(1-f_h)m_h}{m_h-1}\left(\sum_{i=1}^{m_h} z_{hi}^2 - \frac{z_h^2}{m_h}\right)\right]$$

in which

$$z_{hi} = y_{hi} - rx_{hi} \text{ , and } z_h = y_h - rx_h$$

where h represents the stratum which varies from 1 to H,
m_h is the total number of clusters selected in the h^{th} stratum,
y_{hi} is the sum of the weighted values of variable y in the i^{th} cluster in the h^{th} stratum,
x_{hi} is the sum of the weighted number of cases in the i^{th} cluster in the h^{th} stratum, and
f_h is the sampling fraction in stratum h, which is so small that it is ignored.

In addition to the standard error, the design effect (DEFT) for each estimate is calculated, which is defined as the ratio between the standard error using the given sample design and the standard error that would result if a simple random sample had been used. A DEFT value of 1.0 indicates that the sample design is as efficient as a simple random sample, while a value greater than 1.0 indicates the increase in the sampling error due to the use of a more complex and less statistically efficient design. The relative standard error and confidence limits for the estimates are also calculated.

Sampling errors for the 2011 LMIS are calculated for selected variables considered to be of primary interest. The results are presented in this appendix for the country as a whole, for urban and rural areas separately, for the capital city Monrovia, and for each of the five geographical regions. For each variable, the type of statistic (mean, proportion, or rate) and the base population are given in Table B.1. Tables B.2 to B.10 present the value of the statistic (R), its standard error (SE), the number of unweighted (N-UNWE) and weighted (N-WEIG) cases, the design effect (DEFT), the relative standard error (SE/R), and the 95 percent confidence limits (R±2SE) for each variable. The DEFT is considered undefined when the standard error considering simple random sample is zero (when the estimate is close to 0 or 1).

The confidence interval, e.g., as calculated for *child slept under an ITN last night*, can be interpreted as follows: the proportion from the national sample is 0.371 and its standard error is 0.017. Therefore, to obtain the 95 percent confidence limits, one adds and subtracts twice the standard error to the sample estimate, i.e., 0.371±2×0.017. There is a high probability (95 percent) that the *true* proportion of children that slept under an ITN last night is between 0.337 and 0.404.

For the total sample, the value of the DEFT, averaged over all variables, is 1.68. This means that, due to multi-stage clustering of the sample, the average standard error for all the indicators is increased by a factor of 1.68 over that in an equivalent simple random sample.

Table B.1 List of selected variables for sampling errors, Liberia 2011

Variable	Type of estimate	Base population
No education	Proportion	All women 15-49
Secondary education or higher	Proportion	All women 15-49
Owns at least 1 insecticide-treated net (ITN)	Proportion	Households
Child slept under an ITN last night	Proportion	Children under five in households
Pregnant woman slept under an ITN last night	Proportion	All pregnant women 15-49 in households
Received 2+ doses of SP/Fansidar antenatal visit	Proportion	Last birth of women 15-49 with live births last 2 years
Child has fever in last 2 weeks	Proportion	Child under 5 in women's birth history
Child sought care/treatment from a health facility, provider, or pharmacy	Proportion	Child under 5 with fever in last 2 weeks
Child took ACT	Proportion	Child under 5 with fever in last 2 weeks who received any antimalarial drugs
Child has severe anemia (hemoglobin < 8.0 g/dl)	Proportion	Child 6-59 tested for anemia
Child has malaria (on rapid test)	Proportion	Children 6-59 tested (rapid test) for malaria
Child has malaria (on microscopy)	Proportion	Children 6-59 tested (on microscopy) for malaria

Table B.2 Sampling errors: National sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.361	0.014	3939	3939	1.865	0.040	0.332	0.389
At least some secondary education	0.337	0.016	3939	3939	2.116	0.047	0.305	0.368
Ownership of at least one ITN	0.497	0.019	4162	4162	2.387	0.037	0.460	0.534
Child slept under an ITN last night	0.371	0.017	3600	3352	1.596	0.045	0.337	0.404
Pregnant women slept under an ITN last night	0.390	0.033	356	363	1.273	0.084	0.325	0.456
Received 2+ doses of SP/Fansidar during antenatal visit	0.496	0.022	1326	1230	1.570	0.045	0.452	0.541
Child has fever in last 2 weeks	0.492	0.015	3149	2876	1.495	0.030	0.462	0.522
Child sought care/treatment from a health facility	0.597	0.021	1617	1416	1.434	0.035	0.555	0.638
Child took ACT	0.397	0.020	1617	1416	1.418	0.051	0.356	0.438
Child has anemia (hemoglobin < 8.0 g/dl)	0.077	0.007	3169	2942	1.397	0.092	0.063	0.091
Child has malaria (based on rapid test)	0.447	0.019	3149	2920	1.876	0.042	0.409	0.484
Child has malaria (based on microscopy test)	0.278	0.016	3044	2815	1.758	0.058	0.246	0.310

Table B.3 Sampling errors: Urban sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.227	0.015	1986	2106	1.605	0.066	0.197	0.258
At least some secondary education	0.501	0.022	1986	2106	1.975	0.044	0.457	0.545
Ownership of at least one ITN	0.522	0.025	1914	2058	2.169	0.048	0.472	0.571
Child slept under an ITN last night	0.402	0.027	1428	1377	1.626	0.067	0.348	0.456
Pregnant women slept under an ITN last night	0.393	0.054	153	160	1.355	0.139	0.284	0.502
Received 2+ doses of SP/Fansidar during antenatal visit	0.443	0.026	562	540	1.169	0.058	0.391	0.494
Child has fever in last 2 weeks	0.496	0.024	1260	1175	1.547	0.048	0.448	0.544
Child sought care/treatment from a health facility	0.682	0.021	667	583	1.010	0.031	0.639	0.725
Child took ACT	0.358	0.032	667	583	1.457	0.088	0.295	0.422
Child has anemia (hemoglobin < 8.0 g/dl)	0.070	0.012	1224	1160	1.452	0.166	0.047	0.093
Child has malaria (based on rapid test)	0.295	0.034	1214	1149	2.195	0.117	0.226	0.364
Child has malaria (based on microscopy test)	0.167	0.022	1195	1137	1.759	0.133	0.123	0.212

Table B.4 Sampling errors: Rural sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.514	0.021	1953	1833	1.835	0.040	0.472	0.555
At least some secondary education	0.148	0.017	1953	1833	2.081	0.113	0.114	0.181
Ownership of at least one ITN	0.472	0.027	2248	2104	2.539	0.057	0.419	0.526
Child slept under an ITN last night	0.348	0.020	2172	1974	1.542	0.059	0.308	0.389
Pregnant women slept under an ITN last night	0.388	0.040	203	203	1.194	0.102	0.309	0.467
Received 2+ doses of SP/Fansidar during antenatal visit	0.538	0.035	764	689	1.878	0.064	0.469	0.608
Child has fever in last 2 weeks	0.490	0.019	1889	1701	1.478	0.039	0.452	0.528
Child sought care/treatment from a health facility	0.537	0.032	950	833	1.680	0.060	0.473	0.601
Child took ACT	0.424	0.026	950	833	1.381	0.061	0.372	0.476
Child has anemia (hemoglobin < 8.0 g/dl)	0.081	0.009	1945	1782	1.380	0.110	0.063	0.099
Child has malaria (based on rapid test)	0.545	0.023	1935	1770	1.909	0.042	0.499	0.592
Child has malaria (based on microscopy test)	0.353	0.022	1849	1677	1.854	0.063	0.308	0.397

Table B.5 Sampling errors: Monrovia sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.206	0.021	689	1296	1.337	0.100	0.165	0.247
At least some secondary education	0.549	0.033	689	1296	1.714	0.059	0.484	0.614
Ownership of at least one ITN	0.528	0.035	678	1285	1.813	0.066	0.458	0.597
Child slept under an ITN last night	0.415	0.040	397	748	1.376	0.096	0.335	0.494
Pregnant women slept under an ITN last night	0.395	0.077	50	101	1.146	0.194	0.242	0.549
Received 2+ doses of SP/Fansidar during antenatal visit	0.401	0.039	172	312	1.022	0.097	0.323	0.479
Child has fever in last 2 weeks	0.448	0.031	338	624	1.113	0.069	0.386	0.511
Child sought care/treatment from a health facility	0.756	0.033	152	280	0.858	0.044	0.690	0.822
Child took ACT	0.296	0.048	152	280	1.204	0.161	0.201	0.392
Child has anemia (hemoglobin < 8.0 g/dl)	0.064	0.019	316	597	1.324	0.296	0.026	0.101
Child has malaria (based on rapid test)	0.153	0.027	315	595	1.285	0.179	0.098	0.208
Child has malaria (based on microscopy test)	0.071	0.018	312	589	1.231	0.261	0.034	0.108

Table B.6 Sampling errors: North Western sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.498	0.057	497	275	2.543	0.115	0.383	0.613
At least some secondary education	0.188	0.039	497	275	2.200	0.206	0.110	0.266
Ownership of at least one ITN	0.438	0.037	663	377	1.938	0.085	0.363	0.513
Child slept under an ITN last night	0.358	0.041	508	290	1.506	0.114	0.276	0.439
Pregnant women slept under an ITN last night	0.362	0.068	49	29	1.000	0.188	0.226	0.498
Received 2+ doses of SP/Fansidar during antenatal visit	0.508	0.059	193	112	1.660	0.115	0.391	0.625
Child has fever in last 2 weeks	0.544	0.035	450	256	1.396	0.065	0.473	0.614
Child sought care/treatment from a health facility	0.689	0.052	249	139	1.615	0.076	0.584	0.794
Child took ACT	0.415	0.052	249	139	1.527	0.126	0.311	0.520
Child has anemia (hemoglobin < 8.0 g/dl)	0.063	0.023	464	267	1.897	0.372	0.016	0.110
Child has malaria (based on rapid test)	0.493	0.039	460	265	1.569	0.079	0.416	0.571
Child has malaria (based on microscopy test)	0.290	0.033	457	263	1.456	0.112	0.225	0.355

Table B.7 Sampling errors: South Central sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.458	0.033	673	723	1.698	0.071	0.393	0.524
At least some secondary education	0.240	0.034	673	723	2.038	0.140	0.173	0.307
Ownership of at least one ITN	0.361	0.029	691	760	1.606	0.081	0.303	0.420
Child slept under an ITN last night	0.260	0.024	577	609	1.077	0.094	0.211	0.309
Pregnant women slept under an ITN last night	0.260	0.063	63	72	1.164	0.244	0.133	0.387
Received 2+ doses of SP/Fansidar during antenatal visit	0.388	0.049	207	207	1.389	0.126	0.290	0.485
Child has fever in last 2 weeks	0.548	0.033	504	528	1.411	0.061	0.482	0.615
Child sought care/treatment from a health facility	0.495	0.045	281	290	1.373	0.092	0.404	0.586
Child took ACT	0.399	0.048	281	290	1.482	0.120	0.303	0.495
Child has anemia (hemoglobin < 8.0 g/dl)	0.089	0.017	512	546	1.242	0.190	0.055	0.123
Child has malaria (based on rapid test)	0.496	0.044	510	545	1.840	0.088	0.409	0.584
Child has malaria (based on microscopy test)	0.262	0.025	506	538	1.225	0.095	0.213	0.312

Table B.8 Sampling errors: South Eastern A sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.474	0.029	669	278	1.490	0.061	0.416	0.531
At least some secondary education	0.171	0.023	669	278	1.565	0.134	0.125	0.216
Ownership of at least one ITN	0.612	0.048	701	307	2.613	0.079	0.516	0.709
Child slept under an ITN last night	0.448	0.041	718	317	1.690	0.091	0.367	0.530
Pregnant women slept under an ITN last night	0.547	0.056	59	25	0.829	0.102	0.435	0.659
Received 2+ doses of SP/Fansidar during antenatal visit	0.555	0.037	275	120	1.250	0.066	0.481	0.628
Child has fever in last 2 weeks	0.492	0.031	633	270	1.380	0.062	0.431	0.553
Child sought care/treatment from a health facility	0.503	0.057	337	133	1.719	0.113	0.390	0.617
Child took ACT	0.368	0.044	337	133	1.446	0.120	0.280	0.456
Child has anemia (hemoglobin < 8.0 g/dl)	0.047	0.012	616	274	1.407	0.261	0.022	0.071
Child has malaria (based on rapid test)	0.553	0.039	612	272	1.901	0.070	0.476	0.630
Child has malaria (based on microscopy test)	0.326	0.047	597	261	2.167	0.143	0.232	0.419

Table B.9 Sampling errors: South Eastern B sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.414	0.033	721	231	1.804	0.080	0.348	0.481
At least some secondary education	0.230	0.026	721	231	1.671	0.114	0.177	0.282
Ownership of at least one ITN	0.642	0.031	722	246	1.747	0.049	0.579	0.704
Child slept under an ITN last night	0.416	0.032	734	250	1.358	0.077	0.352	0.480
Pregnant women slept under an ITN last night	0.503	0.068	70	24	1.115	0.136	0.367	0.640
Received 2+ doses of SP/Fansidar during antenatal visit	0.618	0.036	239	79	1.173	0.059	0.545	0.691
Child has fever in last 2 weeks	0.481	0.033	635	215	1.628	0.068	0.416	0.546
Child sought care/treatment from a health facility	0.576	0.070	317	103	2.330	0.122	0.435	0.716
Child took ACT	0.385	0.060	317	103	2.013	0.156	0.265	0.505
Child has anemia (hemoglobin < 8.0 g/dl)	0.082	0.020	655	222	1.730	0.241	0.043	0.122
Child has malaria (based on rapid test)	0.705	0.029	654	221	1.533	0.042	0.646	0.763
Child has malaria (based on microscopy test)	0.492	0.029	618	212	1.294	0.058	0.435	0.550

Table B.10 Sampling errors: North Central sample, Liberia 2011

Variable	Value (R)	Standard Error (SE)	Number of cases: Unweighted (N)	Number of cases: Weighted (WN)	Design Effect (DEFT)	Relative Error (SE/R)	Confidence limits: R-2SE	Confidence limits: R+2SE
No education	0.404	0.032	690	1136	1.685	0.078	0.340	0.467
At least some secondary education	0.254	0.029	690	1136	1.725	0.113	0.196	0.311
Ownership of at least one ITN	0.509	0.043	707	1188	2.303	0.085	0.422	0.595
Child slept under an ITN last night	0.372	0.035	666	1138	1.466	0.093	0.303	0.442
Pregnant women slept under an ITN last night	0.419	0.061	65	112	1.027	0.146	0.296	0.541
Received 2+ doses of SP/Fansidar during antenatal visit	0.583	0.054	240	400	1.688	0.092	0.476	0.690
Child has fever in last 2 weeks	0.480	0.031	589	982	1.386	0.065	0.417	0.542
Child sought care/treatment from a health facility	0.568	0.044	281	471	1.322	0.078	0.480	0.656
Child took ACT	0.461	0.037	281	471	1.099	0.080	0.388	0.535
Child has anemia (hemoglobin < 8.0 g/dl)	0.088	0.011	606	1035	1.007	0.128	0.065	0.110
Child has malaria (based on rapid test)	0.495	0.039	598	1021	1.761	0.079	0.417	0.574
Child has malaria (based on microscopy test)	0.350	0.035	554	952	1.644	0.100	0.280	0.420

DATA QUALITY

Appendix C

Table C.1 Household age distribution

Single-year age distribution of the de facto household population by sex (weighted), Liberia 2011

	Male		Female			Male		Female	
Age	Number	Percent	Number	Percent	Age	Number	Percent	Number	Percent
0	318	3.5	308	3.3	36	84	0.9	116	1.3
1	346	3.8	375	4.1	37	80	0.9	77	0.8
2	332	3.7	278	3.0	38	64	0.7	113	1.2
3	374	4.1	341	3.7	39	96	1.1	91	1.0
4	338	3.7	328	3.6	40	130	1.4	115	1.2
5	285	3.2	337	3.7	41	57	0.6	57	0.6
6	302	3.3	280	3.0	42	121	1.3	63	0.7
7	353	3.9	332	3.6	43	63	0.7	61	0.7
8	276	3.0	288	3.1	44	40	0.4	58	0.6
9	261	2.9	290	3.1	45	92	1.0	83	0.9
10	229	2.5	258	2.8	46	56	0.6	53	0.6
11	232	2.6	235	2.5	47	50	0.6	28	0.3
12	221	2.4	238	2.6	48	73	0.8	67	0.7
13	211	2.3	197	2.1	49	59	0.6	43	0.5
14	206	2.3	192	2.1	50	72	0.8	60	0.7
15	193	2.1	177	1.9	51	48	0.5	63	0.7
16	163	1.8	122	1.3	52	79	0.9	62	0.7
17	140	1.6	141	1.5	53	34	0.4	49	0.5
18	159	1.8	165	1.8	54	29	0.3	42	0.5
19	177	2.0	165	1.8	55	44	0.5	51	0.6
20	136	1.5	167	1.8	56	34	0.4	38	0.4
21	128	1.4	182	2.0	57	30	0.3	23	0.3
22	140	1.6	156	1.7	58	29	0.3	38	0.4
23	129	1.4	181	2.0	59	37	0.4	16	0.2
24	127	1.4	147	1.6	60	51	0.6	65	0.7
25	170	1.9	195	2.1	61	17	0.2	23	0.2
26	116	1.3	152	1.7	62	25	0.3	25	0.3
27	152	1.7	134	1.5	63	26	0.3	17	0.2
28	120	1.3	170	1.8	64	28	0.3	19	0.2
29	122	1.4	138	1.5	65	43	0.5	38	0.4
30	135	1.5	151	1.6	66	5	0.1	15	0.2
31	93	1.0	95	1.0	67	16	0.2	13	0.1
32	138	1.5	116	1.3	68	30	0.3	38	0.4
33	70	0.8	73	0.8	69	12	0.1	11	0.1
34	74	0.8	93	1.0	70+	171	1.9	172	1.9
35	100	1.1	109	1.2	Don't know/ missing	41	0.5	16	0.2
					Total	9,037	100.0	9,228	100.0

Note: The de facto population includes all residents and nonresidents who stayed in the household the night before the interview.

Table C.2 Age distribution of eligible and interviewed women

De facto household population of women age 10-54 and interviewed women age 15-49; and percent distribution and percentage of eligible women who were interviewed (weighted), by five-year age groups, Liberia 2011

Age group	Household population of women age 10-54	Interviewed women age 15-49		Percentage of eligible women interviewed
		Number	Percentage	
10-14	1,119	-	-	-
15-19	769	757	19.0	98.4
20-24	833	809	20.3	97.1
25-29	790	778	19.6	98.6
30-34	528	522	13.1	98.9
35-39	507	497	12.5	98.0
40-44	354	348	8.7	98.3
45-49	275	265	6.7	96.5
50-54	277	-	-	-
15-49	4,056	3,975	100.0	98.0

Note: The de facto population includes all residents and nonresidents who stayed in the household the night before the interview. Weights for both household population of women and interviewed women are household weights. Age is based on the household questionnaire.
na = Not applicable

Table C.3 Completeness of reporting

Percentage of observations missing information for selected demographic and health questions (weighted), Liberia 2011

Subject	Reference Group	Percentage with information missing	Number of cases
Birth date			
Month Only	Births in the 5 years	0.74	3,034
Month and Year	preceding the survey	0.00	3,034
Respondent's education	All women age 15-49	0.02	3,939
Anemia	Living children age 6-59 months (from the Household Questionnaire)	2.12	3,006
Malaria		2.87	3,006
Rapid diagnostic test	Living children age 6-59 months		
Microscopy	(from the Household Questionnaire)	6.36	3,006

[1] Both year and age missing

PERSONS INVOLVED IN THE 2011 LIBERIA MALARIA INDICATOR SURVEY

Appendix D

Project Director
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Field Teams

Team 1
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Maima Richards, Interviewer
Martenneh K. Dorley, Interviewer
Gifty Barcon, Health Technician
Sylvanus Dangan, Health Technician

Team 2
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Mark T. Falkornia, Interviewer
S. Biko Smith, Interviewer
Arnesa Cooper, Health Technician
Kollie Marvie, Health Technician

Team 3
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Dekor Wesseh, Interviewer
Advertus Nyan Mianah, Interviewer
Theresa Summerville, Health Technician
S. Rubein Geterminah, Health Technician

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Jamesetta Davies, Interviewer
Leesay B. Kennedy, Interviewer
Abena N. Brefo, Health Technician
Patrick K. Sonah, Jr., Health Technician

Team 5
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Patrick Kollie, Interviewer
Prince Alvin Gonqueh, Interviewer
Galakpai Gorvego, Health Technician
Roseline Caulker-George, Health Technician

Team 6
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Cynthia G. Swen, Interviewer
Korto Dorbor, Health Technician
Prince Z. Theoway, Health Technician

Team 7
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Catherine Georgina Thomas, Interviewer
Philip K. Torborg, Interviewer
Jebbeh Kaikai, Health Technician
Sam B. Gibson, Health Technician

Team 8
Fred J. Tuazama, Supervisor
H.M. Maima Davies, Interviewer
Bee-Geepay Karweaye, Interviewer
Adelaide D. Yango, Health Technician
Gloria J. Davies-Wayne, Health Technician

Team 9
Moses Hardy, Supervisor
Kangar Smith, Interviewer
Precious Monue Togba-Doya, Interviewer
William Kanneh, Health Technician
Iye Fallah, Health Technician

Team 10
Momoh B. Kamara Jr., Supervisor
Cabbeh Barbu, Interviewer
Eric Redd, Interviewer
Patience T. Konneh, Health Technician
Ralph Jetoh, Health Technician

Team 11
Ezekiel S. Bloe, Supervisor
Christopher B. Simmonds, Interviewer
Archibald C. Dennis, Interviewer
G. Edwin Bull, Health Technician
Famatta D. Kamara, Health Technician

Team 12
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Cynthia S. Momo, Health Technician
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Saywah Varney
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QUESTIONNAIRES

Appendix E

2011 LIBERIA MALARIA INDICATOR SURVEY
NATIONAL MALARIA CONTROL PROGRAM - MINISTRY OF HEALTH AND SOCIAL WELFARE
LIBERIA INSTITUTE OF STATISTICS AND GEO-INFORMATION SERVICES

HOUSEHOLD QUESTIONNAIRE

IDENTIFICATION

NAME OF COUNTY _____	. . . . .
NAME OF DISTRICT _____	. . . . .
NAME OF CLAN/TOWNSHIP _____	
NAME OF CITY/TOWN/VILLAGE _____	
LMIS CLUSTER NUMBER	. . . . .
HOUSEHOLD NUMBER	. . . . .
URBAN: MONROVIA=1; OTHER URBAN=2; VILLAGE=3	. . . . .
NAME OF HOUSEHOLD HEAD _____	

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY
				MONTH
				YEAR 2 0 1
INTERVIEWER'S NAME				INT. NUMBER
RESULT*				RESULT
NEXT VISIT: DATE				
TIME				TOTAL NUMBER OF VISITS

*RESULT CODES:
1 COMPLETED
2 NO HOUSEHOLD MEMBER HOME/NO COMPETENT RESPONDENT HOME AT TIME OF VISIT
3 ENTIRE HOUSEHOLD ABSENT FOR EXTENDED PERIOD OF TIME
4 POSTPONED
5 REFUSED
6 DWELLING VACANT OR ADDRESS NOT A DWELLING
7 DWELLING DESTROYED
8 DWELLING NOT FOUND
9 OTHER _____ (SPECIFY)

TOTAL PERSONS IN HOUSEHOLD

TOTAL WOMEN 15-49

LINE NO. OF RESPONDENT TO HOUSEHOLD QUESTIONNAIRE

SUPERVISOR	OFFICE EDITOR	KEYED BY
NAME _____		
DATE _____		

INTRODUCTION AND CONSENT

Hello. My name is _____. I am working with the Ministry of Health. We are conducting a survey about health all over Liberia. The information we collect will help the government to plan health services. Your household was selected for the survey. I would like to ask you some questions about your household. The questions usually take about 15 to 20 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on this card.

GIVE CARD WITH CONTACT INFORMATION

Do you want to ask me anything about the survey? May I begin the interview now?

Signature of interviewer: _____ Date: _____

RESPONDENT AGREES TO BE INTERVIEWED . . . 1 ↓ RESPONDENT DOES NOT AGREE TO BE INTERVIEWED . . . 2 → END

HOUSEHOLD SCHEDULE

LINE NO.	USUAL RESIDENTS AND VISITORS	RELA-TION-SHIP	SEX	RESIDENCE		AGE	ELIGIBILITY	
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES, RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-13 FOR EACH PERSON.	What is the relation-ship of (NAME) to the head of the house-hold? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)? IF 95 OR MORE, RECORD 95	CIRCLE LINE NUM-BER OF ALL WOMEN AGE 15-49	CIRCLE LINE NUM-BER OF ALL CHILD-REN AGE 0-5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
01			M F 1 2	YES NO 1 2	YES NO 1 2	IN YEARS	01	01
02			1 2	1 2	1 2		02	02
03			1 2	1 2	1 2		03	03
04			1 2	1 2	1 2		04	04
05			1 2	1 2	1 2		05	05
06			1 2	1 2	1 2		06	06
07			1 2	1 2	1 2		07	07
08			1 2	1 2	1 2		08	08

CODES FOR Q. 3: RELATIONSHIP TO HEAD OF HOUSEHOLD

01 = HEAD
02 = WIFE OR HUSBAND
03 = SON OR DAUGHTER
04 = SON-IN-LAW OR DAUGHTER-IN-LAW
05 = GRANDCHILD
06 = PARENT
07 = PARENT-IN-LAW
08 = BROTHER OR SISTER
09 = OTHER RELATIVE
10 = ADOPTED/FOSTER/STEPCHILD
11 = NOT RELATED
98= DON'T KNOW

LINE NO.	FOR EVERYONE FEVER AND TREATMENT			
	In the last 4 weeks, has (NAME) been sick with a fever at any time?	Did (NAME) get any treatment for the fever in the last 4 weeks?	Where did (NAME) go for treat-ment? USE CODES BELOW.	How much did the treatment cost? INCLUDE COST OF DOCTOR, NURSE, DRUGS, TESTS IF > 9990, WRITE '9990'.
	(10)	(11)	(12)	(13)
01	Y N DK 1 2 8 NEXT LINE	Y N DK 1 2 8 NEXT LINE		LIBERIAN DOLLARS
02	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
03	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
04	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
05	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
06	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
07	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
08	1 2 8 NEXT LINE	1 2 8 NEXT LINE		

CODES FOR Q. 12: TREATMENT FOR FEVER

01 = GOVERNMENT HOSPITAL
02 = GOVERNMENT HEALTH CENTER
03 = GOVERNMENT HEALTH CLINIC
04 = PRIVATE HOSPITAL/CLINIC
05 = PHARMACY
06 = PRIVATE DOCTOR
07 = MOBILE CLINIC
08 = MEDICINE STORE
09 = TRADITIONAL PRACTITIONER
10 = BLACK BAGGER, DRUG PEDDLER
96 = OTHER
98 = DOES NOT KNOW

HOUSEHOLD SCHEDULE

LINE NO.	USUAL RESIDENTS AND VISITORS	RELA-TION-SHIP	SEX	RESIDENCE		AGE	ELIGIBILITY	
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES, RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-13 FOR EACH PERSON.	What is the relation-ship of (NAME) to the head of the house-hold? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)? IF 95 OR MORE, RECORD 95	CIRCLE LINE NUM-BER OF ALL WOMEN AGE 15-49	CIRCLE LINE NUM-BER OF ALL CHILD-REN AGE 0-5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
09			M F 1 2	Y N 1 2	Y N 1 2	IN YEARS	09	09
10			1 2	1 2	1 2		10	10
11			1 2	1 2	1 2		11	11
12			1 2	1 2	1 2		12	12
13			1 2	1 2	1 2		13	13
14			1 2	1 2	1 2		14	14
15			1 2	1 2	1 2		15	15

TICK HERE IF CONTINUATION SHEET USED ☐

2A) Just to make sure that I have a complete listing, are there any other persons such as small children or infants that we have not listed? YES ☐→ ADD NO ☐

2B) Are there any other people who may not be members of your family, like domestic servants, lodgers, or friends who usually live here? YES ☐→ ADD NO ☐

2C) Are there any guests or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed? YES ☐→ ADD NO ☐

LINE NO.	FOR EVERYONE FEVER AND TREATMENT			
	In the last 4 weeks, has (NAME) been sick with a fever at any time?	Did (NAME) get any treatment for the fever in the last 4 weeks?	Where did (NAME) go for treat-ment? USE CODES BELOW.	How much did the treatment cost? INCLUDE COST OF DOCTOR, NURSE, DRUGS, TESTS IF > 9990, WRITE '9990'.
	(10)	(11)	(12)	(13)
09	Y N DK 1 2 8 NEXT LINE	Y N DK 1 2 8 NEXT LINE		LIBERIAN DOLLARS
10	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
11	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
12	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
13	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
14	1 2 8 NEXT LINE	1 2 8 NEXT LINE		
15	1 2 8 NEXT LINE	1 2 8 NEXT LINE		

CODES FOR Q. 12: TREATMENT FOR FEVER

01 = GOVERNMENT HOSPITAL
02 = GOVERNMENT HEALTH CENTER
03 = GOVERNMENT HEALTH CLINIC
04 = PRIVATE HOSPITAL/CLINIC
05 = PHARMACY
06 = PRIVATE DOCTOR
07 = MOBILE CLINIC
08 = MEDICINE STORE
09 = TRADITIONAL PRACTITIONER
10 = BLACK BAGGER, DRUG PEDDLER
96 = OTHER
98 = DOES NOT KNOW

HOUSEHOLD CHARACTERISTICS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101	What type of water do you mainly drink?	PIPED WATER PIPED INTO DWELLING . . . . . 11 PIPED TO YARD/PLOT . . . . . 12 PUBLIC TAP/STANDPIPE . . . . . 13 TUBE WELL OR BOREHOLE . . . . . 21 DUG WELL HAND PUMP, PROTECTED WELL . . . 31 UNPROTECTED WELL . . . . . 32 WATER FROM SPRING PROTECTED SPRING . . . . . 41 UNPROTECTED SPRING . . . . . 42 RAINWATER . . . . . 51 TANKER TRUCK . . . . . 61 CART WITH SMALL TANK . . . . . 71 SURFACE WATER/RIVER/LAKE/STREAM 81 BOTTLED WATER . . . . . 91 OTHER _____ 96 (SPECIFY)	→ 104 → 104
102	Where is that water source located?	IN OWN DWELLING . . . . . 1 IN OWN YARD/PLOT . . . . . 2 ELSEWHERE 3	→ 104
103	How long does it take to go there, get water, and come back?	MINUTES . . . . . [ ][ ][ ] DON'T KNOW 998	
104	What type of toilet do you use here? IF FLUSH OR POUR FLUSH TOILET, PROBE: When you flush the toilet, where does the water go?	FLUSH OR POUR FLUSH TOILET FLUSH TO PIPED SEWER SYSTEM . . 11 FLUSH TO SEPTIC TANK . . . . . 12 FLUSH TO PIT LATRINE . . . . . 13 FLUSH TO SOMEWHERE ELSE . . . . . 14 FLUSH, DON'T KNOW WHERE . . . . . 15 PIT LATRINE VENTILATED IMPROVED PIT LATRINE 21 PIT LATRINE WITH SLAB . . . . . 22 PIT LATRINE WITHOUT SLAB/OPEN PIT 23 COMPOSTING TOILET . . . . . 31 BUCKET TOILET . . . . . 41 HANGING TOILET/HANGING LATRINE 51 NO FACILITY/BUSH/FIELD . . . . . 61 OTHER _____ 96 (SPECIFY)	→ 107
105	Do you share this toilet facility with other households?	YES . . . . . 1 NO 2	→ 107
106	How many households use this toilet facility?	NO. OF HOUSEHOLDS IF LESS THAN 10 . . . . . [0][ ] 10 OR MORE HOUSEHOLDS . . . . . 95 DON'T KNOW 98	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES			SKIP
107	Does your household have:		**YES**	**NO**	
	Electricity?	ELECTRICITY	1	2	
	A generator?	GENERATOR	1	2	
	A radio?	RADIO	1	2	
	A mobile telephone?	MOBILE TELEPHONE	1	2	
	An ice box?	ICE BOX (REFRIGERATOR) . . .	1	2	
	A table?	TABLE	1	2	
	Chairs?	CHAIRS	1	2	
	A cupboard?	CUPBOARD	1	2	
	A mattress (not made of straw or grass)?	MATTRESS	1	2	
	A sewing machine?	SEWING MACHINE	1	2	
	A television?	TELEVISION	1	2	
	A computer?	COMPUTER	1	2	
108	What do you use for heating food while cooking?	ELECTRICITY . . . . . 01 GAS CYLINDER . . . . . 02 KEROSENE STOVE . . . . . 03 FIRE COAL / CHARCOAL . . . . . 04 WOOD . . . . . 06 NO FOOD COOKED IN HOUSEHOLD . . . 95 OTHER _____ 96 (SPECIFY)			
109	MAIN MATERIAL OF THE **FLOOR**. RECORD OBSERVATION. IF DIFFERENT ROOMS HAVE DIFFERENT FLOOR MATERIAL, CIRCLE THE CODE FOR THE MOST COMMON, i.e., WHAT COVERS THE LARGEST AREA.	NATURAL FLOOR EARTH/SAND/MUD . . . . . 11 RUDIMENTARY FLOOR WOOD PLANKS . . . . . 21 FINISHED FLOOR PARQUET OR POLISHED WOOD . . . 31 FLOOR MAT, LINOLEUM, VINYL . . . . . 32 CERAMIC TILES . . . . . 33 CONCRETE, CEMENT . . . . . 34 CARPET . . . . . 35 OTHER _____ 96 (SPECIFY)			
110	MAIN MATERIAL OF THE **ROOF**. RECORD OBSERVATION.	NATURAL ROOFING THATCH/PALM LEAF . . . . . 11 RUDIMENTARY ROOFING RUSTIC MAT . . . . . 21 PALM/BAMBOO . . . . . 22 WOOD PLANKS . . . . . 23 TARPAULIN, PLASTIC . . . . . 24 FINISHED ROOFING ZINC, METAL . . . . . 31 WOOD . . . . . 32 CERAMIC TILES . . . . . 34 CONCRETE, CEMENT . . . . . 35 ASBESTOS SHEETS, SHINGLES . . . 36 OTHER _____ 96 (SPECIFY)			

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
111	MAIN MATERIAL OF THE OUTSIDE **WALLS**. RECORD OBSERVATION.	NATURAL WALLS MUD AND STICKS . . . . . 11 CANE/PALM/TRUNKS . . . . . 12 STRAW, THATCH MATS . . . . . 13 RUDIMENTARY WALLS MUD BRICKS . . . . . 21 PLYWOOD . . . . . 22 CARDBOARD, PLASTIC . . . . . 23 REUSED WOOD . . . . . 24 FINISHED WALLS CEMENT . . . . . 31 STONE BLOCKS . . . . . 32 BRICKS . . . . . 33 WOOD PLANKS/SHINGLES . . . . . 34 OTHER _____ 96 (SPECIFY)	
112	How many rooms does this household use for sleeping?	ROOMS	
113	Does any member of this household own:	**YES** **NO**	
	A watch?	WATCH 1 2	
	A bicycle?	BICYCLE 1 2	
	A motorcycle or motor scooter?	MOTORCYCLE/SCOOTER . . . 1 2	
	A car or truck?	CAR/TRUCK 1 2	
	A boat or a canoe?	BOAT OR CANOE 1 2	
114	Does any member of this household own any agricultural land?	YES . . . . . 1 NO 2	
115	Is anyone in this household raising any livestock, herds, other farm animals, or poultry?	YES . . . . . 1 NO 2	→ 117
116	How many of the following animals does this household own? IF NONE, ENTER '00'. IF 95 OR MORE, ENTER '95'. IF UNKNOWN, ENTER '98'.		
	Cows?	COWS	
	Pigs?	PIGS	
	Goats?	GOATS	
	Sheep?	SHEEP	
	Chickens, ducks, or guinea fowl?	CHICKENS, DUCKS, OR FOWL . . .	
117	Does any member of this household have a bank account?	YES . . . . . 1 NO 2	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
118	At any time in the past 12 months, has anyone come into your dwelling to spray the interior walls against mosquitoes?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 120
119	Who sprayed the dwelling?	GOVERNMENT WORKER/PROGRAM . . . . . A PRIVATE COMPANY . . . . . B NONGOVERNMENTAL ORGANIZATION (NGO) . . . . . C OTHER _____ (SPECIFY) X DON'T KNOW . . . . . Y	
120	Does your household have any mosquito nets that can be used while sleeping?	YES . . . . . 1 NO 2	→ 122
121	Why doesn't your household have any mosquito nets? CIRCLE ALL MENTIONED.	NO MOSQUITOES . . . . . A NOT AVAILABLE . . . . . B DON'T LIKE TO USE NETS . . . . . C TOO EXPENSIVE . . . . . D OTHER _____ (SPECIFY) X	→ 201
122	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS . . . . . ☐	

		NET #1	NET #2	NET #3
123	ASK RESPONDENT TO SHOW YOU THE NETS. IF MORE THAN 3, USE ADDITIONAL QUESTIONNAIRE(S).	OBSERVED, BUT HAS HOLES . . . 1 OBSERVED, DOES NOT HAVE HOLES 2 NOT OBSERVED 3	OBSERVED, BUT HAS HOLES . . . 1 OBSERVED, DOES NOT HAVE HOLES 2 NOT OBSERVED 3	OBSERVED, BUT HAS HOLES . . . 1 OBSERVED, DOES NOT HAVE HOLES 2 NOT OBSERVED 3
124	How many months ago did your household receive the mosquito net? IF LESS THAN ONE MONTH, WRITE '00'.	MOS AGO . . . . . [ ][ ] MORE THAN 36 MONTHS AGO . . . 95 NOT SURE 98	MOS AGO . . . . . [ ][ ] MORE THAN 36 MONTHS AGO . . . 95 NOT SURE 98	MOS AGO . . . . . [ ][ ] MORE THAN 36 MONTHS AGO . . . 95 NOT SURE 98
125	Did you buy the net or was it given to you free?	FREE . . . . 1 BOUGHT . . . . 2 (SKIP TO 127) DON'T KNOW . . . . . 8 (SKIP TO 129)	FREE . . . . 1 BOUGHT . . . . 2 (SKIP TO 127) DON'T KNOW . . . . . 8 (SKIP TO 129)	FREE . . . . 1 BOUGHT . . . . 2 (SKIP TO 127) DON'T KNOW . . . . . 8 (SKIP TO 129)
126	Where did you receive the free net?	EPI CAMPAIGN . . . 1 ANC VISIT . . . . 2 UNHCR . . . . 3 NGO DISTRIBUTION 4 OTHER ______ 6 (SPECIFY) DON'T KNOW . . . . . 8 (SKIP TO 129)	EPI CAMPAIGN . . . 1 ANC VISIT . . . . 2 UNHCR . . . . 3 NGO DISTRIBUTION 4 OTHER ______ 6 (SPECIFY) DON'T KNOW . . . . . 8 (SKIP TO 129)	EPI CAMPAIGN . . . 1 ANC VISIT . . . . 2 UNHCR . . . . 3 NGO DISTRIBUTION 4 OTHER ______ 6 (SPECIFY) DON'T KNOW . . . . . 8 (SKIP TO 129)
127	How much did you pay for the net? IF DK, WRITE '998'.	COST IN LIB. $ [ ][ ][ ]	COST IN LIB. $ [ ][ ][ ]	COST IN LIB. $ [ ][ ][ ]
128	Where did you buy the net?	PUBLIC SECTOR GOVT HOSPITAL 11 GOVT HEALTH CENTER . . . . . 12 GOVT HEALTH POST . . . . 13 MOBILE CLINIC 14 OTHER PUBLIC SECTOR ______ 16 (SPECIFY) PRIVATE MED SECTOR PVT HOSPITAL/ CLINIC . . . . 21 PHARMACY . . . 22 PVT DOCTOR . . . 23 MOBILE CLINIC 24 OTHER PRIVATE MED. SECTOR ______ 26 (SPECIFY) OTHER SOURCE MEDICINE STORE 31 TRADITIONAL PRACTITIONER 32 MARKET . . . . . 33 OTHER ______ 36 (SPECIFY) DON'T KNOW 98	PUBLIC SECTOR GOVT HOSPITAL 11 GOVT HEALTH CENTER . . . . . 12 GOVT HEALTH POST . . . . 13 MOBILE CLINIC 14 OTHER PUBLIC SECTOR ______ 16 (SPECIFY) PRIVATE MED SECTOR PVT HOSPITAL/ CLINIC . . . . 21 PHARMACY . . . 22 PVT DOCTOR . . . 23 MOBILE CLINIC 24 OTHER PRIVATE MED. SECTOR ______ 26 (SPECIFY) OTHER SOURCE MEDICINE STORE 31 TRADITIONAL PRACTITIONER 32 MARKET . . . . . 33 OTHER ______ 36 (SPECIFY) DON'T KNOW 98	PUBLIC SECTOR GOVT HOSPITAL 11 GOVT HEALTH CENTER . . . . . 12 GOVT HEALTH POST . . . . 13 MOBILE CLINIC 14 OTHER PUBLIC SECTOR ______ 16 (SPECIFY) PRIVATE MED SECTOR PVT HOSPITAL/ CLINIC . . . . 21 PHARMACY . . . 22 PVT DOCTOR . . . 23 MOBILE CLINIC 24 OTHER PRIVATE MED. SECTOR ______ 26 (SPECIFY) OTHER SOURCE MEDICINE STORE 31 TRADITIONAL PRACTITIONER 32 MARKET . . . . . 33 OTHER ______ 36 (SPECIFY) DON'T KNOW 98

		NET #1	NET #2	NET #3
129	OBSERVE OR ASK THE BRAND/ TYPE OF MOSQUITO NET. IF BRAND IS UNKNOWN AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NETS/BRANDS TO THE RESPONDENT	**LONG-LASTING INSECTI-CIDE TREATED NET** OLYSET ..... 11 PERMANET ..... 12 BASF NET ..... 13 OTHER/DK BRAND BUT ITN ... 16 (SKIP TO 133) OTHER BRAND ... 96 DK BRAND 98	**LONG-LASTING INSECTI-CIDE TREATED NET** OLYSET ..... 11 PERMANET ..... 12 BASF NET ..... 13 OTHER/DK BRAND BUT ITN ... 16 (SKIP TO 133) OTHER BRAND ... 96 DK BRAND 98	**LONG-LASTING INSECTI-CIDE TREATED NET** OLYSET ..... 11 PERMANET ..... 12 BASF NET ..... 13 OTHER/DK BRAND BUT ITN ... 16 (SKIP TO 133) OTHER BRAND ... 96 DK BRAND 98
130	When you got the net, was it already treated with an insecticide to kill or repel/drive away mosquitos?	YES .... 1 NO .... 2 NOT SURE 8	YES .... 1 NO .... 2 NOT SURE 8	YES .... 1 NO .... 2 NOT SURE 8
131	Since you got the mosquito net, was it ever soaked or dipped in a liquid to kill or repel/drive away mosquitos?	YES .... 1 NO .... 2 (SKIP TO 133) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 133) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 133) NOT SURE 8
132	How many months ago was the net last soaked or dipped? IF LESS THAN ONE MONTH, WRITE '00'.	MOS AGO ..... [ ][ ] MORE THAN 24 MONTHS AGO ... 95 NOT SURE 98	MOS AGO ..... [ ][ ] MORE THAN 24 MONTHS AGO ... 95 NOT SURE 98	MOS AGO ..... [ ][ ] MORE THAN 24 MONTHS AGO ... 95 NOT SURE 98
133	Did anyone sleep under this mosquito net last night?	YES .... 1 NO .... 2 (SKIP TO 135) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 135) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 135) NOT SURE 8
134	Who slept under this mosquito net last night? RECORD THE PERSON'S NAME AND LINE NUMBER FROM THE HOUSEHOLD SCHEDULE.	NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ]	NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ]	NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ] NAME____________ LINE NO. ..... [ ][ ]
135		GO BACK TO 123 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 201.	GO BACK TO 123 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 201.	GO TO 123 IN FIRST COL. OF A NEW QUESTIONRE.; OR, IF NO MORE NETS, TO 201

HEMOGLOBIN MEASUREMENT AND MALARIA TESTING FOR CHILDREN AGE 0-5

201	CHECK COLUMN 9 IN HOUSEHOLD SCHEDULE. RECORD THE LINE NUMBER AND NAME FOR ALL ELIGIBLE CHILDREN 0-5 YEARS IN QUESTION 202. IF MORE THAN SIX CHILDREN, USE ADDITIONAL QUESTIONNAIRE(S).			
		CHILD 1	CHILD 2	CHILD 3
202	LINE NUMBER FROM COLUMN 9 NAME FROM COLUMN 2	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY MONTH AND YEAR OF BIRTH FROM BIRTH HISTORY AND ASK DAY; IF MOTHER NOT INTERVIEWED, ASK: What is (NAME)'s birth date?	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐
204	CHECK 203: CHILD BORN IN JANUARY 2006 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW)
205	CHECK 203: WAS CHILD BORN IN MONTH OF INTERVIEW OR FIVE PREVIOUS MONTHS?	YES . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW) NO 2	YES . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW) NO 2	YES . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW) NO 2
206	LINE NUMBER OF PARENT/ OTHER ADULT RESPONSIBLE FOR THE CHILD (FROM COLUMN 1 OF HOUSEHOLD SCHEDULE). RECORD '00' IF NOT LISTED.	LINE NUMBER . . . . . ☐☐	LINE NUMBER . . . . . ☐☐	LINE NUMBER . . . . . ☐☐
207	ASK CONSENT FOR ANEMIA TEST FROM PARENT/OTHER ADULT IDENTIFIED IN 206 AS RESPONSIBLE FOR CHILD.	As part of this survey, we are asking children all over the country to take an **anemia** test. Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia. We ask that all children born in 2006 or later take part in anemia testing in this survey and give a few drops of blood from a finger or heel. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. The blood will be tested for anemia immediately, and the result will be told to you right away. The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF CHILD) to participate in the anemia test?		
208	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6
209	ASK CONSENT FOR MALARIA TEST FROM PARENT/OTHER ADULT IDENTIFIED IN 206 AS RESPONSIBLE FOR CHILD.	As part of this survey, we are asking that children all over the country take a test to see if they have **malaria**. Malaria is a serious illness caused by a parasite transmitted by a mosquito bite. This survey will help the government to develop programs to prevent malaria. We ask that all children born in 2006 or later take part in malaria testing in this survey and give a few drops of blood from a finger or heel. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. (We will use blood from the same finger prick made for the anemia test). One blood drop will be tested for malaria immediately, and the result will be told to you right away. A few blood drops will be collected on a slide and taken to a laboratory for testing. You will not be told the results of the laboratory testing. All results will be kept strictly confidential and will not be shared with anyone other than members of our survey team. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF CHILD) to participate in the malaria testing?		
210	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6

211	PREPARE EQUIPMENT AND SUPPLIES ONLY FOR THE TEST(S) FOR WHICH CONSENT HAS BEEN OBTAINED AND PROCEED WITH THE TEST(S).			
212	BAR CODE LABEL	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT 99994 REFUSED ..... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE SLIDE AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT 99994 REFUSED ..... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE SLIDE AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT 99994 REFUSED ..... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE SLIDE AND THE 3RD ON THE TRANSMITTAL FORM.
213	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA AND MALARIA BROCHURE.	G/DL [ ][ ].[ ] NOT PRESENT .....994 REFUSED ....995 OTHER 996	G/DL [ ][ ].[ ] NOT PRESENT .....994 REFUSED ....995 OTHER 996	G/DL [ ][ ].[ ] NOT PRESENT .....994 REFUSED ....995 OTHER 996
214	RECORD RESULT CODE OF THE MALARIA RDT	TESTED .... 1 NOT PRESENT ..... 2 REFUSED .... 3 OTHER .... 6 (SKIP TO 216)	TESTED .... 1 NOT PRESENT ..... 2 REFUSED .... 3 OTHER .... 6 (SKIP TO 216)	TESTED .... 1 NOT PRESENT ..... 2 REFUSED .... 3 OTHER .... 6 (SKIP TO 216)
215	RECORD THE RESULT OF THE MALARIA RDT HERE AND IN THE ANEMIA AND MALARIA BROCHURE.	POSITIVE............ 1 (SKIP TO 218) NEGATIVE .... 2 OTHER 6	POSITIVE............ 1 (SKIP TO 218) NEGATIVE .... 2 OTHER 6	POSITIVE............ 1 (SKIP TO 218) NEGATIVE .... 2 OTHER 6
216	CHECK 213 HEMOGLOBIN RESULT	BELOW 8.0 G/DL, SEVERE ANEMIA 1 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER .... 6 (SKIP TO 227)	BELOW 8.0 G/DL, SEVERE ANEMIA 1 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER .... 6 (SKIP TO 227)	BELOW 8.0 G/DL, SEVERE ANEMIA 1 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER .... 6 (SKIP TO 227)
217	<u>**SEVERE ANEMIA REFERRAL**</u> STATEMENT	The anemia test shows that (NAME OF CHILD) has severe anemia. Your child is very ill and must be taken to a health facility immediately. SKIP TO 227		
218	Has (NAME) suffered from the any of following sicknesses or symptoms in the past few days: Extreme weakness: Inability to sit or stand? Inability to eat/drink or breastfeed? Pale and/or cold extremities? Persistent vomiting or vomiting everything? Heart problems? Loss of consciousness? Rapid or difficult breathing? Seizures? Abnormal bleeding? Jaundice (yellow skin)? Dark urine (brown)? IF NO SYMPTOMS, CIRCLE CODE Y	EXTREME WEAKNESS A INABILITY TO EAT ... B PALE OR COLD ..... C VOMITING .... D HEART PROBLEMS ... E LOSS OF CONSCIOUSNESS F RAPID BREATHING ... G SEIZURES .... H BLEEDING .... I JAUNDICE .... J DARK URINE .... K NO SYMPTOMS ..... Y	EXTREME WEAKNESS A INABILITY TO EAT ... B PALE OR COLD ..... C VOMITING .... D HEART PROBLEMS ... E LOSS OF CONSCIOUSNESS F RAPID BREATHING ... G SEIZURES .... H BLEEDING .... I JAUNDICE .... J DARK URINE .... K NO SYMPTOMS ..... Y	EXTREME WEAKNESS A INABILITY TO EAT ... B PALE OR COLD ..... C VOMITING .... D HEART PROBLEMS ... E LOSS OF CONSCIOUSNESS F RAPID BREATHING ... G SEIZURES .... H BLEEDING .... I JAUNDICE .... J DARK URINE .... K NO SYMPTOMS ..... Y
219	CHECK 218 CODE A-K CIRCLED?	CODE Y CIRCLED . . 1 CODE A-K CIRCLED 2 (SKIP TO 222)	CODE Y CIRCLED . . 1 CODE A-K CIRCLED 2 (SKIP TO 222)	CODE Y CIRCLED . . 1 CODE A-K CIRCLED 2 (SKIP TO 222)

220	CHECK 213 HEMOGLOBIN RESULT	BELOW 8.0 G/DL, SEVERE ANEMIA 1 (SKIP TO 222) 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER 6	BELOW 8.0 G/DL, SEVERE ANEMIA 1 (SKIP TO 222) 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER 6	BELOW 8.0 G/DL, SEVERE ANEMIA 1 (SKIP TO 222) 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER 6
221	In the past two weeks has (NAME) taken or is taking ACTs given by a doctor or health center to treat the malaria? VERIFY BY ASKING TO SEE TREATMENT	YES .... 1 (SKIP TO 223) NO .... 2 (SKIP TO 224)	YES .... 1 (SKIP TO 223) NO .... 2 (SKIP TO 224)	YES .... 1 (SKIP TO 223) NO .... 2 (SKIP TO 224)
222	**SEVERE MALARIA REFERRAL** STATEMENT	The malaria test shows that (NAME OF CHILD) has malaria. Your child also has symptoms of severe malaria. The malaria treatment I have will not help your child, and I cannot give you the medication. Your child is very ill and must be taken to a health facility right away. SKIP TO 226		
223	**ALREADY TAKING ACT REFERRAL STATEMENT**	You have told me that (NAME OF CHILD) has already received ACT for malaria. Therefore, I cannot give you additional ACT. However, the test shows that he/she is positive for malaria. If your child has a fever for two days after the last dose of ACT, you should take the child to the nearest health facility for further examination. SKIP TO 226		
224	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD	The malaria test shows that your child has malaria. We can give you free medicine. The medicine is called ACT. ACT is very effective and in a few days it should get rid of the fever and other symptoms. You do not have to give the child the medicine. This is up to you. Please tell me whether you accept the medicine or not.		
225	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	ACCEPTED MEDICINE 1 __________ (SIGN) REFUSED .... 2 OTHER 6	ACCEPTED MEDICINE 1 __________ (SIGN) REFUSED .... 2 OTHER 6	ACCEPTED MEDICINE 1 __________ (SIGN) REFUSED .... 2 OTHER 6
226	RECORD THE RESULT CODE OF **MALARIA TREATMENT OR REFERRAL**	MEDICATION GIVEN 1 MEDS REFUSED ..... 2 SEVERE MALARIA REFERRAL .... 3 ALREADY TAKING ACTS REFERRAL .... 4 OTHER 6	MEDICATION GIVEN 1 MEDS REFUSED ..... 2 SEVERE MALARIA REFERRAL .... 3 ALREADY TAKING ACTS REFERRAL .... 4 OTHER 6	MEDICATION GIVEN 1 MEDS REFUSED ..... 2 SEVERE MALARIA REFERRAL .... 3 ALREADY TAKING ACTS REFERRAL .... 4 OTHER 6
227	GO BACK TO 203 IN NEXT COLUMN OF THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE NEXT PAGE; IF NO MORE CHILDREN, END INTERVIEW.			

		CHILD 4	CHILD 5	CHILD 6
202	LINE NUMBER FROM COLUMN 9 NAME FROM COLUMN 2	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY MONTH AND YEAR OF BIRTH FROM BIRTH HISTORY AND ASK DAY; IF MOTHER NOT INTERVIEWED, ASK: What is (NAME)'s birth date?	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐
204	CHECK 203: CHILD BORN IN JANUARY 2006 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW)
205	CHECK 203: WAS CHILD BORN IN MONTH OF INTERVIEW OR FIVE PREVIOUS MONTHS?	YES . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW) NO 2	YES . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW) NO 2	YES . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, END INTERVIEW) NO 2
206	LINE NUMBER OF PARENT/ OTHER ADULT RESPONSIBLE FOR THE CHILD (FROM COLUMN 1 OF HOUSEHOLD SCHEDULE). RECORD '00' IF NOT LISTED.	LINE NUMBER . . . . . ☐☐	LINE NUMBER . . . . . ☐☐	LINE NUMBER . . . . . ☐☐
207	ASK CONSENT FOR ANEMIA TEST FROM PARENT/OTHER ADULT IDENTIFIED IN 206 AS RESPONSIBLE FOR CHILD.	As part of this survey, we are asking children all over the country to take an **anemia** test. Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia. We ask that all children born in 2006 or later take part in anemia testing in this survey and give a few drops of blood from a finger or heel. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. The blood will be tested for anemia immediately, and the result will be told to you right away. The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF CHILD) to participate in the anemia test?		
208	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6
209	ASK CONSENT FOR MALARIA TEST FROM PARENT/OTHER ADULT IDENTIFIED IN 206 AS RESPONSIBLE FOR CHILD.	As part of this survey, we are asking that children all over the country take a test to see if they have **malaria**. Malaria is a serious illness caused by a parasite transmitted by a mosquito bite. This survey will help the government to develop programs to prevent malaria. We ask that all children born in 2006 or later take part in malaria testing in this survey and give a few drops of blood from a finger or heel. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. (We will use blood from the same finger prick made for the anemia test). One blood drop will be tested for malaria immediately, and the result will be told to you right away. A few blood drops will be collected on a slide and taken to a laboratory for testing. You will not be told the results of the laboratory testing. All results will be kept strictly confidential and will not be shared with anyone other than members of our survey team. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF CHILD) to participate in the malaria testing?		
210	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6	GRANTED . . . . . 1 _____ (SIGN) REFUSED . . . . . 2 NOT PRESENT . . . . . 5 OTHER 6

211	PREPARE EQUIPMENT AND SUPPLIES ONLY FOR THE TEST(S) FOR WHICH CONSENT HAS BEEN OBTAINED AND PROCEED WITH THE TEST(S).			
212	BAR CODE LABEL	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT 99994 REFUSED ..... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE SLIDE AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT 99994 REFUSED ..... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE SLIDE AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT 99994 REFUSED ..... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE SLIDE AND THE 3RD ON THE TRANSMITTAL FORM.
213	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA AND MALARIA BROCHURE.	G/DL [ ][ ].[ ] NOT PRESENT .....994 REFUSED ....995 OTHER 996	G/DL [ ][ ].[ ] NOT PRESENT .....994 REFUSED ....995 OTHER 996	G/DL [ ][ ].[ ] NOT PRESENT .....994 REFUSED ....995 OTHER 996
214	RECORD RESULT CODE OF THE MALARIA RDT	TESTED .... 1 NOT PRESENT ..... 2 REFUSED .... 3 OTHER .... 6 (SKIP TO 216)	TESTED .... 1 NOT PRESENT ..... 2 REFUSED .... 3 OTHER .... 6 (SKIP TO 216)	TESTED .... 1 NOT PRESENT ..... 2 REFUSED .... 3 OTHER .... 6 (SKIP TO 216)
215	RECORD THE RESULT OF THE MALARIA RDT HERE AND IN THE ANEMIA AND MALARIA BROCHURE.	POSITIVE............ 1 (SKIP TO 218) NEGATIVE .... 2 OTHER 6	POSITIVE............ 1 (SKIP TO 218) NEGATIVE .... 2 OTHER 6	POSITIVE............ 1 (SKIP TO 218) NEGATIVE .... 2 OTHER 6
216	CHECK 213 HEMOGLOBIN RESULT	BELOW 8.0 G/DL, SEVERE ANEMIA 1 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER .... 6 (SKIP TO 227)	BELOW 8.0 G/DL, SEVERE ANEMIA 1 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER .... 6 (SKIP TO 227)	BELOW 8.0 G/DL, SEVERE ANEMIA 1 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER .... 6 (SKIP TO 227)
217	<u>**SEVERE ANEMIA REFERRAL**</u> STATEMENT	The anemia test shows that (NAME OF CHILD) has severe anemia. Your child is very ill and must be taken to a health facility immediately. SKIP TO 227		
218	Has (NAME) suffered from the any of following sicknesses or symptoms in the past few days: Extreme weakness: Inability to sit or stand? Inability to eat/drink or breastfeed? Pale and/or cold extremities? Persistent vomiting or vomiting everything? Heart problems? Loss of consciousness? Rapid or difficult breathing? Seizures? Abnormal bleeding? Jaundice (yellow skin)? Dark urine (brown)? IF NO SYMPTOMS, CIRCLE CODE Y	EXTREME WEAKNESS A INABILITY TO EAT ... B PALE OR COLD ..... C VOMITING .... D HEART PROBLEMS ... E LOSS OF CONSCIOUSNESS F RAPID BREATHING ... G SEIZURES .... H BLEEDING .... I JAUNDICE .... J DARK URINE .... K NO SYMPTOMS ..... Y	EXTREME WEAKNESS A INABILITY TO EAT ... B PALE OR COLD ..... C VOMITING .... D HEART PROBLEMS ... E LOSS OF CONSCIOUSNESS F RAPID BREATHING ... G SEIZURES .... H BLEEDING .... I JAUNDICE .... J DARK URINE .... K NO SYMPTOMS ..... Y	EXTREME WEAKNESS A INABILITY TO EAT ... B PALE OR COLD ..... C VOMITING .... D HEART PROBLEMS ... E LOSS OF CONSCIOUSNESS F RAPID BREATHING ... G SEIZURES .... H BLEEDING .... I JAUNDICE .... J DARK URINE .... K NO SYMPTOMS ..... Y
219	CHECK 218 CODE A-K CIRCLED?	CODE Y CIRCLED .. 1 CODE A-K CIRCLED 2 (SKIP TO 222)	CODE Y CIRCLED .. 1 CODE A-K CIRCLED 2 (SKIP TO 222)	CODE Y CIRCLED .. 1 CODE A-K CIRCLED 2 (SKIP TO 222)

220	CHECK 213 HEMOGLOBIN RESULT	BELOW 8.0 G/DL, SEVERE ANEMIA 1 (SKIP TO 222) 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER 6	BELOW 8.0 G/DL, SEVERE ANEMIA 1 (SKIP TO 222) 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER 6	BELOW 8.0 G/DL, SEVERE ANEMIA 1 (SKIP TO 222) 8.0 G/DL OR ABOVE 2 NOT PRESENT ..... 4 REFUSED .... 5 OTHER 6
221	In the past two weeks has (NAME) taken or is taking ACTs given by a doctor or health center to treat the malaria? VERIFY BY ASKING TO SEE TREATMENT	YES .... 1 (SKIP TO 223) NO .... 2 (SKIP TO 224)	YES .... 1 (SKIP TO 223) NO .... 2 (SKIP TO 224)	YES .... 1 (SKIP TO 223) NO .... 2 (SKIP TO 224)
222	**SEVERE MALARIA REFERRAL** STATEMENT	The malaria test shows that (NAME OF CHILD) has malaria. Your child also has symptoms of severe malaria. The malaria treatment I have will not help your child, and I cannot give you the medication. Your child is very ill and must be taken to a health facility right away. SKIP TO 226		
223	**ALREADY TAKING ACT REFERRAL STATEMENT**	You have told me that (NAME OF CHILD) has already received ACT for malaria. Therefore, I cannot give you additional ACT. However, the test shows that he/she is positive for malaria. If your child has a fever for two days after the last dose of ACT, you should take the child to the nearest health facility for further examination. SKIP TO 226		
224	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD	The malaria test shows that your child has malaria. We can give you free medicine. The medicine is called ACT. ACT is very effective and in a few days it should get rid of the fever and other symptoms. You do not have to give the child the medicine. This is up to you. Please tell me whether you accept the medicine or not.		
225	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	ACCEPTED MEDICINE 1 __________ (SIGN) REFUSED .... 2 OTHER 6	ACCEPTED MEDICINE 1 __________ (SIGN) REFUSED .... 2 OTHER 6	ACCEPTED MEDICINE 1 __________ (SIGN) REFUSED .... 2 OTHER 6
226	RECORD THE RESULT CODE OF **MALARIA TREATMENT OR REFERRAL**	MEDICATION GIVEN 1 MEDS REFUSED ..... 2 SEVERE MALARIA REFERRAL .... 3 ALREADY TAKING ACTS REFERRAL .... 4 OTHER 6	MEDICATION GIVEN 1 MEDS REFUSED ..... 2 SEVERE MALARIA REFERRAL .... 3 ALREADY TAKING ACTS REFERRAL .... 4 OTHER 6	MEDICATION GIVEN 1 MEDS REFUSED ..... 2 SEVERE MALARIA REFERRAL .... 3 ALREADY TAKING ACTS REFERRAL .... 4 OTHER 6
227	GO BACK TO 203 IN NEXT COLUMN OF THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF AN ADDITIONAL QUESTIONNAIRE; IF NO MORE CHILDREN, END INTERVIEW.			

TREATMENT FOR CHILDREN WITH POSITIVE MALARIA TESTS

The malaria test shows that your child has malaria. We can give you free medicine. The medicine is called ACT. ACT is very effective and in a few days it should get rid of the fever and other symptoms.

You do not have to give the child the medicine. This is up to you. Please tell me whether you accept the medicine or not.

TREATMENT WITH ACT			
Weight (in Kg)	**Age**	**Artesunate(AS) and Amodiaquine (AQ)**	**Dosage**
< 4.5 kgs.	< 6 months	NOTHING	NOTHING
4.5 < 9 kgs.	6-11 months	25 mg AS + 67.5 mg AQ	1 tablet once a day for 3 days
9-18 kgs.	1 - 5 years	50 mg AS + 135 mg AQ	1 tablet once a day for 3 days
Amodiaquine and Artesunate (ACT) are to be taken together once a day for 3 days. IF THE CHILD WEIGHS LESS THAN 4.5 KGS., DO NOT LEAVE DRUGS. TELL THE PARENT TO TAKE THE CHILD TO HEALTH FACILITY.			

ALSO TELL THE PARENT/ADULT RESPONSIBLE FOR THE CHILD:
If [NAME] has a fever for two days after completing the last dose of ACTs, you should take him/her to a health professional for treatment right away.

2011 LIBERIA MALARIA INDICATOR SURVEY
NATIONAL MALARIA CONTROL PROGRAM - MINISTRY OF HEALTH AND SOCIAL WELFARE
LIBERIA INSTITUTE OF STATISTICS AND GEO-INFORMATION SERVICES

WOMAN'S QUESTIONNAIRE

IDENTIFICATION

NAME OF COUNTY _____	. . . . .
NAME OF DISTRICT _____	. . . . .
NAME OF CLAN/TOWNSHIP _____	
NAME OF CITY/TOWN/VILLAGE _____	
LMIS CLUSTER NUMBER	. . . . .
HOUSEHOLD NUMBER	. . . . .
URBAN: MONROVIA=1; OTHER URBAN=2; VILLAGE=3	. . . . .
NAME OF HOUSEHOLD HEAD _____	
NAME AND LINE NUMBER OF WOMAN _____	

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY
				MONTH
				YEAR 2 0 1
INTERVIEWER'S NAME				INT. NUMBER
RESULT*				RESULT
NEXT VISIT: DATE				TOTAL NUMBER OF VISITS
TIME				

*RESULT CODES:

1	COMPLETED	4	REFUSED		
2	NOT AT HOME	5	PARTLY COMPLETED	7	OTHER _____ (SPECIFY)
3	POSTPONED	6	INCAPACITATED		

SUPERVISOR	OFFICE EDITOR	KEYED BY
NAME _____		
DATE _____		

INTRODUCTION AND CONSENT

Hello. My name is _____. I am working with Ministry of Health. We are conducting a survey about health all over Liberia. The information we collect will help the government to plan health services. Your household was selected for the survey. The questions usually take about 10 to 20 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on the card that has already been given to your household.

Do you want to ask me anything about the survey? May I begin the interview now?

Signature of interviewer: _____ Date: _____

RESPONDENT AGREES TO BE INTERVIEWED . . . 1 ↓ RESPONDENT DOES NOT AGREE TO BE INTERVIEWED . . . 2 → END

SECTION 1. RESPONDENT'S BACKGROUND

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101	RECORD THE TIME.	HOUR . . . . . [ ][ ] MINUTES . . . . . [ ][ ]	
102	In what month and year were you born?	MONTH . . . . . [ ][ ] DON'T KNOW MONTH . . . . . 98 YEAR . . . . . [ ][ ][ ][ ] DON'T KNOW YEAR 9998	
103	How old are you? COMPARE AND CORRECT 102 AND/OR 103 IF INCONSISTENT.	AGE IN COMPLETED YEARS [ ][ ]	
104	Have you ever attended school?	YES . . . . . 1 NO 2	→ 107
105	What is the highest level of school you attended: primary, secondary, or higher?	PRIMARY . . . . . 1 SECONDARY . . . . . 2 HIGHER 3	
106	What is the highest grade you completed?	GRADE . . . . . [ ][ ]	
107	What is your religion?	CHRISTIAN . . . . . 1 MUSLIM . . . . . 2 TRADITIONAL RELIGION . . . . . 3 NO RELIGION . . . . . 4 OTHER _____ 6 (SPECIFY)	
108	What dialect do you speak very well (besides English)?	BASSA . . . . . 01 GBANDI . . . . . 02 BELLE . . . . . 03 DEY . . . . . 04 GIO . . . . . 05 GOLA . . . . . 06 GREBO . . . . . 07 KISSI . . . . . 08 KPELLE . . . . . 09 KRAHN . . . . . 10 KRU . . . . . 11 LORMA . . . . . 12 MANDIGO . . . . . 13 MANO . . . . . 14 MENDE . . . . . 15 VAI . . . . . 16 NONE / ONLY ENGLISH . . . . . 17 OTHER 96	

SECTION 2. REPRODUCTION

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
201	Now I would like to ask about all the births you have had during your life. Have you ever born a child?	YES . . . . . 1 NO 2	→ 206
202	Do you have any children you born who are living with you? I mean belly born.	YES . . . . . 1 NO 2	→ 204
203	How many sons live with you? And how many daughters live with you? IF NONE, RECORD '00'.	SONS AT HOME . . . . . [ ][ ] DAUGHTERS AT HOME . . . . . [ ][ ]	
204	Do you have any children you born who are alive but do not live with you?	YES . . . . . 1 NO 2	→ 206
205	How many sons are alive but do not live with you? And how many daughters are alive but do not live with you? IF NONE, RECORD '00'.	SONS ELSEWHERE . . . . . [ ][ ] DAUGHTERS ELSEWHERE . [ ][ ]	
206	Have you ever born a child who was born alive and later died? IF NO, PROBE: Any baby who cried or showed signs of life but did not survive?	YES . . . . . 1 NO 2	→ 208
207	How many boys have died? And how many girls have died? IF NONE, RECORD '00'.	BOYS DEAD . . . . . [ ][ ] GIRLS DEAD . . . . . [ ][ ]	
208	SUM ANSWERS TO 203, 205, AND 207, AND ENTER TOTAL. IF NONE, CIRCLE '00'.	TOTAL BIRTHS . . . . . [ ][ ] NONE 00	
209	CHECK 208: Just to make sure that I have this right: you have had in TOTAL _____ births during your life. Is that correct? YES ☐ NO ☐ → PROBE AND CORRECT 201-208 AS NECESSARY.		
210	Now I'd like to ask you about your more recent births. How many births have you had in the last 6 years? IF NONE CIRCLE '00.'	TOTAL BIRTHS IN THE LAST 6 YEARS . . . . . [ ][ ] NONE 00	→ 224

211

Now I want the names of all the children you born in the **last six years**, whether still alive or not, starting with your last/most recent birth.

RECORD NAMES OF ALL THE BIRTHS IN THE LAST 6 YEARS IN 212. RECORD TWINS AND TRIPLETS ON SEPARATE ROWS.

212 What is/was the name of your (most recent/ next) child? RECORD NAME BIRTH HISTORY NUMBER	213 Is (NAME) a boy or a girl?	214 Were any of these births twins?	215 In what month and year was (NAME) born? PROBE: What is his/her birthday?	216 Is (NAME) still living?	217 IF LIVING: How old is (NAME)? RECORD AGE IN COM-PLETED YEARS.	218 IF LIVING: Is (NAME) living with you?	219 IF LIVING: RECORD HOUSE-HOLD LINE NUMBER OF CHILD (RECORD '00' IF CHILD NOT LISTED IN HOUSE-HOLD).	220 Did you born any other child between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
01	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ NEXT BIRTH	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐ ↓ (NEXT BIRTH)	
02	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ 220	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
03	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ 220	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
04	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ 220	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
05	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ 220	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
06	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ 220	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
07	BOY 1 GIRL 2	SING 1 MULT 2	MONTH ☐☐ YEAR ☐☐☐☐	YES . . . . 1 NO . . . . 2 ↓ 220	AGE IN YEARS ☐☐	YES . . . . 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
221	Did you born any child since the birth of (NAME OF MOST RECENT BIRTH)? IF YES, RECORD BIRTH(S) IN TABLE.	YES . . . . . 1 NO 2	
222	COMPARE 210 WITH NUMBER OF BIRTHS IN HISTORY AND MARK: NUMBERS ARE SAME NUMBERS ARE DIFFERENT → (PROBE AND RECONCILE.)		
223	CHECK 215: ENTER THE NUMBER OF BIRTHS IN 2006 OR LATER. IF NONE CIRCLE '0.'	NUMBER OF BIRTHS . . . . . ☐ NONE 0	
224	Are you pregnant now?	YES . . . . . 1 NO . . . . . 2 UNSURE 8	→ 226
225	How many months pregnant are you? RECORD NUMBER OF COMPLETED MONTHS.	MONTHS . . . . . ☐☐	
226	CHECK 223: ONE OR MORE BIRTHS IN 2006 OR LATER NO BIRTHS IN 2006 OR LATER OR IS BLANK → 501		

SECTION 3. PREGNANCY AND INTERMITTENT PREVENTIVE TREATMENT

301	CHECK 212 AND 215: ENTER IN 302 THE NAME AND BIRTH HISTORY NUMBER OF THE MOST RECENT BIRTH SINCE 2006 EVEN IF THE CHILD IS NO LONGER ALIVE. Now I would like to ask you some questions about your last pregnancy that ended in a live birth.		
302	NAME AND BIRTH HISTORY NUMBER FROM 212	NAME OF LAST BIRTH _____ BIRTH HISTORY NO.	
303	When you were pregnant with (NAME) did you see anyone for a check-up (prenatal care) for this pregnancy? IF YES: Whom did you see? Anyone else? PROBE TO IDENTIFY EACH TYPE OF PERSON AND RECORD ALL MENTIONED.	HEALTH PERSONNEL DOCTOR . . . . . A NURSE/MIDWIFE . . . . . B PHYSICIAN ASST. . . . . C TRADITIONAL MIDWIFE . . . . . D OTHER _____ X (SPECIFY) NO ONE . . . . . Y	
303A	During this pregnancy, did anyone tell you that pregnant women need to take some kind of medicine to keep them from getting malaria? EMPHASIZE THE WORD 'KEEP'.	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
304	During this pregnancy, did you take any medicine to keep you from getting malaria? EMPHASIZE 'KEEP'. DO NOT CIRCLE '1' IF SHE WAS ONLY GIVEN DRUGS BECAUSE SHE HAD MALARIA.	YES . . . . . 1 NO . . . . . 2 → 401 DON'T KNOW 8	
305	What medicine did you take to keep from getting malaria? RECORD ALL MENTIONED. IF SHE DOES NOT KNOW THE TYPE OF DRUG, SHOW HER THE TYPICAL ANTIMALARIAL DRUGS. TREATMENT WITH SP/FANSIDAR USUALLY CONSISTS OF TAKING 3 BIG WHITE TABLETS AT THE HEALTH FACILITY.	SP/FANSIDAR . . . . . A CHLOROQUINE . . . . . B OTHER _____ X (SPECIFY) DON'T KNOW . . . . . Z	
306	CHECK 305: DRUGS TAKEN FOR MALARIA PREVENTION CODE 'A' CIRCLED → ↓ CODE 'A' NOT CIRCLED → 401		
307	How many times did you take (SP/Fansidar) during this pregnancy?	TIMES	
308	CHECK 303: PRENATAL CARE FROM HEALTH PERSONNEL DURING THIS PREGNANCY CODE 'A', 'B' OR 'C' CIRCLED → ↓ OTHER → 401		
309	Did you get the (SP/Fansidar) during any prenatal care visit, during another visit to a health facility or from another source?	PRENATAL VISIT . . . . . 1 ANOTHER FACILITY VISIT . . . . . 2 OTHER SOURCE _____ 6 (SPECIFY)	

SECTION 4. FEVER IN CHILDREN

401	CHECK 215: ENTER IN THE TABLE THE BIRTH HISTORY NUMBER, NAME, AND SURVIVAL STATUS OF EACH BIRTH IN 2006 OR LATER. ASK THE QUESTIONS ABOUT ALL OF THESE BIRTHS. BEGIN WITH THE LAST BIRTH. (IF THERE ARE MORE THAN 3 BIRTHS, USE LAST 2 COLUMNS OF ADDITIONAL QUESTIONNAIRES). Now I would like to ask some questions about the health of your children born since January 2006. (We will talk about each separately.)			
402	BIRTH HISTORY NUMBER FROM 212	LAST BIRTH BIRTH HISTORY NUMBER . . . [ ][ ]	NEXT-TO-LAST BIRTH BIRTH HISTORY NUMBER . . . [ ][ ]	SECOND-FROM-LAST BIRTH BIRTH HISTORY NUMBER . . . [ ][ ]
403	FROM 212 AND 216	NAME ______ LIVING [ ] DEAD [ ] (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 501)	NAME ______ LIVING [ ] DEAD [ ] (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 501)	NAME ______ LIVING [ ] DEAD [ ] (GO TO 403 IN THE NEXT-TO-LAST COLUMN OF NEW QUESTIONNAIRE, OR IF NO MORE BIRTHS, GO TO 501)
404	Has (NAME) been ill with a fever at any time in the last 2 weeks?	YES . . . . 1 NO . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8	YES . . . . 1 NO . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8	YES . . . . 1 NO . . . . 2 (GO TO 403 IN NEXT-TO LAST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8
406	Did you seek advice or treatment for the fever from any source?	YES . . . . 1 NO . . . . 2 (SKIP TO 411A)	YES . . . . 1 NO . . . . 2 (SKIP TO 411A)	YES . . . . 1 NO . . . . 2 (SKIP TO 411A)
407	Where did you get treatment from? Anywhere else? PROBE TO IDENTIFY EACH TYPE OF SOURCE AND CIRCLE THE APPROPRIATE CODE(S). IF UNABLE TO DETERMINE IF A HOSPITAL, HEALTH CENTER, OR CLINIC IS PUBLIC OR PRIVATE MEDICAL, WRITE THE THE NAME OF THE PLACE. ______ (NAME OF PLACE(S))	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . B GOVT HEALTH POST . . . . C MOBILE CLINIC D FIELDWORKER E OTHER PUBLIC SECTOR ______ F (SPECIFY) **PRIVATE MED SECTOR** PVT HOSPITAL/ CLINIC . . . . G PHARMACY . . . H PVT DOCTOR . . . I MOBILE CLINIC J FIELDWORKER K OTHER PRIVATE MED. SECTOR ______ L (SPECIFY) **OTHER SOURCE** MEDICINE STORE M TRADITIONAL PRACTITIONER N MARKET . . . . . O BLACK BAGGER/ DRUG PEDDLER P OTHER ______ X (SPECIFY)	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . B GOVT HEALTH POST . . . . C MOBILE CLINIC D FIELDWORKER E OTHER PUBLIC SECTOR ______ F (SPECIFY) **PRIVATE MED SECTOR** PVT HOSPITAL/ CLINIC . . . . G PHARMACY . . . H PVT DOCTOR . . . I MOBILE CLINIC J FIELDWORKER K OTHER PRIVATE MED. SECTOR ______ L (SPECIFY) **OTHER SOURCE** MEDICINE STORE M TRADITIONAL PRACTITIONER N MARKET . . . . . O BLACK BAGGER/ DRUG PEDDLER P OTHER ______ X (SPECIFY)	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . B GOVT HEALTH POST . . . . C MOBILE CLINIC D FIELDWORKER E OTHER PUBLIC SECTOR ______ F (SPECIFY) **PRIVATE MED SECTOR** PVT HOSPITAL/ CLINIC . . . . G PHARMACY . . . H PVT DOCTOR . . . I MOBILE CLINIC J FIELDWORKER K OTHER PRIVATE MED. SECTOR ______ L (SPECIFY) **OTHER SOURCE** MEDICINE STORE M TRADITIONAL PRACTITIONER N MARKET . . . . . O BLACK BAGGER/ DRUG PEDDLER P OTHER ______ X (SPECIFY)

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ______	NEXT-TO-LAST BIRTH NAME ______	SECOND-FROM-LAST BIRTH NAME ______
408	CHECK 407:	TWO OR MORE CODES CIRCLED [ ] / ONLY ONE CODE CIRCLED [ ] (SKIP TO 411A)	TWO OR MORE CODES CIRCLED [ ] / ONLY ONE CODE CIRCLED [ ] (SKIP TO 411A)	TWO OR MORE CODES CIRCLED [ ] / ONLY ONE CODE CIRCLED [ ] (SKIP TO 411A)
409	Where did you first go for advice or treatment? USE LETTER CODE FROM 407.	FIRST PLACE . . . [ ]	FIRST PLACE . . . [ ]	FIRST PLACE . . . [ ]
411A	At any time during the sickness, did (NAME) have a drop of blood taken from his/her finger or heel?	YES . . . . 1 NO . . . . 2 DON'T KNOW 8	YES . . . . 1 NO . . . . 2 DON'T KNOW 8	YES . . . . 1 NO . . . . 2 DON'T KNOW 8
412	At any time during the sickness, did (NAME) take any medicine for the sickness?	YES . . . . 1 NO . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8	YES . . . . 1 NO . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8	YES . . . . 1 NO . . . . 2 (GO TO 403 IN NEXT-TO-LAST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8
413	What medicine did (NAME) take? Any other medicine? RECORD ALL MENTIONED.	**ANTIMALARIAL DRUGS** SP/FANSIDAR . . . A CHLOROQUINE B QUININE . . . . C NEW MALARIA MEDICINE (ACT) D OTHER ANTI-MALARIAL ______ . . . E (SPECIFY) **ANTIBIOTIC DRUGS** PILL/SYRUP . . . F INJECTION . . . G **OTHER DRUGS** ASPIRIN . . . . H PARACETOMOL I IBUPROFEN . . . J OTHER ______ X (SPECIFY) DON'T KNOW . . . . . Z	**ANTIMALARIAL DRUGS** SP/FANSIDAR . . . A CHLOROQUINE . B QUININE . . . . C NEW MALARIA MEDICINE (ACT) D OTHER ANTI-MALARIAL ______ . . . E (SPECIFY) **ANTIBIOTIC DRUGS** PILL/SYRUP . . . F INJECTION . . . G **OTHER DRUGS** ASPIRIN . . . . H PARACETOMOL I IBUPROFEN . . . J OTHER ______ X (SPECIFY) DON'T KNOW . . . . . Z	**ANTIMALARIAL DRUGS** SP/FANSIDAR . . . A CHLOROQUINE B QUININE . . . . C NEW MALARIA MEDICINE (ACT) D OTHER ANTI-MALARIAL ______ . . . E (SPECIFY) **ANTIBIOTIC DRUGS** PILL/SYRUP . . . F INJECTION . . . G **OTHER DRUGS** ASPIRIN . . . . H PARACETOMOL I IBUPROFEN . . . J OTHER ______ X (SPECIFY) DON'T KNOW . . . . . Z
414	CHECK 413: ANY CODE A-E CIRCLED?	YES [ ] / NO [ ] (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501)	YES [ ] / NO [ ] (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501)	YES [ ] / NO [ ] (GO TO 403 IN NEXT-TO-LAST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501)
416	CHECK 413: SP/FANSIDAR ('A') GIVEN	CODE 'A' CIRCLED [ ] / CODE 'A' NOT CIRCLED [ ] (SKIP TO 419)	CODE 'A' CIRCLED [ ] / CODE 'A' NOT CIRCLED [ ] (SKIP TO 419)	CODE 'A' CIRCLED [ ] / CODE 'A' NOT CIRCLED [ ] (SKIP TO 419)
417	How long after the fever started did (NAME) first take SP/Fansidar?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ________	NEXT-TO-LAST BIRTH NAME ________	SECOND-FROM-LAST BIRTH NAME ________
419	CHECK 413: CHLOROQUINE ('B') GIVEN	CODE 'B' CIRCLED ☐ ↓ CODE 'B' NOT CIRCLED ☐ (SKIP TO 422)	CODE 'B' CIRCLED ☐ ↓ CODE 'B' NOT CIRCLED ☐ (SKIP TO 422)	CODE 'B' CIRCLED ☐ ↓ CODE 'B' NOT CIRCLED ☐ (SKIP TO 422)
420	How long after the fever started did (NAME) first take chloroquine?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
422	CHECK 413: QUININE ('C') GIVEN	CODE 'C' CIRCLED ☐ ↓ CODE 'C' NOT CIRCLED ☐ (SKIP TO 425)	CODE 'C' CIRCLED ☐ ↓ CODE 'C' NOT CIRCLED ☐ (SKIP TO 425)	CODE 'C' CIRCLED ☐ ↓ CODE 'C' NOT CIRCLED ☐ (SKIP TO 425)
423	How long after the fever started did (NAME) first take quinine?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
425	CHECK 413: NEW MALARIA MEDICINE (ACT) ('D') GIVEN	CODE 'D' CIRCLED ☐ ↓ CODE 'D' NOT CIRCLED ☐ (SKIP TO 428)	CODE 'D' CIRCLED ☐ ↓ CODE 'D' NOT CIRCLED ☐ (SKIP TO 428)	CODE 'D' CIRCLED ☐ ↓ CODE 'D' NOT CIRCLED ☐ (SKIP TO 428)
426	How long after the fever started did (NAME) first take the new malaria medicine (ACT)?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
428	CHECK 413: OTHER ANTIMALARIAL ('E') GIVEN	CODE 'E' CIRCLED ☐ ↓ CODE 'E' NOT CIRCLED ☐ (SKIP TO 431)	CODE 'E' CIRCLED ☐ ↓ CODE 'E' NOT CIRCLED ☐ (SKIP TO 431)	CODE 'E' CIRCLED ☐ ↓ CODE 'E' NOT CIRCLED ☐ (SKIP TO 431)
429	How long after the fever started did (NAME) first take the (OTHER ANTIMALARIAL)?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
431		GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501.	GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 501.	GO TO 403 IN NEXT-TO-LAST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501.

SECTION 5. KNOWLEDGE OF MALARIA

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
501	Have you ever heard of an sickness called malaria?	YES . . . . . 1 NO 2	→ 512
502	What are some things that can happen to you when you have malaria? CIRCLE ALL MENTIONED.	FEVER . . . . . A CHILLS . . . . . B HEADACHE . . . . . C JOINT PAIN . . . . . D POOR APPETITE . . . . . E BODY PAIN . . . . . F OTHER _____ X (SPECIFY) DOES NOT KNOW ANY . . . . . Z	
503	Which group of people are most likely to get malaria? CIRCLE ALL MENTIONED.	CHILDREN . . . . . A PREGNANT WOMEN . . . . . B ADULTS . . . . . C ELDERLY . . . . . D EVERYONE . . . . . E DOES NOT KNOW . . . . . Z	
504	What causes malaria? CIRCLE ALL MENTIONED.	MOSQUITOES . . . . . A DIRTY WATER . . . . . B DIRTY SURROUNDINGS . . . . . C BEER . . . . . D CERTAIN FOODS . . . . . E OTHER _____ X (SPECIFY) DOES NOT KNOW ANY . . . . . Z	
505	Are there things people can do to stop them from getting malaria?	YES . . . . . 1 NO 2	→ 507
506	What are the some of the things that people can do to stop them from getting malaria? CIRCLE ALL MENTIONED.	SLEEP UNDER MOSQUITO NET . . . . . A USE MOSQUITO COILS . . . . . B USE INSECTICIDE SPRAY . . . . . C KEEP DOORS AND WINDOWS CLOSED D USE INSECT REPELLANT . . . . . E KEEP SURROUNDINGS CLEAN . . . . . F CUT THE GRASS . . . . . G OTHER _____ X (SPECIFY) DOES NOT KNOW ANY . . . . . Z	
507	Can malaria be treated?	YES . . . . . 1 NO . . . . . 2 DOES NOT KNOW 8	→ 509
508	What medicines are used to treat malaria? CIRCLE ALL MENTIONED.	SP/FANSIDAR . . . . . A CHLOROQUINE . . . . . B QUININE . . . . . C NEW MALARIA DRUG (ACT) . . . . . D ASPIRIN, PANADOL, PARACETEMOL E OTHER _____ X (SPECIFY) DOES NOT KNOW ANY . . . . . Z	
509	In the past few months, have you seen or heard any messages about malaria?	YES . . . . . 1 NO 2	→ 512

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
510	What messages about malaria have you seen or heard? CIRCLE ALL MENTIONED.	IF HAVE FEVER, GO TO HEALTH FACILITY . . . . . A SLEEP UNDER MOSQUITO BED NETS B PREGNANT WOMEN SHOULD TAKE DRUGS TO PREVENT MALARIA . . . C MALARIA KILLS . . . . . D OTHER _____ X (SPECIFY) DOES NOT KNOW ANY . . . . . Z	
511	Where did you hear or see these messages? CIRCLE ALL MENTIONED.	RADIO . . . . . A BILLBOARD . . . . . B POSTER . . . . . C T-SHIRT . . . . . D LEAFLET/FACT SHEET/ BROCHURE E TELEVISION . . . . . F VIDEO CLUB . . . . . G SCHOOL . . . . . H COMMUNITY HEALTH WORKERS, TTM, TBA, HEALTH PROMOTERS . I PEER EDUCATORS . . . . . J OTHER _____ X (SPECIFY)	
512	RECORD THE TIME.	HOUR . . . . . [ ][ ] MINUTES . . . . . [ ][ ]	

INTERVIEWER'S OBSERVATIONS

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS ABOUT RESPONDENT:

COMMENTS ON SPECIFIC QUESTIONS:

ANY OTHER COMMENTS:

SUPERVISOR'S OBSERVATIONS

NAME OF SUPERVISOR: _____ DATE: _____