Liberia

Malaria Indicator Survey

2009

Liberia
Malaria Indicator Survey
2009

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

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

ICF Macro
Calverton, Maryland, USA

September 2009

This report summarizes the findings of the 2009 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 U.S. Agency for International Development (USAID) from PMI funds through ICF Macro, an ICF International Company. ICF Macro also provided technical assistance and medical supplies and equipment for the survey through the MEASURE DHS program, which is funded by the USAID and is designed to assist developing countries to collect 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, P.O. 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 Macro, 11785 Beltsville Drive, Suite 300, Calverton, MD 20705, U.S.A. (Telephone: 1-301-572-0200; Fax: 1-301-572-0999; E-mail: reports@macrointernational.com).

Suggested citation:

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

CONTENTS

TABLES AND FIGURES

CHAPTER 4 MALARIA

APPENDIX A SAMPLE DESIGN

APPENDIX B ESTIMATES OF SAMPLING ERRORS

APPENDIX C DATA QUALITY TABLES

FOREWORD

Malaria, though preventable and curable, still 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 & Social Welfare (MOH&SW), through the National Malaria Control Program (NMCP), introduced a policy and strategic plan for malaria control and prevention. This plan is in line with the Abuja Declaration, which the Government of Liberia signed in April 2000. The measures laid out in the National Strategic Plan are attempts to fulfil the objective of reducing malaria morbidity and mortality by 50 percent by the year 2010, set by the Roll Back Malaria (RBM) initiative of the World Health Organization (WHO).

Some resources have been mobilized from the Global Funds for AIDS, Tuberculosis and Malaria (GFATM) and the U.S. President's Malaria Initiative (PMI) and other partners to implement this National Malaria Strategic Plan. Since 2005, the NMCP and her partners have increased implementation of key interventions such as use of artemisinin-based combination therapy (ACT), long-lasting insecticide-treated mosquito nets (LLINs) and education and behavior change programs in Liberia.

One of the key tools to improve the management of malaria control activities in any country is an accurate and reliable indicator database. The MOH&SW is currently strengthening the integrated Health Management Information System (HMIS) unit in an effort to provide a repository for routine data for the Ministry. At present, data from the HMIS are not very reliable and cover only those with access to health facilities, estimated to be about half the population.

Thus, the NMCP relies on the Liberia Malaria Indicator Survey (LMIS) every two years in order to track 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 need to update the 2005 data was the impetus for the 2009 LMIS.

The results presented in this report clearly indicate that coverage of malaria control interventions in Liberia is increasing gradually. However, use of these interventions is still low, indicating that more needs to be done both by the MOH&SW and her partners in terms of behaviour change communication, if Liberia is to achieve the WHO/RBM targets of reducing malaria morbidity and mortality by 50 percent by the year 2010.

The information in this report will help the NMCP and other partners in the RBM initiative to assess the current Malaria Control Policy and Strategic Plan and 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.

Mr. Tornorlah Varpilah

DEPUTY MINISTER FOR PLANNING, RESEARCH AND DEVELOPMENT,
MINISTRY OF HEALTH & SOCIAL WELFARE
REPUBLIC OF LIBERIA

ACKNOWLEDGMENTS

I would herein like to extend my heartfelt thanks and appreciation to all institutions and individuals that made the 2009 Liberia Malaria Indictor Survey (LMIS) achievable.

The LMIS was conducted under the auspices of the National Malaria Control Program (NMCP) of the Ministry of Health and Social Welfare (MOH&SW) and the Liberia Institute for Statistics and Geo-Information Services (LISGIS), with technical support from the MEASURE DHS project at ICF Macro. Financial support was provided by the President's Malaria Initiative (PMI) through the United States Agency for International Development (USAID). Funds from the Global Fund for AIDS, Tuberculosis and Malaria and the United Nations Development Program were used to partition office space at the NMCP's headquarters to accommodate the data processing operation.

The overall coordinating body for the LMIS was the Planning and Coordinating Committee (PCC), made up of the Planning Department of the MOH&SW, LISGIS, UNICEF, and WHO.

Administrative and moral support was provided by many individuals, including Dr. Walter Gwenigale, Minister of Health & Social Welfare, RL; Mr. Tornorlah Varpilah, Deputy Minister for Planning, Research & Human Resource Development, MOH&SW; Dr. Bernice Dahn, Deputy Minister/Chief Medical Officer, MOH&SW, RL; Mr. T. Edward Liberty, Director, LISGIS; Mr. Tolbert Nyenswah, Deputy Program Manager, NMCP/MOH&SW; Mr. Christopher McDermott, Health Team Leader, USAID; Dr. Kassahun Abate Belay, Malaria Advisor, USAID/PMI; Dr. Filiberto Hernandez, PMI/CDC; Dr. James Tanu Duworko, USAID; Mr. Kaa Williams, USAID; County Health Officers of the 15 counties; and the Internal Affairs Ministry and County Superintendents of the 15 counties. Finally, Dr. Saye Dahn Baawo of the Family Health Division of the MOH&SW made valuable comments on the questionnaire.

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.

Dr. Joel J. Jones
PROGRAM MANAGER
NATIONAL MALARIA CONTROL PROGRAM
MINISTRY OF HEALTH & SOCIAL WELFARE
REPUBLIC OF LIBERIA

ABBREVIATIONS

ACT	Artemesinin-combination therapy
CBR	Crude birth rate
EA	Enumeration area
GFR	General fertility rate
IPT	Intermittent preventive treatment
ITN	Insecticide-treated mosquito net
LDHS	Liberia Demographic and Health Survey
LMIS	Liberia Malaria Indicator Survey
LISGIS	Liberia Institute of Statistics and Geo-Information Services
MOH&SW	Ministry of Health and Social Welfare
NMCP	National Malaria Control Program
NN	Neonatal
PMI	President's Malaria Initiative
PNN	Postneonatal
RDT	Rapid diagnostic test
SP	Sulphadoxine-pyrimethamine
TFR	Total fertility rate
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization

SUMMARY OF FINDINGS

The 2009 LMIS was carried out from mid-December 2008 to March 2009, using a nationally representative sample of 4,500 households. All women age 15-49 years in these households were eligible to be individually interviewed and were asked questions about malaria prevention during pregnancy and treatment of childhood fevers. In addition, the survey included testing for anemia and malaria among children age 6-59 months. Using a finger prick blood sample, 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 taken to a laboratory in Monrovia for malaria testing.

The 2009 LMIS was designed to provide data to monitor all the key malaria indicators in Liberia. Specifically, the LMIS collected information on ownership and use of mosquito bed nets—including insecticide-treated nets, intermittent preventive treatment for pregnant women, timing and type of treatment of childhood fever, and prevalence of malaria parasites and anemia among young children.

BEDNET OWNERSHIP AND USE

The survey documented a dramatic increase in household ownership of mosquito bednets. Overall, 49 percent of households in Liberia have at least one mosquito net (treated or untreated), and 19 percent have more than one net. This is a big improvement over the household net ownership of 18 percent recorded in 2005, and a sizeable jump in the last two years from the 30 percent recorded in the 2007 Liberia Demographic and Health Survey. It is also reassuring to note that almost all nets are insecticide-treated nets (ITNs); 47 percent of households report owning an ITN.

Although the survey took place just after the height of the malaria transmission season, slightly over one-quarter of children (26 percent) were reported to have slept under an ITN the night before the survey. Twenty-nine percent of all women and 33 percent of pregnant women reported that they slept under an ITN the night before the survey.

INTERMITTENT PREVENTIVE TREATMENT FOR PREGNANT WOMEN

In the 2009 LMIS, women who had a live birth in the two years preceding the survey were asked if they had taken any drugs to prevent getting malaria during that pregnancy and, if yes, which drug. Almost half (45 percent) of women reported that they took SP/Fansidar two or more times during the pregnancy at a prenatal care visit, a huge improvement from the 4 percent measured in the 2005 survey.

TREATMENT OF CHILDHOOD FEVER

In the 2009 LMIS, mothers were asked whether their children under five years had had a fever in the two weeks preceding the survey and if so, whether the child was given any medicine and if so, what kind. Survey results show that 44 percent of children under five had a fever in the two weeks preceding the survey and, of these, two-thirds took some type of antimalarial drug.

Thirty percent of mothers said that the child was given the "new malaria medicine", the common name given for the recommended combination drug, artesunate plus amodiaquine. This is an encouraging increase from the 3 percent reported to be using ACT as measured in the 2005 MIS and the 9 percent reported in the 2007 LDHS. Nevertheless, it is discouraging to note that almost the same proportion of children (28 percent) are reported to have received chloroquine for their fever.

Anemia in Children

Survey data confirm that anemia is a critical public health problem in Liberia. Almost two-thirds (63 percent) of Liberian children 6-59 months old are anemic. Twenty-nine percent of children are mildly anemic, while another 29 percent are moderately anemic, and 5 percent are severely anemic.

Malaria Prevalence in Children

Malaria parasitemia among children age 6-59 months was measured in the 2009 LMIS in two ways. In the field, health technicians used the Paracheck Pf™ rapid diagnostic blood test to determine whether children had malaria. In addition, health technicians made thick blood smears that were brought back to Monrovia for microscopic testing in the laboratory.

According to the microscopy readings in the central laboratory, 32 percent of children 6-59 months tested positive for malaria.

Fertility and Child Mortality

Although measuring fertility and childhood mortality indicators was not an objective of the LMIS, they are useful by-products. To measure indicators related to coverage of intermittent malaria prevention treatment during pregnancy and treatment of childhood fever, a complete birth history was included in the LMIS as part of the woman's questionnaire.

Results indicate that the total fertility rate in Liberia was 5.9 children per woman for the three-year period preceding the survey (roughly 2006 through 2008). This represents a sizeable increase from the level of 5.2 children measured in the 2007 LDHS. Since it is unlikely that fertility rates would have increased so much in such a short time, a more likely explanation is that the earlier survey may have underestimated the level of fertility.

With regard to childhood mortality, the 2009 LMIS data indicate no significant change since the 2007 LDHS. For example, for the five years immediately preceding the surveys, the infant mortality rate was 73 deaths per 1,000 live births as measured in the 2009 LMIS, compared with 71 as measured in the 2007 LDHS. Similarly, under-five mortality was 114 deaths per 1,000 live births in 2009 and 110 in 2007.

LIBERIA


N
Lofa
GUINEA
SIERRA LEONE
Gbarpolu
NORTH WESTERN
Grand Cape
Mount
NORTH CENTRAL
CÔTE D'IVOIRE
Bong
Nimba
Bomi
Margibi
Montserrado
SOUTH CENTRAL
MONROVIA
Grand Bassa
River Cess
Grand Gedeh
SOUTH
EASTERN A
Sinoe
River Gee
Atlantic Ocean
SOUTH
EASTERN B
Grand Kru
0
50
100
200 Kilometers
Maryland

INTRODUCTION 1

1.1 COUNTRY PROFILE

Liberia is located on the west coast of Africa, with a land area of 110,080 km^2 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). Most of the country lies below 500 meters in altitude; rain forest and swampy areas are common features. The climate is suitable for malaria transmission throughout the year in almost all parts of the country. During the main rainy season—July to 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 per annum; however, this decreases as one moves inland to as little as 2,000 mm. Average humidity is about 72 percent (Ministry of Health, 2001).

The country is divided into 15 counties that are further subdivided into districts, chiefdoms and clans. The total population is estimated 3.5 million with an annual growth rate of 2.1 percent (LISGIS, 2008). Table 1.1 shows some selected indicators of development for Liberia.

Table 1.1 Selected human development indicators for Liberia 2008

Population	3.5 million
Annual population growth	2.1 percent
Under-five mortality rate (per 1,000 births)	110 deaths
Maternal mortality ratio (per 100,000 births)	994 maternal deaths
Literacy rate (age 15-49)	41 percent (women); 70 percent (men)
Net attendance ratio at primary school (as percentage of primary-school-age population)	41 percent (boys); 39 percent (girls)
Net attendance ratio at primary school (as percentage of secondary-school-age population)	21 percent (boys); 18 percent (girls)

Source: LISGIS, 2008; LISGIS et al., 2008

1.2 BACKGROUND ON MALARIA IN LIBERIA

Although it is preventable and curable, malaria remains a major public health problem in Liberia, taking its greatest toll on young children and pregnant women. Malaria is the leading cause of attendance at out-patient departments (38 percent) and is also the number one cause of in-patient deaths. Hospital records suggest that at least 42 percent of in-patient deaths are attributable to malaria (NMCP, 2006). This health problem was exacerbated by 15 years of civil conflict that resulted in large population displacements as well as damage to health systems. In an effort to reduce the malaria burden in Liberia, the Ministry of Health and Social Welfare (MOHSW) introduced a policy and strategic plan for malaria control and prevention (NMCP, 2008). This plan is in line with the Abuja Declaration, which the Government of Liberia signed in April 2000. The measures laid out in the National Strategic Plan are attempts to fulfill WHO's Roll Back Malaria objective of reducing malaria morbidity and mortality by 50 percent by the year 2010. As part of this plan, the MOHSW has endorsed the use of more effective drugs for treatment in Liberia—Artesunate plus Amodiaquine (ACT)—as well as preventive measures such as intermittent preventive treatment (IPT) for pregnant women, and the use of insecticide-treated nets (ITNs).

In 2005, the National Malaria Control Program (NMCP) of the MOHSW implemented a nationally representative, household-based Malaria Indicators Survey (MIS) (NMCP, 2006). 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 the NMCP in close collaboration with the Bureau of Statistics of the Ministry of Planning and Economic Affairs, 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; and the UN Population Fund (UNFPA). The survey also included a health facility component. Among the more important findings of the survey was the fact that 66 percent of children under five were infected with the malaria parasite (*Plasmodium falciparum*) using a rapid diagnostic test at the time of the survey and that 87 percent of children under five had anemia (NMCP, 2006).

In addition, the Government of Liberia implemented the 2007 Liberia Demographic and Health Survey (LDHS), with LISGIS as the national implementing agency, assisted by the Ministries of Planning and Economic Affairs (MPEA) and Health and Social Welfare (MOHSW). The survey was a joint undertaking of LISGIS, MPEA, MOHSW, the National AIDS Control Program (NACP), the Liberia Institute for Biomedical Research (LIBR), the United Nations Population Fund, the U.S. Agency for International Development (USAID), UNICEF, UNDP, and Macro International, Inc. The survey provides information about the levels and trends in fertility, child mortality, family planning use, and maternal and child health. It also showed that 30 percent of households in Liberia in early 2007 owned a mosquito bednet and that 59 percent of children under five with fever were treated with antimalarial drugs, mostly chloroquine, while only 9 percent were treated with artemisinin combination therapy (ACT), which in Liberia consists of artesunate and amodiaquine (LISGIS et al., 2008).

1.3 OBJECTIVES OF THE LIBERIA MALARIA INDICATOR SURVEY

Since the first LMIS in 2005, the NMCP and its partners have scaled-up malaria interventions in all parts of the country. In order to determine the progress made in malaria control and prevention in Liberia since 2005, the 2009 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 2009 LMIS were to:

- Measure the extent of ownership and use of mosquito bednets
- Assess coverage of the intermittent preventive treatment program to protect pregnant women
- Identify practices used to treat malaria among children under five and the use of specific anti-malarial 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 and to transfer skills to Liberian counterparts related to survey design, training, budgeting, logistics, data collection, monitoring, data processing, analysis, report drafting, and data dissemination.

1.4 METHODOLOGY OF THE 2009 LIBERIA MALARIA INDICATOR SURVEY

The 2009 LMIS was carried out from mid-December 2008 to March 2009, using a nationally representative sample of almost 4,500 households. All women age 15-49 years in these households were eligible to be individually interviewed and were asked questions about malaria prevention during pregnancy and treatment of childhood fevers. In addition, the survey included testing for anemia and malaria among children age 6-59 months. Using a finger prick blood sample, 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 laboratory at the JFK Hospital in Monrovia where they were tested for presence of malaria parasites.

1.4.1 Survey Organization

The 2009 LMIS was implemented by the **National Malaria Control Program** (NMCP) of the MOHSW. The NMCP was responsible for general administrative management of the survey, including overseeing of day-to-day operations; establishing and hosting meetings of the Technical Committee; designing the survey; developing the survey protocol and ensuring its approval by the Liberian National Ethics Committee on Bio-Medical Research prior to the data collection; participating along with LISGIS in recruiting, training, and monitoring field staff, and providing the necessary medicines for treatment of any children who test positive for malaria during the survey. The NMCP also took primary responsibility for the data processing operation, report writing, and data dissemination. NMCP was also responsible for administering all the funds for the local costs and for keeping adequate accounts and provided office space for the survey operations and data processing.

The **Liberia Institute of Statistics and Geo-Information Services** (LISGIS) assisted NMCP in the design of the LMIS, especially in the area of sample design and selection. In this regard, they provided the necessary maps and lists of households in the selected sample points. LISGIS also took a primary role in recruiting, training, and monitoring the data collection staff and loaned some of its vehicles for the survey operations. LISGIS also provided the geographic coordinates for each of the selected sample points, as well as their portable weighing scales for use in weighing children prior to prescribing medication.[1]

The **Laboratory at the China-Liberia Malaria Center** on the JFK Hospital compound in Monrovia implemented the microscopic reading of the malaria slides to determine malaria parasite infection. A sample of slides was sent to the laboratory at the Saclepea Comprehensive Health Center for external quality control reading.

In order to maintain communications between 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 Macro** using funds provided by the President's Malaria Initiative (PMI) through (USAID)/Liberia. Over the course of the project, Macro staff made 11 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 blood smears), data processing, data analysis, report preparation, and data dissemination. DHS also provided copies of its model Malaria Indicator Survey questionnaires; model

[1] Most of the vehicles and scales were purchased with USAID/Liberia funds for use in the 2007 LDHS.

interviewers', supervisors' 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 parasitemia testing and some computers and related equipment for data processing.

Financial support for the survey was provided by the Government of Liberia and the U.S. 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 equally across the regions, with 25 sample points or clusters per region. As a result, the LMIS sample is not self-weighting at the national level and sample weighting factors have been applied to the survey records in order to bring them into proportion.

The survey utilized a two-stage sample design (see Appendix A for details). The first stage involved selecting 150 clusters with probability proportional to size from the list of approximately 7,000 enumeration areas (EAs) covered in the March 2008 National Population and Housing Census. The EA size was the number of residential households residing in the EA 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 every stratum, with a predetermined number of EAs to be selected. Implicit stratification was achieved in each of the explicit sampling stratum by sorting the sampling frame according to districts and clan within each of the sampling stratum and by 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. Because the census was still fresh (March 2008), it was decided to use the census household results as the sampling frame for household selection in the second stage, thus avoiding having to undertake a costly separate household listing operation. This involved borrowing the census questionnaire books for each of the selected EAs or clusters and copying information for all the occupied residential households recorded in the census book. These lists served as the sampling frame for household selection.

All women age 15-49 years who were either permanent residents of the households in the sample or visitors present in the 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 DHS programs, as well as on previous surveys conducted in Liberia, including the 2005 LMIS and the 2007 LDHS. In consultation with the Technical Committee, NMCP and Macro 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 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.

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 women who were eligible 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 and results with regard to the anemia and malaria testing of young children.

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

- Background characteristics (age, residential history, education, literacy, religion, dialect)
- Full reproductive history and child mortality
- Prenatal care and preventive malaria treatment for most recent birth
- Prevalence and treatment of fever among children under five
- Knowledge about malaria (symptoms, causes, ways to avoid, types of medicines, etc.).

Because almost all of the questions had been included in previous surveys and NMCP had experience with anemia and malaria testing, no formal pretest was held.

1.4.4 Anemia and Malaria Testing

The 2009 LMIS incorporated three biomarkers, taking finger prick blood samples from children age 6-59 months to perform on-the-spot testing for (1) anemia and (2) malaria and (3) to prepare thick blood smears that were read in the laboratory to determine malaria parasitemia. 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 (nurse, physician's assistant) 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 the child's parent or guardian at the end of the household interview. The protocol for the blood specimen collection and analysis was approved by Macro International's Institutional Review Board as well as by the Liberian National Ethics Committee on Bio-Medical Research.

Anemia testing. Because of the strong correlation between malaria 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 micro cuvette from the finger prick. Hemoglobin analysis was carried out on site using a battery-operated portable HemoCue analyzer which produces a result in less than one minute. Results were given to the child's parent or guardian verbally and in written form. Those whose children had a hemoglobin level of 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 staff at the health facility. Results of the anemia test were recorded on the household questionnaire as well as in a brochure explaining the causes and prevention of anemia that was left in the household.

Rapid malaria testing. Another major objective of the LMIS was to provide information about the extent of malaria infection among children age 6-59 months. Using the same finger prick used for anemia testing, a drop of blood was tested immediately using the Paracheck 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 and written form and were recorded on the household questionnaire.

Those who tested positive for malaria using the rapid diagnostic test were offered a full course of medicine according to standard procedures for treating malaria in Liberia (NMCP, 2007a). In order to ascertain the correct dose, the nurse on each team was instructed to ask about any medications the child might already be taking. S/he then weighed the child using a portable scale and provided the appropriate dose of artemisinin-based combination therapy (ACT) along with instructions on how to administer the medicines to the child.[2] All medicines for malaria treatment were provided by the NMCP.

Malaria testing: blood smears. In addition to the Paracheck rapid test, a thick blood smear was also 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 malaria infection.

1.4.5 Training

From a pool of over 1,200 applicants for the supervisor and interviewer positions, NMCP and LISGIS recruited 56 for the interviewer/supervisor training. They also allowed over 26 observers to attend the training without remuneration, all of whom hoped to do better than those who were officially recruited. The pool of male and female trainees consisted largely of those who had experience in previous surveys such as the 2007 LDHS, the 2005 LMIS, and other social surveys.

[2] MOHSW issues ACT as separate medicines—amodiaquine and artesunate. Amodiaquine is issued in blister packs of tablets of 153 mg, while artesunate is in blister packs of tablets of 50 mg. Dosage depends on the weight of the recipient. For example, the proper dosage for a child weighing 5-7 kg is one-quarter tablet of amodiaquine and one-half tablet of artesunate to be taken together once a day for three days, while the dosage for a child weighing 11-13 kg is three-fourths of a tablet of amodiaquine and 1 tablet of artesunate taken together once a day for three days.

These participants attended a two-week training course from December 1-12 at Thinker's Village Beach on the outskirts of Monrovia. Training of the interviewer/supervisor candidates consisted of reviewing how to fill 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. Two quizzes were administered. Trainers included the LMIS Project Director, the Assistant Project Director, and three LISGIS staff, with support from two Macro staff. Despite the large candidate pool, many did not qualify on the basis of tests and practice interviewing and many were not proficient in the major local languages. Of the 82 attendees in the interviewer/supervisor training, twelve were selected as supervisors, 24 were selected as interviewers, and eight were held in reserve.

NMCP also identified over 35 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 and 7 were further trained as microscopists in the laboratory (see below). The health technicians were trained by a Macro biomarker specialist and a malaria laboratory consultant 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. Trainees participated in numerous practice sessions in the classroom.

All trainees participated in two field practice exercises in households living close to the training site. They also received a lecture on the epidemiology of malaria in Liberia and correct treatment protocols by a senior member of the NMCP. Finally, all health technicians, team supervisors, and the nurses/nurse aides on each team received more specific instructions on how to calculate the correct dose of antimalarial medication to leave with the parents/caretakers of children who test positive on the malaria rapid diagnostic test. This included how to use the portable scales to determine the child's weight. It also included how to record children's anemia and malaria results on the anemia and malaria brochure that 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.

1.4.6 Fieldwork

Twelve teams were organized for the data collection, each comprised of one supervisor, two interviewers, two health technicians, and one driver. Three senior staff from LISGIS, one from NMCP, and one from the MOH&SW Monitoring and Evaluation Unit were designated as field coordinators and were each assigned a number of teams to monitor. NMCP was able to organize the questionnaire printing on time, and arrange for the fieldwork logistics such as field staff contracts, identification cards with pictures, special survey T-shirts, and other local supplies for the field teams.

Data collection for the LMIS started as scheduled on December 15, 2008. In order to allow for maximum supervision in the first two weeks as well as to allow teams to be home for Christmas, all 12 teams started work in Monrovia, covering two clusters each before moving out of Monrovia just after the holidays. Fieldwork was completed by all teams by the end of February. However, field checking uncovered a situation in which one team had not actually conducted interviews in some four clusters that it claimed it had completed. To rectify the deception, three other teams were sent to complete the four clusters in March 2009.

1.4.7 Laboratory Testing

Prior to the start of the field staff training, a Macro malaria consultant worked with the head of the malaria laboratory at the JFK Hospital compound to inspect the lab, check on supplies, unpack and inventory the supplies sent by Macro, and obtain electrical stabilizers for the microscopes and materials needed for staining the slides. Although the lab was refurbished by the Chinese in 2007, it had not been extensively used.

After the health technician training was completed, the consultant trained the seven identified microscopists at the laboratory. All trainees had participated in the health technician training, so they were fully aware of the objectives and logistics of the survey. The training covered the importance of good laboratory practice such as quality control of reagents, smears, and malaria diagnosis and the consequences of failing to care for and maintain laboratory equipment used in microscopy. Also discussed was the biology of the *plasmodium* parasite, including describing the red blood cells where the parasites live, the life cycle of each plasmodium species, and their characteristic features. The importance of making good blood smears was emphasized, as were the standard procedures for staining slides. Finally, trainees spent about a week practicing slide reading using blood smears taken during the practice interviewing. One of the trainees was assigned to registering, staining and mounting the slides. The other six microscopists then started to read slides from the actual survey. The purpose of the blood slides was to provide a gold standard for malaria infection and not to ascertain the type of parasite.

The consultant returned to Monrovia in late January to check on the progress of the lab work. During this visit, he conducted a second reading of some 400 slides, including at least 60 from each of the six microscopists. Using his reading as the gold standard, he selected microscopists with the fewest discordant results to be the second readers. If the results of the first and second readings did not match, a third person acted as the tie breaker. Laboratory testing continued for about five months. Macro also provided the computer software for recording the laboratory test results.

After the laboratory testing at the Malaria Center was completed, a systematic sample of 300 slides were sent to the Comprehensive Health Center Laboratory in Saclepea for an independent quality control check.

1.4.8 Data Processing

The processing of the LMIS questionnaire data began a few weeks 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 two data editors, all of whom were trained by a Macro 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 early May 2009.

1.5 Response Rates

Table 1.2 shows response rates for the 2009 LMIS. Of the 4,485 households selected in the sample, 4,285 were found occupied at the time of the fieldwork. The shortfall is due to households that 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 Table A.4). Of the existing households, 4,162 were successfully interviewed, yielding a household response rate of 97 percent.

In the households interviewed in the survey, a total of 4,512 eligible women were identified, of whom 4,397 were successfully interviewed yielding a response rate of 98 percent. The household response rates are slightly lower in the urban than rural sample, though they are almost equal for women. The principal reason for nonresponse among eligible women was the failure to find them at home despite repeated visits to the household.

Table 1.2 Results of the household and individual interviews

Number of households, number of interviews, and response rates, according to residence (unweighted), Liberia 2009

	Residence		
Result	Urban	Rural	Total
Household interviews			
Households selected	2,065	2,420	4,485
Households occupied	1,967	2,318	4,285
Households interviewed	1,884	2,278	4,162
Household response rate[1]	95.8	98.3	97.1
Interviews with women age 15-49			
Number of eligible women	2,263	2,249	4,512
Number of eligible women interviewed	2,199	2,198	4,397
Eligible women response rate[2]	97.2	97.7	97.5

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

CHARACTERISTICS OF HOUSEHOLDS AND WOMEN 2

The purpose of this chapter is to provide a descriptive summary of some socioeconomic characteristics of the households and women interviewed in the 2009 LMIS. 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 collecting age, sex, and relationship to the head of the household for all usual residents and visitors who spent the night preceding the interview. This method of data collection allows the analysis of the results for either the de jure (usual residents) or de facto (those who are there at the time of the survey) populations. 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.

This chapter also provides a profile of the women who were interviewed in the LMIS. Information is presented on basic characteristics including age at the time of the survey, religion, residence, education, literacy, 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 POPULATION BY AGE AND SEX

Age and sex are important demographic variables and are the primary basis of demographic classification. The distribution of the de facto household population in the 2009 LMIS is shown in Table 2.1 by five-year age groups, according to sex and residence.

Table 2.1 Household population by age, sex, and residence

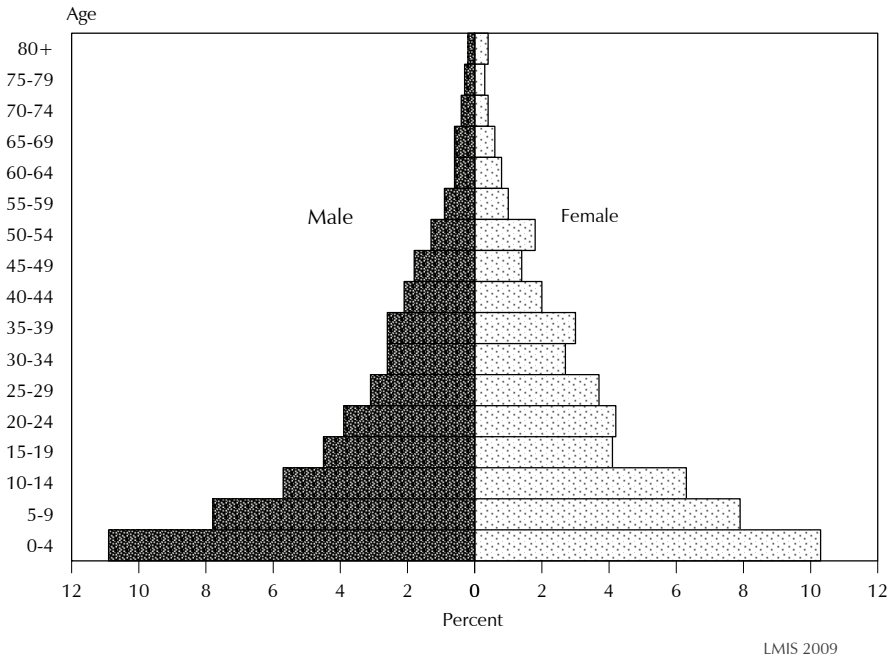
Percent distribution of the de facto household population by five-year age groups, according to sex and residence, Liberia 2009

	Urban			Rural			Total		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total
<5	18.4	16.5	17.4	24.8	23.5	24.2	21.9	20.2	21.1
5-9	14.5	14.9	14.7	17.1	16.0	16.5	15.9	15.5	15.7
10-14	12.6	14.8	13.8	10.9	10.2	10.6	11.7	12.4	12.0
15-19	10.8	10.4	10.6	7.7	6.1	6.9	9.1	8.1	8.6
20-24	10.1	9.6	9.9	6.0	7.1	6.5	7.9	8.3	8.1
25-29	7.4	7.7	7.6	5.5	7.0	6.2	6.3	7.3	6.8
30-34	5.2	5.5	5.4	5.2	5.2	5.2	5.2	5.3	5.3
35-39	5.1	5.7	5.4	5.5	5.9	5.7	5.3	5.8	5.6
40-44	4.6	3.9	4.2	4.1	4.0	4.0	4.3	4.0	4.1
45-49	3.7	2.2	3.0	3.7	3.2	3.4	3.7	2.7	3.2
50-54	2.6	3.3	3.0	2.7	3.7	3.2	2.6	3.5	3.1
55-59	1.8	1.6	1.7	1.7	2.3	2.0	1.8	2.0	1.9
60-64	1.0	1.0	1.0	1.4	1.9	1.7	1.2	1.5	1.4
65-69	0.9	1.0	1.0	1.3	1.3	1.3	1.2	1.1	1.1
70-74	0.6	0.9	0.7	0.9	0.7	0.8	0.8	0.8	0.8
75-79	0.4	0.5	0.5	0.8	0.7	0.7	0.6	0.6	0.6
80 +	0.2	0.5	0.4	0.6	1.0	0.8	0.5	0.8	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	5,015	5,360	10,376	6,074	6,109	12,183	11,090	11,470	22,559

A total of over 22,000 people were enumerated in the survey, almost equally divided by sex; the overall sex ratio is 97 males per 100 females. The sex ratio is higher in rural areas (99 males per 100 females) than urban areas (94 males per 100 females). Almost half of the total household population (46 percent) resides in urban areas; this statistic correlates closely with the proportion urban from the 2008 Population and Housing Census.

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 is a reflection of the young age structure of the population of Liberia and indicates a population with high fertility. Forty-nine percent of the population are below 15 years of age while 48 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; for example, whereas the number of boys age 14 and 15 enumerated in the household are identical, the number of girls age 14 is more than 50 percent higher than the number age 15.

Figure 2.1 **Population Pyramid**



2.2 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 2.2. 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.

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

Liberian households most commonly consist of 4-6 members, with the average household size being 5.6 persons. This is considerably larger than the average household size of 5.0 found in the 2006-07 LDHS. Overall, 16 percent of households have nine or more members. Rural households are slightly larger than urban households.

Table 2.2 Household composition

Percent distribution of households by sex of head of household and by household size and mean size of household, according to residence, Liberia 2009

Characteristic	Residence		Total
	Urban	Rural	
Household headship			
Male	66.0	73.4	70.0
Female	34.0	26.6	30.0
Total	100.0	100.0	100.0
Number of usual members			
1	7.8	6.4	7.0
2	9.7	7.3	8.4
3	12.5	10.1	11.2
4	14.3	16.0	15.2
5	13.9	13.4	13.7
6	11.0	14.9	13.1
7	8.2	9.7	9.0
8	6.2	6.8	6.5
9+	16.4	15.3	15.8
Total	100.0	100.0	100.0
Mean size of households	5.5	5.7	5.6
Number of households	1,940	2,222	4,162

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

2.3 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, type of flooring, roof, and walls, 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.

2.3.1 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 2.3 shows the percent distribution of households and of population by the source of the household's drinking water. Sources which are likely to provide water suitable for drinking are identified as 'improved sources'. They include a piped source within the dwelling or plot, public tap, tube well or borehole, protected well or spring, rainwater, and bottled water.[1] However, even if water is obtained from an improved source, it may be contaminated during transport or storage.

The survey shows that three-quarters (75 percent) of Liberian households have an improved source of drinking water. By far the most common single source of water is protected dug wells (61 percent of households). Urban households are much more likely than rural households to use an improved source of drinking water (93 versus 58 percent). One-quarter of rural households get their drinking water from lakes and ponds, rivers, and streams (surface water).

Comparison with the 2006-07 LDHS implies that there has been some improvement in sources of water. The proportion of households with improved sources of water increased from 65 to 75 percent. Some of this 'improvement' is due to the increase in the proportion of urban households between the two surveys, while some is also due to an increase in the proportion of urban households with improved water sources.

[1] The categorization into improved and non-improved follows that proposed by the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (WHO/UNICEF, 2004).

Table 2.3 Household drinking water

Percent distribution of households and de jure population by source of drinking water, according to residence, Liberia 2009

Source of drinking water	Households			Population		
	Urban	Rural	Total	Urban	Rural	Total
Improved source[1]	93.3	58.2	74.5	92.8	62.8	76.5
Piped water into dwelling/yard/plot	11.5	0.3	5.5	10.0	0.5	4.8
Public tap/standpipe	7.7	0.0	3.6	7.4	0.0	3.4
Tube well or borehole	3.5	1.2	2.3	3.6	1.2	2.3
Protected dug well	66.9	56.0	61.1	68.7	60.7	64.4
Protected spring	0.0	0.5	0.3	0.0	0.5	0.3
Bottled water	3.6	0.1	1.7	3.0	0.0	1.4
Non-improved source	6.7	41.8	25.4	7.1	37.1	23.4
Unprotected dug well	4.6	6.7	5.7	5.6	5.4	5.5
Unprotected spring	0.5	10.9	6.0	0.4	9.4	5.3
Tanker truck/cart with small tank	1.3	0.0	0.6	0.9	0.0	0.4
Surface water	0.3	24.2	13.0	0.2	22.3	12.2
Missing	0.0	0.0	0.0	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	1,940	2,222	4,162	10,598	12,599	23,197

[1] Bottled water is considered an improved source

2.3.2 Household Sanitation Facilities

Ensuring adequate sanitation facilities is another of the Millennium Development Goals. Table 2.4 shows that 44 percent of Liberian households use an improved toilet facility, while 56 percent use a non-improved facility, mostly the bush or fields. Although it appears as though there has been a major improvement in toilet facilities since 2006-07, much of the difference is due to the fact that in the LDHS, toilets that were shared with other households were considered to be 'non-improved' facilities. In the LMIS, no question was asked as to whether the toilet was shared or not.

Table 2.4 Household sanitation facilities

Percent distribution of households and de jure population by type of toilet facilities, according to residence, Liberia 2009

Type of toilet facility	Households			Population		
	Urban	Rural	Total	Urban	Rural	Total
Improved facility	62.7	27.3	43.7	63.6	30.2	45.4
Flush/pour flush to piped sewer system	5.4	0.0	2.5	4.8	0.0	2.2
Flush/pour flush to septic tank	15.1	0.7	7.4	15.1	0.8	7.3
Flush/pour flush to pit latrine	3.6	0.0	1.7	3.7	0.0	1.7
Ventilated improved pit (VIP) latrine	9.2	8.0	8.5	9.0	8.3	8.6
Pit latrine with slab	28.3	17.7	22.6	29.9	20.3	24.7
Composting toilet	1.1	0.9	1.0	1.1	0.8	0.9
Non-improved facility	36.0	72.6	55.7	35.0	69.7	53.8
Flush/pour flush not to sewer/septic tank/pit latrine	1.4	0.0	0.7	1.2	0.0	0.5
Pit latrine without slab/open pit	10.1	6.3	8.1	9.6	5.6	7.4
Bucket	0.7	0.1	0.4	0.6	0.0	0.3
Hanging toilet/hanging latrine	3.7	1.2	2.4	4.0	1.0	2.4
No facility/bush/field	20.1	65.0	44.1	19.6	63.1	43.2
Other	1.3	0.0	0.6	1.2	0.0	0.6
Missing	0.0	0.0	0.0	0.1	0.0	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	1,940	2,222	4,162	10,598	12,599	23,197

Note: In the LMIS, households were not asked if the toilet was shared with other households; consequently, the data are not comparable to the 2007 LDHS results.

2.3.3 Housing Characteristics

Table 2.5 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, in the case of the use of biomass fuels, exposure to indoor pollution—that have a direct bearing on the health and welfare of household members.

Table 2.5 Household characteristics

Percent distribution of households and de jure population by housing characteristics and percentage using solid fuel for cooking, according to residence, Liberia 2009

Housing characteristic	Households			Population		
	Urban	Rural	Total	Urban	Rural	Total
Electricity						
Yes	3.5	0.5	1.9	3.4	0.4	1.8
No	96.3	99.3	97.9	96.5	99.2	98.0
Missing	0.1	0.2	0.2	0.1	0.4	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
Flooring material						
Earth, sand	22.1	79.1	52.5	22.4	75.9	51.5
Wood/planks	0.1	0.0	0.1	0.1	0.1	0.1
Floor mat, linoleum, vinyl	2.9	0.0	1.3	2.2	0.0	1.0
Ceramic tiles	6.1	0.7	3.2	6.2	1.0	3.3
Concrete/cement	68.3	20.0	42.5	68.8	22.8	43.8
Carpet	0.5	0.0	0.2	0.2	0.0	0.1
Other/missing	0.0	0.1	0.1	0.1	0.2	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Roofing material						
Thatch/palm leaf	4.6	47.6	27.6	4.2	43.9	25.8
Palm/ bamboo/ mats	0.4	0.1	0.2	0.3	0.1	0.2
Tarpaulin, plastic	3.2	2.1	2.6	2.7	2.1	2.4
Zinc, metal	87.1	48.7	66.6	88.1	52.3	68.7
Ceramic tiles	0.1	0.1	0.1	0.1	0.0	0.0
Concrete, cement	2.5	0.2	1.3	2.6	0.4	1.4
Asbestos sheets, shingles	2.0	1.2	1.6	1.8	1.1	1.4
Other	0.1	0.1	0.1	0.2	0.0	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Wall material						
Mud and sticks	14.2	77.5	48.0	13.4	73.5	46.0
Cane/ palm/ trunks	0.2	0.2	0.2	0.2	0.2	0.2
Straw, thatch mats	3.4	0.9	2.0	2.8	0.6	1.6
Mud bricks	12.5	7.6	9.9	14.8	9.9	12.1
Cement or stone blocks	58.5	12.6	34.0	58.6	14.6	34.7
Bricks	2.1	0.8	1.4	2.3	0.7	1.5
Wood planks/shingles	0.2	0.0	0.1	0.2	0.0	0.1
Other/missing	0.3	0.2	0.3	0.1	0.2	0.2
Total	91.5	99.8	95.9	92.3	99.8	96.4
Rooms used for sleeping						
One	51.0	43.0	46.7	34.3	27.9	30.8
Two	23.6	32.3	28.2	25.2	34.7	30.3
Three or more	25.2	24.6	24.9	40.4	37.3	38.7
Missing	0.2	0.1	0.1	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Cooking fuel						
Charcoal, fire coal	76.9	6.7	39.4	74.2	5.7	37.0
Wood	21.9	92.6	59.7	25.5	93.9	62.7
No food cooked in household	1.0	0.6	0.8	0.2	0.3	0.2
Missing/ Other	0.2	0.1	0.0	0.0	0.2	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Percentage using solid fuel for cooking[1]	98.8	99.3	99.1	99.8	99.6	99.6
Number of households	1,940	2,222	4,162	10,598	12,599	23,197

[1] Includes fire coal/charcoal and wood.

Ninety-eight percent of Liberian households do not have electricity. The two percent that have electricity are mostly located in the urban areas. The reason for the low level of electricity access is that the entire electric grid of the country was destroyed during the civil crisis and only a small fraction of Monrovia has been restored to the electricity grid that is being developed.

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. Over half (53 percent) of households in Liberia live in dwellings with earth, sand or mud floors, while 43 percent live in dwellings with concrete or cement floors. Differences by urban-rural residence are very large. Over two-thirds of urban households have concrete or cement floors, while almost 80 percent of rural households have earthen floors.

Two in three households in Liberia live in dwellings with zinc or metal roofs. Most of the remainder live in dwellings with roofs made of thatch or palm leaf (28 percent). While almost 90 percent of urban households live in dwellings with metal roofs, rural households are almost evenly split between those with metal roofs and those with thatch or palm leaf roofs.

With regard to the type of walls in the dwelling, almost half of households live in structures with mud walls, while one-third live in structures with cement or stone blocks for walls. The materials of the walls are more likely to be cement or stone blocks in urban areas and mud and sticks in rural areas.

The number of rooms a household uses for sleeping is an indicator of socio-economic level, but also can be used to assess crowding which can facilitate the spread of disease. In the 2009 LMIS, household respondents were asked how many rooms were used for sleeping, regardless of whether they were bedrooms. In Liberia, 47 percent of households have only one room for sleeping, while 28 percent have two rooms and 25 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.

Table 2.5 also shows the distribution of households by the type of fuel used for cooking. Three in five (60 percent) of Liberian households use wood for fuel, while the remainder use charcoal (also called fire coal or coal). Over three-quarters of urban households use charcoal for cooking, while almost all rural households use wood.

2.4 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 2.6 shows the availability of selected consumer goods by residence.

Of the 16 selected household durable goods, chairs, tables, and mattresses stand out as the most commonly owned by households; all three items are owned by about 70 percent of Liberian households. Half of Liberian households have a radio, while over four in ten households have a mobile phone and one-third own a watch. Only 18 percent of households have a cupboard and less than ten percent have a generator or a television. Ownership of refrigerators, sewing machines, computers, bicycles, motorcycles, cars, and boats is very rare.

Table 2.6 Household durable goods

Percentage of households and de jure population possessing various household effects and means of transportation, by residence, Liberia 2009

	Households			Population		
Possession	Urban	Rural	Total	Urban	Rural	Total
Household effects						
Generator	18.7	2.1	9.9	22.0	3.3	11.9
Radio	64.2	37.5	49.9	68.3	41.5	53.7
Television	16.5	1.7	8.6	18.6	2.5	9.9
Mobile telephone	69.0	20.7	43.2	74.5	23.8	47.0
Refrigerator/ice box	2.8	0.9	1.8	3.0	1.1	2.0
Table	82.3	56.0	68.2	84.9	59.6	71.2
Chair	81.2	60.4	70.1	83.7	63.5	72.7
Cupboard	30.1	6.6	17.6	32.6	7.3	18.8
Mattress	89.3	52.9	69.9	90.3	57.7	72.6
Sewing machine	4.6	1.2	2.8	5.0	1.5	3.1
Computer	2.1	0.1	1.0	2.2	0.1	1.1
Watch	44.9	22.4	32.9	48.1	25.7	35.9
Means of transport						
Bicycle	4.3	1.8	3.0	5.9	2.5	4.0
Motorcycle/scooter	5.7	2.2	3.8	6.4	2.7	4.4
Car/truck	4.8	0.1	2.3	5.7	0.1	2.6
Boat/canoe	0.6	1.7	1.2	0.8	1.8	1.4
Number	1,940	2,222	4,162	10,598	12,599	23,197

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, mattresses, radios, and tables.

Comparison with the 2006-07 LDHS shows mostly minor differences in the proportion of households owning these various possessions. One exception, however, is mobile phones. The proportion of households with a mobile phone has increased from 29 percent in 2006-07 to 43 percent in 2009.

2.5 WEALTH INDEX

The wealth index is a background characteristic that is used throughout the report as a proxy for long-term standard of living of the household. It is based on the data on the household's ownership of consumer goods; dwelling characteristics; type of drinking water source; toilet facilities; and other characteristics that are related to a household's socioeconomic status. To construct the index, each of these assets was assigned a weight (factor score) generated through principal component analysis, and the resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and standard deviation of one (Gwatkin et al., 2000). Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The sample was then divided into quintiles from one (lowest) to five (highest). A single asset index was developed on the basis of data from the entire country sample and this index is used in all the tabulations presented.

Table 2.7 shows the distribution of the de jure household population into five wealth levels (quintiles) based on the wealth index by residence. These distributions indicate the degree to which wealth is evenly (or unevenly) distributed by geographic areas.

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 to 36 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 almost three-fifths (59 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 2.7 Wealth quintiles

Percent distribution of the jure population by wealth quintiles, according to residence and region, Liberia 2009

	Wealth quintile						
Residence/region	Lowest	Second	Middle	Fourth	Highest	Total	Number of population
Residence							
Urban	1.1	6.5	17.7	33.9	40.8	100.0	10,598
Rural	35.9	31.4	22.2	8.1	2.4	100.0	12,599
Region							
Monrovia	0.0	0.4	5.7	34.5	59.4	100.0	5,534
North Western	34.3	34.4	20.3	8.1	3.0	100.0	1,650
South Central	19.9	17.1	21.5	22.9	18.6	100.0	4,440
South Eastern A	49.3	35.2	9.6	2.7	3.3	100.0	1,716
South Eastern B	38.7	34.2	16.1	6.9	4.2	100.0	1,349
North Central	21.4	26.2	31.7	16.7	4.1	100.0	8,509
Total	20.0	20.0	20.2	19.9	19.9	100.0	23,197

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, dialect, 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 slightly lower proportion of women age 15-19 than age 20-24 could be due to deliberate age misreporting on the part of interviewers. As mentioned above and shown in Appendix Table C.1, there were 50 percent more girls listed on the Household Questionnaire as being age 14 than age 15. This pattern is almost certainly due to interviewers' deliberately displacing the ages of these adolescents to avoid having to do an individual interview.

The overwhelming majority of Liberian women (85 percent) are Christian, while 9 percent are Muslim. The largest ethnic group in terms of dialect spoken is Kpelle (20 percent), followed by Bassa (13 percent) and Mano (12 percent).

Women age 15-49 are almost evenly split between urban (51 percent) and rural (49 percent). The distribution of respondents by region shows that just over one-third of women live in the North Central region (Bong, Nimba, and Lofa counties) and just under one-third live in Greater Monrovia. Seventeen percent of women respondents live in South Central region (Grand Bassa, Margibi, and Montserrado outside of Monrovia). Regions with the 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).

Table 2.8 Background characteristics of respondents

Percent distribution of women age 15-49 by selected background characteristics, Liberia 2009

Background characteristic	Weighted percent	Number of women	
		Weighted	Unweighted
Age			
15-19	19.1	839	835
20-24	20.2	886	868
25-29	17.5	771	784
30-34	12.8	564	594
35-39	14.1	622	612
40-44	9.7	429	420
45-49	6.5	286	284
Religion			
Christian	84.6	3,718	3,760
Muslim	9.0	394	451
Traditional religion	1.2	53	28
No religion	5.0	220	146
Missing	0.2	11	11
Ethnicity			
Bassa	13.3	584	685
Gbandi	3.7	164	107
Belle	0.3	13	11
Dey	0.2	7	6
Gio	8.0	351	200
Gola	2.1	92	154
Grebo	7.3	319	656
Kissi	5.8	254	166
Kpelle	19.7	868	666
Krahn	2.5	110	223
Kru	6.4	281	462
Lorma	6.1	267	181
Mandigo	1.7	73	68
Mano	11.6	511	276
Mende	1.3	59	66
Vai	4.1	179	229
None/ English only	4.5	196	158
Other/missing	1.5	69	83
Residence			
Urban	50.6	2,225	2,199
Rural	49.4	2,172	2,198
Region			
Monrovia	29.2	1,285	853
North Western	6.3	276	533
South Central	17.3	762	634
South Eastern A	7.2	317	790
South Eastern B	4.8	211	702
North Central	35.2	1,546	885
Education			
No education	41.7	1,834	1,928
Primary	30.1	1,322	1,353
Secondary +	28.2	1,241	1,116
Wealth quintile			
Lowest	18.2	802	990
Second	18.4	811	1,034
Middle	18.6	818	773
Fourth	21.2	934	751
Highest	23.5	1,033	849
Total	100.0	4,397	4,397

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

Just over four in ten women age 15-49 have never been to school, while 30 percent have attended only primary school and 28 percent have reached secondary school. By definition, roughly one-fifth of respondents fall into each wealth quintile.

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 program is being undertaken by the government. Presently, 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 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 only one-third of women age 15-49 have completed primary school and only 6 percent have completed secondary school. Overall, the median number of years of education is 2.

Table 2.9 Educational attainment of women

Percent distribution of women age 15-49 by highest level of schooling attended or completed, and median grade completed, according to background characteristics, Liberia 2009

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	22.9	36.4	5.8	27.5	4.3	3.0	100.0	4.0	1,726
15-19	14.9	47.0	7.7	25.2	4.5	0.9	100.0	4.0	839
20-24	30.6	26.3	4.1	29.8	4.1	5.1	100.0	3.9	886
25-29	48.1	21.3	2.5	22.2	1.6	4.4	100.0	0.1	771
30-34	47.9	26.7	2.7	16.1	0.8	5.8	100.0	0.4	564
35-39	56.2	19.7	2.8	16.3	1.2	3.8	100.0	0.0	622
40-44	55.2	16.0	1.7	22.5	0.4	4.2	100.0	0.0	429
45-49	73.7	9.0	1.3	12.2	0.6	3.2	100.0	0.0	286
Residence									
Urban	26.7	21.9	5.3	35.5	3.2	7.4	100.0	5.2	2,225
Rural	57.1	30.9	2.1	8.3	1.4	0.2	100.0	0.0	2,172
Region									
Monrovia	21.3	20.8	4.1	41.1	2.9	9.8	100.0	6.1	1,285
North Western	65.3	22.8	1.3	9.2	1.3	0.3	100.0	0.0	276
South Central	50.8	27.0	3.8	13.7	1.2	3.5	100.0	0.0	762
South Eastern A	56.4	30.9	1.0	8.2	3.1	0.4	100.0	0.0	317
South Eastern B	45.5	31.8	5.2	17.1	0.0	0.3	100.0	0.8	211
North Central	46.5	29.6	4.1	16.2	2.7	0.9	100.0	0.9	1,546
Wealth quintile									
Lowest	67.1	26.2	2.0	3.7	0.6	0.4	100.0	0.0	802
Second	60.1	26.6	1.9	8.5	2.5	0.4	100.0	0.0	811
Middle	41.4	35.3	4.4	15.9	2.2	0.9	100.0	1.6	818
Fourth	31.3	28.2	6.0	30.3	2.8	1.5	100.0	4.0	934
Highest	17.3	17.5	3.8	44.4	3.2	13.7	100.0	7.2	1,033
Total	41.7	26.4	3.7	22.1	2.3	3.9	100.0	2.0	4,397

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

Younger women have generally reached higher levels of school than older women. For example, only 15 percent of women age 15-19 have never been to school, compared with 74 percent of women age 45-49. Urban women are better educated than rural women; the median number of years of school is 5.2 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 (54 percent). The educational level of women in North Western region (Bomi, Grand Cape Mount, and Gbarpolu counties) is particularly low, with 65 percent of women having no schooling at all.

Table 2.9 also shows that poorer women tend to be less educated; more than three-fifths of women in the two lowest wealth quintiles have no education, compared to less than one-fifth of women in the highest wealth quintile.

2.6.3 Literacy of Women

The ability to read and write is an important personal asset, allowing individuals increased opportunities in life. Knowing the distribution of the literate population can help those involved in health communication plan how to reach women with their messages. Instead of asking respondents if they could read, LMIS interviewers assessed the ability to read among women who had never been to school or who had attended only the primary level by asking them to read a simple, short sentence.[2] Table 2.10 shows the percent distribution of female respondents by level of literacy and the percentage literate according to background characteristics.

The data show that only 40 percent of adult women are literate. There are large differentials in literacy across background characteristics. For example, only 19 percent of women 45-49 are literate, compared with 60 percent of women age 15-19. There is a threefold urban-rural differential in literacy, with 60 percent of urban women literate, compared with 20 percent of rural women. Monrovia has by far the highest proportion of women who are literate (67 percent), while North Western and South Eastern A regions have the lowest. Literacy increases as wealth increases, from 12 percent among women in the poorest wealth quintile to 72 percent of those in the highest quintile.

[2] These sentences include the following: 1. The child is reading a book. 2. Farming is hard work; 3. Parents should care for their children; 4. The rains were heavy this year.

Table 2.10 Women's literacy

Percent distribution of women age 15-49 by level of schooling attended and level of literacy, and percentage literate, according to background characteristics, Liberia 2009

Background characteristic	Secondary school or higher	No schooling or primary school: Can read a whole sentence	Can read part of a sentence	Cannot read at all	No card with required language	Blind/ visually impaired	Missing	Total	Percent-age literate[1]	Number
Age										
15-19	30.5	9.5	19.6	39.6	0.1	0.3	0.4	100.0	59.6	839
20-24	39.0	2.7	6.1	51.4	0.3	0.0	0.5	100.0	47.8	886
25-29	28.2	0.4	6.6	64.7	0.0	0.0	0.1	100.0	35.2	771
30-34	22.7	2.1	7.1	67.9	0.0	0.0	0.3	100.0	31.9	564
35-39	21.3	1.5	5.4	71.5	0.3	0.0	0.0	100.0	28.2	622
40-44	27.1	2.0	2.8	67.7	0.0	0.0	0.4	100.0	31.9	429
45-49	16.0	1.6	1.6	80.2	0.0	0.0	0.6	100.0	19.2	286
Residence										
Urban	46.1	4.0	8.9	40.2	0.2	0.0	0.5	100.0	59.1	2,225
Rural	9.9	2.4	7.5	80.1	0.0	0.1	0.1	100.0	19.7	2,172
Region										
Monrovia	53.8	3.5	9.3	32.3	0.3	0.0	0.7	100.0	66.6	1,285
North Western	10.7	2.6	9.6	77.0	0.2	0.0	0.0	100.0	22.8	276
South Central	18.3	4.7	8.6	68.1	0.0	0.0	0.3	100.0	31.7	762
South Eastern A	11.7	3.2	9.0	76.1	0.0	0.0	0.0	100.0	23.9	317
South Eastern B	17.5	3.8	12.0	66.5	0.0	0.0	0.2	100.0	33.3	211
North Central	19.8	2.3	6.1	71.5	0.0	0.2	0.1	100.0	28.2	1,546
Wealth quintile										
Lowest	4.7	2.3	5.3	87.3	0.1	0.3	0.0	100.0	12.3	802
Second	11.4	1.2	7.9	79.2	0.0	0.0	0.3	100.0	20.6	811
Middle	18.9	3.5	9.7	67.8	0.0	0.0	0.0	100.0	32.2	818
Fourth	34.6	4.8	10.6	49.5	0.1	0.0	0.5	100.0	49.9	934
Highest	61.4	3.8	7.3	26.6	0.3	0.0	0.6	100.0	72.4	1,033
Total	28.2	3.2	8.2	59.9	0.1	0.1	0.3	100.0	39.6	4,397

[1] Refers to women who attended secondary school or higher and women who can read a whole sentence or part of a sentence

FERTILITY, PRENATAL CARE, AND CHILDHOOD MORTALITY 3

Although measuring fertility and childhood mortality indicators was not an objective of the LMIS, they are useful by-products. In order to measure indicators related to coverage of intermittent malaria prevention treatment during pregnancy and treatment of childhood fever, a complete birth history was included as part of the woman's questionnaire.

Data on fertility were collected in several ways. Each woman interviewed was asked about all of the births she had had in her lifetime. Questions were asked separately about the number of sons and daughters who live with the mother, those who live elsewhere, and those who have died. Subsequently, a list of all births was recorded along with name, age if still alive, and age at death if dead. Finally, information was collected on whether women were pregnant at the time of the survey. In addition to providing data about fertility, the birth history also is used to measure childhood mortality.

This chapter looks at a number of fertility indicators including levels, patterns, and trends in both current and cumulative fertility; the length of birth intervals; and the age at which women initiate childbearing. It also covers data on the proportion of women who obtained prenatal care for their most recent birth in the last five years. Estimates of childhood mortality are presented at the end of the chapter.

3.1 CURRENT FERTILITY

Current fertility can be measured using the age-specific fertility rate (ASFR), the total fertility rate (TFR), the general fertility rate, and the crude birth rate. The ASFR provides the age pattern of fertility, while the TFR refers to the number of live births that a woman would have had if she were subject to the current ASFRs throughout the reproductive ages (15-49 years). The general fertility rate is expressed as the number of live births per 1,000 women of reproductive age, and the crude birth rate is expressed as the number of live births per 1,000 population. The measures of fertility presented in this chapter refer to the period of three years prior to the survey. This generates a sufficient number of births to provide robust and current estimates. Current estimates of fertility levels are presented in Table 3.1 by urban-rural residence.

Table 3.1 Current fertility

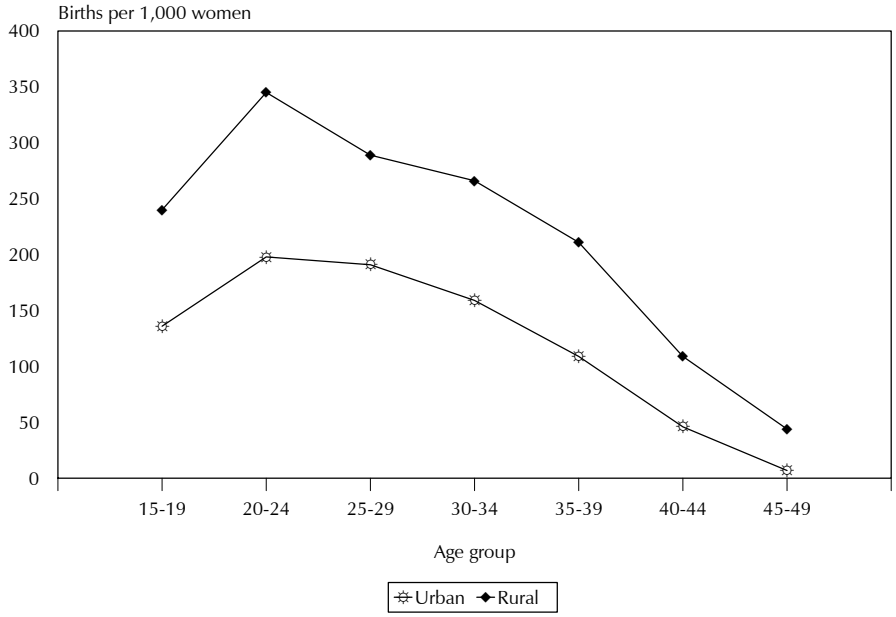
Age-specific and total fertility rates, the general fertility rate, and the crude birth rate for the three years preceding the survey, by residence, Liberia 2009

	Residence		
Age group	Urban	Rural	Total
15-19	136	240	177
20-24	198	345	268
25-29	191	289	241
30-34	159	266	214
35-39	109	211	166
40-44	46	109	81
45-49	7	44	29
TFR (15-49)	4.2	7.5	5.9
GFR	152	260	205
CBR	33.5	45.9	40.3

Notes: Age-specific fertility rates are per 1,000 women. Rates for age group 45-49 may be slightly biased due to truncation. Rates are for the period 1-36 months prior to interview.
TFR: Total fertility rate expressed per woman
GFR: General fertility rate expressed per 1,000 women age 15-44
CBR: Crude birth rate, expressed per 1,000 population

Survey results indicate that the total fertility rate in Liberia was 5.9 children per woman for the three-year period preceding the survey (roughly 2006 through 2008). This means that a Liberian woman who is at the beginning of her childbearing years would give birth to an average of almost six children by the end of her reproductive period if fertility levels remained constant at the levels observed in the three-year period before the 2009 LMIS. The TFR of 7.5 for women in rural areas is more than three births higher than the rate of 4.2 for women in urban areas. These rates are considerably higher than those measured in the LDHS two years earlier (see section 3.3).

Figure 3.1 Age-Specific Fertility Rates by Urban-Rural Residence, Liberia 2006-08



The peak childbearing years are 20-24, followed by 25-29. Fertility at each age is higher in rural than in urban areas (Figure 3.1). Adolescent fertility is very high, with teenage girls contributing 15 percent of the total fertility rate in Liberia.

The general fertility rate is 205. This means that there were 205 births for every 1,000 women during the three-year period preceding the survey. There is a clear differential in this rate by residence: 260 births per 1,000 women age 15-44 years in the rural areas versus 152 births per 1,000 women in the urban areas.

The crude birth rate for Liberia is 40 births per 1,000 population. As with the general fertility rate, there is also a clear differential by residence: 46 births per 1,000 population in the rural areas versus 34 births per 1,000 population in the urban areas.

3.2 Fertility Differentials by Background Characteristics

Fertility is known to vary by residence, educational background, and other background characteristics of a woman. Table 3.2 shows several different indicators of fertility, mainly the total fertility rate, the mean number of births to women age 40-49, and the percentage currently pregnant by residence, region, education, and wealth quintile. The mean number of births to women age 40-49 is an indicator of cumulative fertility; it reflects the fertility performance of older women who are nearing the end of their reproductive period. If fertility remains stable over time, the two fertility measures, total fertility rate (TFR) and children ever born (CEB), tend to be very similar. The percentage pregnant provides a useful additional measure of current fertility, although it is recognized that it may not capture all pregnancies in an early stage.

As mentioned above, the data in Table 3.2 show a strong urban-rural differential in fertility. Regional variations in fertility are marked, ranging from a high of 7.9 births per woman in North Western region to a low of 3.5 in Monrovia. The TFR is inversely related to the level of education. Women with no education give birth to almost twice as many children as women who have been to secondary school

(7.1 vs. 3.9 births). Fertility is strongly related to wealth; women in the poorest wealth quintile have an average of 8.0 births per woman, compared with only 3.2 among women in the highest quintile.

Ten percent of the women interviewed at the time of the survey said they were pregnant. Rural women are much more likely to be pregnant (12 percent) than urban women (9 percent). Current pregnancy is highest in South Eastern A (13 percent) and North Western regions (12 percent) and lowest in Monrovia (7 percent). The percentage of women currently pregnant is lower among women with at least some secondary school (7 percent) than among those with either no education or only primary education (both 11 percent). The proportion pregnant declines as wealth increases.

Table 3.2 also shows the mean number of children ever born to women age 40-49 years. Overall, women age 40-49 years have given birth to an average of 6.8 children. Differences in the mean number of children ever born generally follow a similar pattern to that for the TFR and the percentage currently pregnant.

Table 3.2 Fertility by background characteristics

Total fertility rate for the three years preceding the survey, percentage of women age 15-49 currently pregnant, and mean number of children ever born to women age 40-49 years, by background characteristics, Liberia 2009

Background characteristic	Total fertility rate	Percentage of women age 15-49 currently pregnant	Mean number of children ever born to women age 40-49
Residence			
Urban	4.2	8.6	5.9
Rural	7.5	11.5	7.4
Region			
Monrovia	3.5	7.1	5.4
North Western	(7.9)	12.2	7.3
South Central	(6.2)	10.6	7.7
South Eastern A	7.5	13.3	7.8
South Eastern B	(6.6)	9.3	6.8
North Central	6.8	11.2	6.8
Education			
No education	7.1	11.3	7.1
Primary	6.2	11.2	7.1
Secondary +	3.9	7.0	5.5
Wealth quintile			
Lowest	8.0	13.2	7.4
Second	7.1	11.2	7.1
Middle	6.5	11.3	7.7
Fourth	5.3	10.3	6.6
Highest	3.2	5.6	5.2
Total	5.9	10.0	6.8

Note: Total fertility rates are for the period 1-36 months prior to interview. Total fertility rates in parentheses are based on 500-749 unweighted women; all others are based on 750 or more unweighted women.

3.3 FERTILITY TRENDS

Table 3.3 examines trends in fertility in Liberia by comparing the results of the 2009 LMIS with the three LDHS surveys that were implemented in Liberia in 1986, 1999-2000, and 2007. This comparison is appropriate because all four surveys used similar methods of data collection although the current fertility rates for the 1986 LDHS are based on births in the five years preceding the survey, while those for the other three surveys are based on births in the three years preceding the survey.

The data show a steady decline in the fertility rates across the first three surveys with a steep increase for the LMIS. The TFR declined gradually from 6.6 in the five years preceding the 1986 LDHS (roughly equivalent to 1981-85) to 6.2 for the three years before the 1999-2000 LDHS (approximately 1997-99), and then dropped rapidly to 5.2 for the period 2004-06 (Figure 3.2). The fact that the decline was so rapid and was followed by a steep increase to 5.9 two years later calls into question the accuracy of the rate from the 2007 LDHS. It is unlikely that fertility has changed so much in such a short period of time. A more plausible explanation is that, since the 2007 LDHS included a sizeable section of questions for children under five, interviewers may have omitted young children and/or displaced their ages so as to make them older and not subject to lengthy questioning.

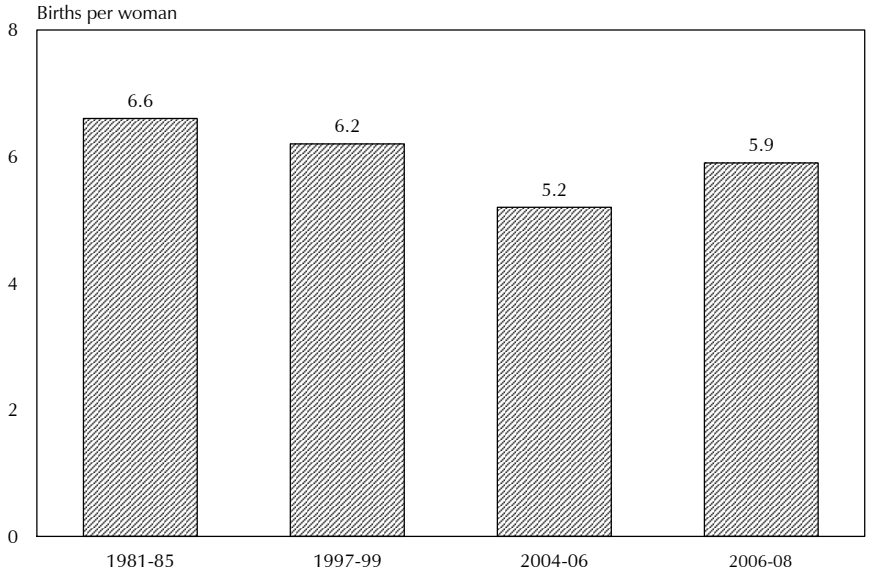
Table 3.3 Trends in fertility from various surveys

Age-specific and total fertility rates from various surveys, Liberia 1981-85 to 2006-08

Mother's age at birth	Survey and approximate calendar period of the fertility rates			
	1986 LDHS 1981-85	1999-2000 LDHS 1997-99	2007 LDHS 2004-06	2009 LMIS 2006-08
15-19	184	135	141	177
20-24	285	279	243	268
25-29	272	241	226	241
30-34	223	211	187	214
35-39	181	171	142	166
40-44	114	112	72	81
45-49	63	83	29	29
Total fertility rate	6.6	6.2	5.2	5.9

Notes: Age-specific fertility rates are per 1,000 women.
Source: Chieh-Johnson et al., 1988; MPEA, et al., 2000; LISGIS et al., 2008

Figure 3.2 Trends in Total Fertility Rate



Source: Chieh-Johnson et al., 1988; MPEA et al., 2000; LISGIS and Macro, 2008

3.4 CHILDREN EVER BORN AND LIVING

Table 3.4 presents the distribution of all women by the number of children ever born, according to five-year age groups. The table also shows the mean number of children ever born. Data on the number of children ever born reflect the accumulation of births to women over their entire reproductive years and therefore have limited reference to current fertility levels, particularly when a country has experienced a decline in fertility. However, the information on children ever born is useful for observing how average family size varies across age groups, and for observing the level of primary infertility.

Table 3.4 Children ever born and living

Percent distribution of all women by number of children ever born, mean number of children ever born and mean number of living children, according to age group, Liberia 2009

	Number of children ever born														
Age	0	1	2	3	4	5	6	7	8	9	10+	Total	Number of women	Mean number of children ever born	Mean number of living children
15-19	67.4	27.7	4.0	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	839	0.38	0.35
20-24	15.2	32.3	31.3	16.1	3.6	1.5	0.1	0.0	0.0	0.0	0.0	100.0	886	1.65	1.44
25-29	7.4	15.1	23.7	22.4	16.5	10.2	3.6	0.5	0.6	0.0	0.0	100.0	771	2.77	2.31
30-34	3.6	10.8	11.0	15.6	16.1	17.2	13.0	7.3	4.2	0.8	0.3	100.0	564	4.04	3.18
35-39	0.5	4.1	6.1	11.6	14.7	16.1	17.0	12.9	7.5	6.6	2.9	100.0	622	5.32	4.16
40-44	0.5	2.7	3.3	7.8	8.6	14.9	12.5	11.3	11.3	8.6	18.5	100.0	429	6.62	4.85
45-49	0.5	2.1	4.1	9.2	7.6	7.7	11.9	14.3	8.0	14.1	20.6	100.0	286	6.98	5.04
Total	17.8	16.8	14.1	12.3	9.1	8.5	6.7	4.9	3.3	2.8	3.6	100.0	4,397	3.26	2.56

The data show that early childbearing is common in Liberia. One-third of girls age 15-19 have already given birth; by age 20-24, over 8 in 10 have had a baby. Less than one percent of women at the end of their reproductive age remain childless.

On average, Liberian women attain a parity of 7 children per woman at the end of their childbearing. As expected, the mean number of children ever born rises steadily with increasing age of women, thus indicating minimal or no recall lapse. Women in their late 20s have given birth to almost three children on average, while women in their early 30s have had four births and those age 40-44 have borne 6.6 children each. As expected, women above 40 years have much higher parities, with one in five women 45-49 reporting having had 10 or more births.

3.5 BIRTH INTERVALS

A birth interval is defined as the length of time between two live births. Research has shown that short birth intervals are closely associated with poor health of children, especially during infancy. Children born too close to a previous birth, especially if the interval between the births is less than two years, are at increased risk of health problems and dying at an early age. Longer birth intervals, on the other hand, contribute to the improved health status of both mother and child.

The study of birth intervals is done using two measures, namely, median birth interval and proportion of non-first births that occur with an interval of 24 months or more after the previous birth. Table 3.5 presents the distribution of second and higher-order births in the five years preceding the survey by the number of months since the previous birth, according to background characteristics. The table also presents the median number of months since the preceding birth.

The table shows that the median birth interval is 33 months, that is, half of non-first births to women in Liberia occur within three years after a previous birth. The median birth interval increases with age from 28 months for births to women age 15-19 years to 40 months for births to women age 40-49 years. The longer birth interval among older women may be attributed to the decline in fecundity as women grow older.

Table 3.5 Birth intervals

Percent distribution of non-first births in the five years preceding the survey by number of months since preceding birth, and median number of months since preceding birth, according to background characteristics, Liberia 2009

Background characteristic	Months since preceding birth						Total	Number of non-first births	Median number of months since preceding birth
	7-17	18-23	24-35	36-47	48-59	60+			
Age									
15-19	20.8	12.5	54.6	7.2	4.9	0.0	100.0	49	27.7
20-29	8.8	15.4	38.5	20.6	8.0	8.6	100.0	1,458	31.1
30-39	8.6	13.6	28.8	19.7	10.7	18.7	100.0	1,232	35.6
40-49	6.7	12.5	25.5	11.9	15.3	28.0	100.0	385	39.9
Sex of preceding birth									
Male	8.1	13.2	33.9	20.2	10.1	14.5	100.0	1,578	33.2
Female	9.1	15.4	32.8	17.7	9.7	15.3	100.0	1,546	32.6
Survival of preceding birth									
Living	6.1	13.7	34.5	19.9	10.6	15.2	100.0	2,621	33.9
Dead	21.9	17.4	27.2	14.2	6.4	12.9	100.0	503	27.8
Birth order									
2-3	7.2	13.4	34.4	21.1	9.2	14.8	100.0	1,338	33.8
4-6	9.6	14.4	33.4	16.8	10.7	15.0	100.0	1,197	32.6
7+	10.0	16.1	30.7	18.5	10.0	14.7	100.0	590	31.9
Residence									
Urban	6.3	11.7	29.2	18.3	12.0	22.4	100.0	1,058	37.3
Rural	9.8	15.6	35.5	19.3	8.8	11.0	100.0	2,066	31.2
Region									
Monrovia	5.4	10.7	25.8	18.8	14.1	25.2	100.0	478	39.3
North Western	12.0	18.0	36.2	17.2	7.9	8.7	100.0	261	29.9
South Central	9.6	13.9	35.6	21.5	9.0	10.4	100.0	631	31.9
South Eastern A	12.9	16.0	34.2	18.0	8.4	10.5	100.0	329	30.3
South Eastern B	11.5	12.1	35.3	18.6	10.5	11.9	100.0	171	31.7
North Central	7.1	14.9	34.0	18.5	9.5	16.0	100.0	1,254	32.9
Education									
No education	9.2	14.9	34.1	18.9	9.8	13.2	100.0	1,775	32.4
Primary	9.0	16.2	35.1	19.6	8.6	11.5	100.0	885	31.1
Secondary +	5.6	8.4	27.1	18.1	13.1	27.7	100.0	464	40.8
Wealth quintile									
Lowest	11.5	17.8	35.4	17.7	8.1	9.5	100.0	838	30.1
Second	8.1	15.7	34.8	20.4	8.8	12.1	100.0	748	32.2
Middle	10.8	13.6	35.6	17.4	9.2	13.3	100.0	648	31.5
Fourth	5.0	11.4	32.1	20.3	13.7	17.5	100.0	526	36.5
Highest	4.5	8.6	23.1	19.8	12.2	31.8	100.0	364	44.3
Total	8.6	14.3	33.3	19.0	9.9	14.9	100.0	3,124	32.9

Note: First-order births are excluded from this table. The interval for multiple births is the number of months since the preceding pregnancy that ended in a live birth.

There are no significant differences in the median birth interval by sex of the child and birth order. The median birth interval is shorter if the previous child has died than if the previous child survived (28 vs. 34 months). The median interval between births to urban women is almost 6 months longer (37 months) than for rural women (31 months). The median birth interval ranges from a low of 30 months in the North Western and South Eastern A regions to 39 months in Monrovia. The median number of months since the preceding birth is longer among non-first births to women with at least some secondary education (41 months) than among women with no education or only primary schooling (31-32 months). Birth intervals increase with wealth; the median interval increases from 30 months among births to women in the lowest wealth quintile to 44 months among those in the highest quintile.

Comparison with data from the 2007 LDHS shows somewhat shorter birth intervals in 2009. The median number of months between births reported in the 2007 LDHS was 36 months, compared with 33 months in the 2009 LMIS.

3.6 AGE AT FIRST BIRTH

The age at which childbearing commences is an important determinant of the overall level of fertility as well as the health and welfare of the mother and the child. In some societies, postponement of first births due to an increase in age at marriage has contributed to overall fertility decline. Table 3.6 shows the percentage of women who have given birth by specific ages, according to age at the time of the survey.

Table 3.6 Age at first birth

Percentage of women age 15-49 who gave birth by exact ages, percentage who have never given birth, and median age at first birth, according to current age, Liberia 2009

	Percentage who gave birth by exact age					Percentage who have never given birth	Number of women	Median age at first birth
Current age	15	18	20	22	25			
15-19	3.4	na	na	na	na	67.4	839	a
20-24	7.2	37.8	66.6	na	na	15.2	886	18.9
25-29	6.4	37.1	61.0	75.1	88.5	7.4	771	19.0
30-34	8.0	38.5	60.2	75.8	86.3	3.6	564	19.0
35-39	11.1	47.0	67.6	81.0	90.6	0.5	622	18.3
40-44	16.9	53.0	75.1	87.7	94.5	0.5	429	17.7
45-49	11.2	51.7	70.2	82.9	90.3	0.5	286	17.8
20-49	9.3	42.3	65.9	na	na	6.2	3,558	18.6
25-49	10.0	43.8	65.6	79.5	89.7	3.1	2,671	18.5

na = Not applicable due to censoring
a = Omitted because less than 50 percent of women had a birth before reaching the beginning of the age group

The data show that the median age at first birth in Liberia fluctuates around 18 to 19 years across age groups of women. The percentage of women who gave birth before age 15 and 18 years generally shows some postponement of first birth by younger cohorts of mothers. For example, only 3 percent of women age 15-19 years had given birth by age 15 years, compared with at least 11 percent of those age 35 years and older.

Comparison with previous surveys indicates some evidence of a decline in age at first birth. The median age at first birth among women age 20-49 was 19.2 in 1986, 19.4 in 1999/2000, 19.1 in 2007 and 18.6 in 2009.

3.7 TEENAGE PREGNANCY AND MOTHERHOOD

Teenage pregnancy is a major health concern because of its association with higher morbidity and mortality for both the mother and child. Childbearing during the teenage years also frequently has adverse social consequences, particularly on female educational attainment since women who become mothers in their teens are more likely to curtail education.

Using information from the 2009 LMIS, Table 3.7 shows the percentage of women age 15-19 who are mothers or who are pregnant with their first child. The table shows that 33 percent of adolescents have had a birth and another five percent are currently pregnant with their first child. This means that almost four in ten girls 15-19 have begun childbearing.

Table 3.7 Teenage pregnancy and motherhood

Percentage of women age 15-19 who have had a live birth or who are pregnant with their first child and percentage who have begun childbearing, by background characteristics, Liberia 2009

Background characteristic	Percentage of teenage women who: Have had a live birth	Are pregnant with first child	Percentage who have begun childbearing	Number of women
Age				
15	4.9	5.6	10.5	149
16	14.1	8.0	22.0	182
17	36.7	4.1	40.8	124
18	44.8	2.8	47.6	207
19	57.9	4.5	62.3	177
Residence				
Urban	26.7	3.5	30.3	502
Rural	41.3	7.1	48.4	337
Region				
Monrovia	21.1	3.9	25.0	304
North Western	43.0	9.4	52.3	43
South Central	32.2	3.1	35.3	130
South Eastern A	44.1	12.2	56.4	46
South Eastern B	41.7	9.2	50.9	42
North Central	40.6	4.5	45.1	274
Education				
No education	59.1	8.2	67.3	125
Primary	29.4	5.3	34.7	458
Secondary +	25.5	2.8	28.3	256
Wealth quintile				
Lowest	46.6	6.4	53.0	117
Second	33.7	10.1	43.8	116
Middle	49.6	4.3	53.9	153
Fourth	30.7	3.5	34.2	208
Highest	16.5	3.6	20.1	246
Total	32.6	5.0	37.6	839

The proportion of adolescents already on the path to family formation rises rapidly with age, from 11 percent at age 15 years to 62 percent at age 19 years. Rural adolescents tend to start childbearing earlier than their urban counterparts. Forty-eight percent of adolescents in rural areas have begun childbearing, compared with 30 percent of their counterparts in the urban areas. By region, the percentage of women 15-19 years who have begun childbearing ranges from a low of 25 percent in Monrovia to a high of 56 percent in South Eastern A region. Table 3.7 also shows that childbearing among adolescents decreases with higher education—67 percent of adolescents with no education have started childbearing, compared with only 28 percent of those with at least some secondary education. Early childbearing varies considerably by wealth quintile. The proportion of adolescents who have begun childbearing decreases from 53 percent of those in the lowest wealth quintile to only 20 percent of those in the highest quintile.

Comparison with similar data from 1999-2000 implies that early childbearing has increased over the last few years. The proportion of women age 15-19 who have already had a child or are pregnant with their first birth increased from 29 percent to 32 percent between 1999-2000 and 2007 and then to 38 percent in 2009. The proportion has increased at almost every age. For example, in 1999-2000 37 percent of 18-year-olds had begun childbearing, compared with 48 percent in 2009.

3.8 PRENATAL CARE

The major objective of prenatal care is to identify and treat problems during pregnancy such as anemia and infections. It is during a prenatal care visit that screening for complications and advice on a range of issues including place of delivery and referral of mothers with complications occur. Information on prenatal care is of great value in identifying subgroups of women who do not utilize such services and is useful in planning improvements in the services.

Table 3.8 presents the percent distribution of women age 15-49 who had a live birth in the five years preceding the survey by the type of prenatal care provider consulted during the pregnancy for the most recent birth, according to background characteristics. If a woman received prenatal care from more than one provider, the provider with the highest qualifications was recorded. The survey shows that over nine in ten mothers (95 percent) receive prenatal care from a health professional (doctor, nurse, midwife, or physician's assistant). Only two percent of mothers receive prenatal care from a traditional midwife and 2 percent do not receive any prenatal care.

Differences in professional prenatal care coverage by age of mother and by birth order are very small. There are somewhat larger differences in the use of prenatal care services between women in urban and rural areas. Health professionals provide prenatal care services for 99 percent of urban mothers, compared with 93 percent of rural mothers. Urban mothers are particularly more likely than rural mothers to receive care from doctors. By region, South Eastern B stands out as having a particularly low level of prenatal care coverage by health professionals (80 percent).

Use of prenatal care services is related to women's educational level. Ninety-nine percent of mothers with at least some secondary education receive prenatal care services from a health professional, compared with only 93 percent of mothers with no education. The proportion of mothers who receive prenatal care increases with wealth, from 90 percent of those in the lowest wealth quintile to 99 percent of those in the highest quintile.

Trends in prenatal care coverage in Liberia are difficult to interpret. The proportion of women who get prenatal care from a doctor, nurse, or midwife (excluding physician's assistants) increased very slightly from 83 percent in 1986 to 84 percent in 1999-2000, declined to 76 percent in 2007, and then increased dramatically to 95 percent in 2009.[1] Although the wording of the question on prenatal care was identical in the 2007 LDHS and the 2009 LMIS, it appears as if reporting was not reliable in one or both surveys, since such a large increase in prenatal care coverage in a two-year period is implausible.

[1] Data for 1986, 2007, and 2009 refer to the most recent birth to women who had a birth in the five years preceding the survey, while data for 1999-2000 refer to all births in the three years preceding the survey. These discrepancies in definition probably do not affect the results to any considerable degree. Moreover, the earlier two surveys did not include a category for physician's assistants.

Table 3.8 Prenatal care

Percent distribution of women age 15-49 who had a live birth in the five years preceding the survey by prenatal care provider during pregnancy for the most recent birth and the percentage receiving prenatal care from a skilled provider for the most recent birth, according to background characteristics, Liberia 2009

Background characteristic	Doctor	Nurse/ midwife	Physician's assistant	Traditional midwife	Other	No one	Missing	Total	Percentage receiving prenatal care from a skilled provider	Number of women
Mother's age at birth										
<20	21.7	74.9	0.9	1.6	0.2	0.8	0.0	100.0	97.4	473
20-34	18.6	76.1	0.8	2.2	0.2	1.8	0.3	100.0	95.5	1,726
35-49	20.9	71.2	0.4	4.1	0.0	3.3	0.3	100.0	92.4	488
Birth order										
1	25.1	71.6	0.6	1.4	0.2	0.9	0.3	100.0	97.2	577
2-3	19.8	76.1	0.5	1.6	0.2	1.6	0.2	100.0	96.3	890
4-5	16.1	77.0	0.9	4.2	0.1	1.7	0.1	100.0	94.0	587
6+	17.4	74.8	1.1	2.9	0.1	3.3	0.4	100.0	93.2	633
Residence										
Urban	28.1	70.7	0.2	0.1	0.0	0.7	0.2	100.0	99.0	1,138
Rural	13.2	78.2	1.1	4.2	0.2	2.8	0.3	100.0	92.5	1,549
Region										
Monrovia	42.7	55.9	0.3	0.0	0.0	0.9	0.3	100.0	98.8	581
North Western	13.3	77.9	0.7	7.7	0.0	0.3	0.0	100.0	91.9	193
South Central	15.1	80.4	1.3	1.1	0.0	1.9	0.2	100.0	96.8	492
South Eastern A	9.5	81.6	1.1	1.8	1.7	4.0	0.3	100.0	92.2	229
South Eastern B	12.4	65.5	1.8	11.2	0.0	8.3	0.9	100.0	79.7	141
North Central	13.1	82.4	0.5	2.4	0.0	1.5	0.2	100.0	96.0	1,051
Mother's education										
No education	13.8	78.3	1.1	3.6	0.2	2.8	0.3	100.0	93.1	1,280
Primary	21.2	74.5	0.3	2.1	0.2	1.6	0.1	100.0	96.0	796
Secondary +	29.4	68.8	0.6	0.5	0.0	0.3	0.4	100.0	98.8	611
Wealth quintile										
Lowest	8.3	79.9	1.9	5.0	0.4	4.0	0.5	100.0	90.1	591
Second	14.2	78.5	0.8	4.6	0.1	1.6	0.3	100.0	93.4	571
Middle	16.9	79.2	0.1	1.0	0.2	2.6	0.0	100.0	96.2	551
Fourth	25.7	72.8	0.3	0.8	0.0	0.4	0.0	100.0	98.8	538
Highest	37.4	61.4	0.4	0.0	0.0	0.4	0.4	100.0	99.2	436
Total	19.5	75.0	0.7	2.4	0.1	1.9	0.2	100.0	95.3	2,687

Note: If more than one source of prenatal care was mentioned, only the provider with the highest qualifications is considered in this tabulation.
[1] Skilled provider includes doctor, nurse, midwife, and physician's assistant

3.9 LEVELS AND TRENDS IN INFANT AND CHILD MORTALITY

Information on child mortality serves the needs of the health sector by identifying population groups that are at high risk. Infant and child mortality rates are also regarded as indices reflecting the degree of poverty and deprivation of a population.

The data for mortality estimation were collected in the birth history section of the Woman's Questionnaire. The birth history section began with questions about the respondent's experience with childbearing (i.e., the number of sons and daughters living with the mother, the number who live elsewhere, and the number who have died). These questions were followed by a birth history in which the respondent was asked to list each of her births, starting with the first. For each birth, data were obtained on sex, month and year of birth, survivorship status, and current age, or if the child was dead, age at death. This information is used to directly estimate mortality rates. Age-specific mortality rates are categorized and defined as follows:

Neonatal mortality (NN): the probability of dying within the first month of life

Postneonatal mortality (PNN): the difference between infant and neonatal mortality

Infant mortality ($_1q_0$): the probability of dying before the first birthday

Child mortality ($_4q_1$): the probability of dying between the first and fifth birthday

Under-five mortality ($_5q_0$): the probability of dying between birth and fifth birthday.

All rates are expressed per 1,000 live births, except for child mortality, which is expressed per 1,000 children surviving to 12 months of age.

Table 3.9 shows neonatal, postneonatal, infant, child, and under-five mortality rates for successive five-year periods before the survey. For the five years immediately preceding the survey (approximately calendar years 2004-2008), the infant mortality rate is 73 deaths per 1,000 live births and under five mortality is 114 deaths per 1,000 live births (Figure 3.3). Thus, one in every nine Liberian children dies before reaching age five. The neonatal mortality rate is 38 deaths per 1,000 live births during the most recent five-year period, while the postneonatal mortality rate is 35 deaths per 1,000 live births. This means that one-third of under-five deaths occur during the first month of life. The child mortality rate is 45 deaths per 1,000 children surviving to age one year.

Mortality trends str usually examined in two ways: by comparing mortality rates for three five-year periods preceding a single survey, and by comparing mortality estimates obtained from various surveys. Any conclusions with respect to the trends in mortality have to be interpreted with caution because sampling errors associated with mortality estimates are large.

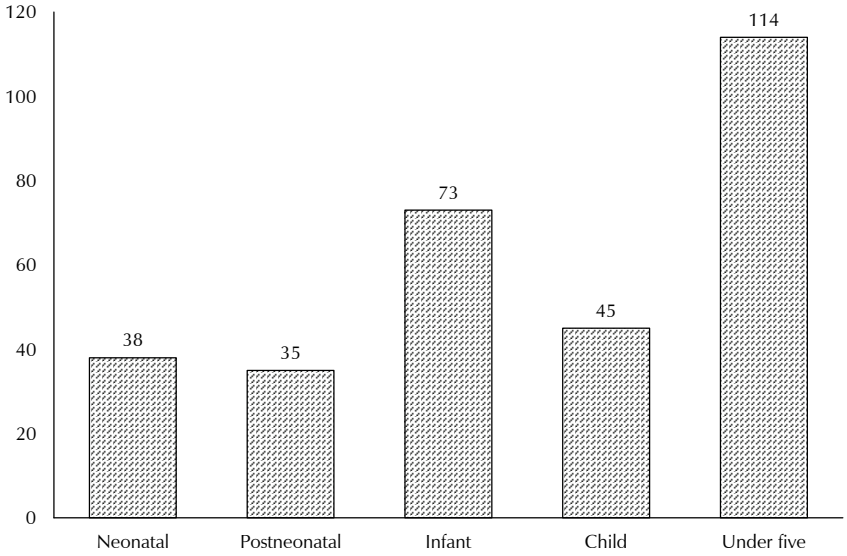
Table 3.9 Early childhood mortality rates

Neonatal, postneonatal, infant, child, and under-five mortality rates for five-year periods preceding the survey, Liberia 2009

Years preceding the survey	Neonatal mortality (NN)	Postneonatal mortality (PNN)[1]	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
0-4	38	35	73	45	114
5-9	54	81	135	88	211
10-14	66	91	157	110	249

[1] Computed as the difference between the infant and neonatal mortality rates

Figure 3.3 Infant and Child Mortality Rates Liberia 2004-08



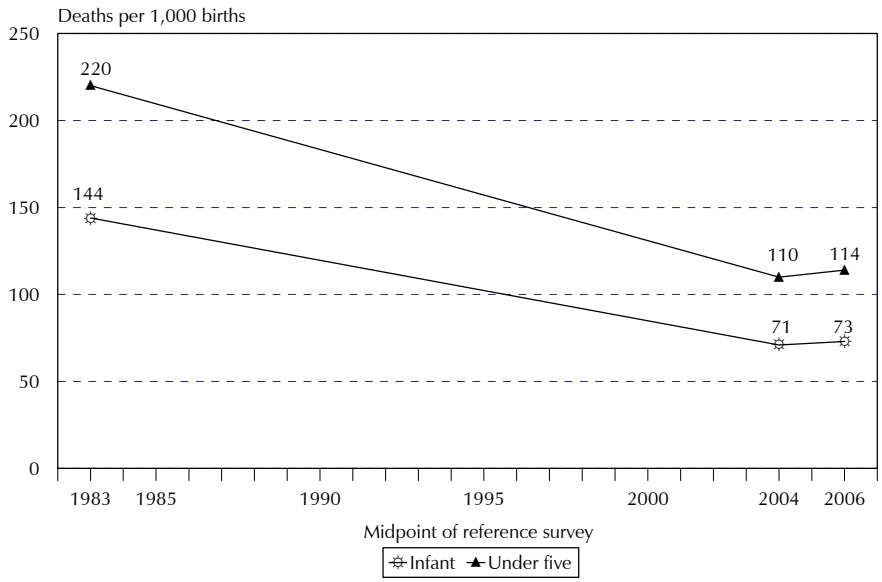
Note: Data refer to the 5-year period preceding the survey. Rates are per 1,000 births., except for child mortality, which is children surviving to age 12 months.

The data from the birth histories in the 2009 LMIS imply that there has been a dramatic decline in child mortality in Liberia over the 15-year period preceding the survey. For example, under-five mortality appears to have been cut in half, from 211 deaths per 1,000 births 10-14 years before the survey to 114 for the five-year period before the survey. Although this trend is very plausible given the end of the civil war that raged in Liberia for over a decade, caution should also be exercised since the child mortality data are derived from the birth history and many women who were interviewed had difficulty in providing dates of birth for their children.

Nevertheless, the downward trend is substantiated by comparison with the 1986 LDHS data. which showed an infant mortality rate of 144 and an under-five mortality rate of 220. Figure 3.4 shows the infant and under-five mortality rates for the 1986 LDHS, the 2007 LDHS, and the 2009 LMIS.[2] The surveys reveal that both infant and under-five mortality rates have declined considerably, though they have plateaued in the past two years.

[2] Data for the 1999-2000 LDHS are not shown since the rates (117 for infant mortality and 194 for under-five mortality) were estimated using indirect methods which have been shown to over-estimate child mortality.

Figure 3.4 Trends in Infant and Under-Five Mortality Rates



Note: Data refer to the five years before each survey.

3.10 DATA QUALITY

The quality of mortality estimates calculated from retrospective birth histories depends upon the completeness with which births and deaths are reported and recorded. One factor that affects childhood mortality estimates is the quality of reporting of age at death, which may distort the age pattern of mortality. If age at death is misreported, it will bias the estimates, especially if the net effect of the age misreporting results in transference from one age bracket to another. For example, a net transfer of deaths from under one month to a higher age will affect the estimates of neonatal and postneonatal mortality. To minimize errors in reporting of age at death, interviewers were instructed to record age at death in days if the death took place in the month following the birth, in months if the child died before age two years, and in years if the child was at least two years of age. They also were asked to probe for deaths reported at one year to determine a more precise age at death in terms of months.

The data in Appendix Table C.6 show that despite these instructions, there were a number of deaths reported to have occurred at age "one year." It is likely that at least some of these may have occurred before the child's first birthday and thus should be classified as infant deaths. Transferring some of these deaths from childhood to infancy would slightly increase the infant mortality rate and slightly decrease the child mortality rate. For the most recent five-year period before the survey, the proportion of infant deaths that occurred during the first month of life (57 percent) is plausible.

Another potential data quality problem is the selective omission from the birth histories of children who did not survive, which can lead to underestimation of mortality rates. When selective omission of childhood deaths occurs, it is usually more severe for deaths occurring early in infancy. One way such omissions can be detected is by examining the proportion of early neonatal deaths to infant deaths. Generally, if there is substantial underreporting of deaths, the result is an abnormally low ratio of early neonatal deaths to infant deaths. As shown in Appendix Table C.5, for the most recent five-year period before the survey, the proportion of neonatal deaths occurring in the first week of life is high (77

percent).[3] The fact that the proportions are lower for earlier periods prior to the survey implies that reporting may not be as accurate for these earlier times.

A third potential data quality problem is displacement of birth dates, which may cause a distortion of mortality trends. This can occur if an interviewer knowingly records a death as occurring in a different year, which would happen if an interviewer is trying to reduce their workload, because additional questions are asked for children under five. In the 2009 LMIS questionnaire, the cut-off year for these questions was 2003.

As shown in Appendix Table C.4, there is no evidence of displacement of births from 2003 back to 2002. There are 836 births reported as occurring in 2003, compared with 692 in 2002, which if anything, represents displacement into the reference period instead of out of it. It is interesting to note that this lack of displacement in the LMIS is in contrast with a considerable displacement seen in the 2007 LDHS (LISGIS et al., 2008). An important difference in the two surveys is that the LMIS had very few questions for children under five compared with the lengthy sections on health and delivery care for births in the five years before the 2007 LDHS.

3.11 SOCIOECONOMIC DIFFERENTIALS IN INFANT AND CHILD MORTALITY

Mortality differentials by place of residence, region, educational level of the mother, and household wealth are presented in Table 3.10. For a sufficient number of births to study mortality differentials across population subgroups, period-specific rates are presented for the ten-year period preceding the survey (roughly corresponding to calendar years 1999 to 2008).

Table 3.10 Early childhood mortality rates by socioeconomic characteristics

Neonatal, postneonatal, infant, child, and under-five mortality rates for the 10-year period preceding the survey, by background characteristic, Liberia 2009

Background characteristic	Neonatal mortality (NN)	Postneonatal mortality (PNN)[1]	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
Residence					
Urban	48	41	90	53	138
Rural	44	64	108	70	170
Region					
Monrovia	56	30	87	56	137
North Western	36	83	119	78	187
South Central	41	60	100	84	176
South Eastern A	57	64	120	68	181
South Eastern B	32	48	79	49	124
North Central	44	59	103	54	151
Mother's education					
No education	40	62	102	69	164
Primary	51	52	102	66	162
Secondary +	53	42	95	39	131
Wealth quintile					
Lowest	52	69	121	62	176
Second	46	57	103	55	153
Middle	33	62	95	66	155
Fourth	38	43	81	85	159
Highest	62	34	95	46	137

[1] Computed as the difference between the infant and neonatal mortality rates

[3] There are no models for mortality patterns during the neonatal period. However, one review of data from several developing countries concluded that, at neonatal mortality rate levels of 20 per 1,000 or higher, approximately 70 percent of neonatal deaths occur within the first six days of life (Boerma, 1988).

The 2009 LMIS data show that mortality levels in rural areas tend to be higher than urban areas. For example, under-five mortality in rural areas is 170 per 1,000 live births, compared with 138 for urban areas.

There are regional variations in childhood mortality rates. The data show that South Eastern B region (124 deaths per 1,000 live births) and Monrovia (137 deaths per 1,000 births) have the lowest under-five mortality rates, while the North Western region has the highest (187 per 1,000 births). This means that almost one in five children born in North Western region does not live to the fifth birthday.

Many studies have documented that mother's level of education is strongly correlated with child survival. Higher levels of maternal educational attainment are generally associated with lower mortality rates, since education exposes mothers to information about better nutrition, use of contraceptives to space births and knowledge about childhood illness and treatment. In Liberia, under-five mortality amongst children whose mothers have no education (164 per 1,000 live births) or only primary school (162 per 1,000 births) is higher than among mothers with secondary or higher education (131 per 1,000 live births).

Childhood mortality also varies by household wealth status. Under-five mortality decreases from 176 deaths per 1,000 births for the lowest wealth quintile to 137 for the highest wealth quintile.

3.12 Demographic Differentials in Infant and Child Mortality

The demographic characteristics of both mother and child have been found to play an important role in the survival probability of children. Table 3.11 presents early childhood mortality rates by demographic characteristics (i.e., sex of child, mother's age at birth, birth order, and previous birth interval).

Childhood mortality rates show the usual pattern of higher rates for males than females. Data in Table 3.11 shows that male mortality exceeds female mortality at all levels except child mortality (age 1-4 years). Data from previous studies show that births to young mothers (under age 20 years) and older mothers (35 years and over) experience a higher risk of dying. This U-shaped pattern is also seen in Liberia, where mortality rates are generally higher for the youngest and oldest mothers.

First births and higher order births normally experience a higher risk of mortality. Data from the 2009 LMIS confirm this pattern. Neonatal, infant, postneonatal, and under-five mortality rates are lowest for second through sixth births, while child mortality rates do not show any particular pattern by birth order.

The spacing of birth interval has a significant impact on a child's chances of survival. Generally, children born less than two years after a prior sibling suffer significantly higher risks of death than children born after a longer birth interval.

The data for Liberia corroborate this pattern. Mortality rates at all ages of childhood show a strong relationship with length of the birth interval. Under-five mortality is more than twice as high among children born less than two years after a preceding sibling than for those born four or more years after a previous child (238 versus 91 per 1,000 births). The relationship occurs at every age group.

Table 3.11 Early childhood mortality rates by demographic characteristics

Neonatal, postneonatal, infant, child, and under-five mortality rates for the 10-year period preceding the survey, by demographic characteristics, Liberia 2009

Demographic characteristic	Neonatal mortality (NN)	Postneonatal mortality (PNN)[1]	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
Child's sex					
Male	52	57	109	62	164
Female	39	54	92	64	151
Mother's age at birth					
<20	64	67	131	81	201
20-29	42	50	92	74	159
30-39	34	57	91	31	119
40-49	78	43	121	72	184
Birth order					
1	57	57	114	64	170
2-3	39	48	88	73	154
4-6	35	51	86	66	146
7+	61	78	139	36	170
Previous birth interval[2]					
<2 years	74	81	155	99	238
2 years	38	54	92	69	155
3 years	26	41	66	47	110
4+ years	24	37	61	31	91

[1] Computed as the difference between the infant and neonatal mortality rates
[2] Excludes first-order births

MALARIA

4

4.1 KNOWLEDGE OF MALARIA

4.1.1 Knowledge of Malaria Symptoms

In order to assess basic knowledge about malaria, all women who were interviewed in the LMIS were asked if they had ever heard of malaria and if so, they were asked if they could name any symptoms of malaria (specifically, "what are some things that can happen to you when you have malaria?"). Results are shown in Table 4.1. Percentages may sum to more than 100 because respondents could give more than one response.

Table 4.1 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 2009

Background characteristic	All women		Among women who have heard of malaria, percentage who reported specific signs or symptoms of malaria									Number of women who have heard of malaria
	Percentage who have heard of malaria	Number of women	Fever	Chills	Head-ache	Joint pain	Poor appe-tite	Vomit-ing	Weak-ness	Yellow urine/ eye	Does not know any	
Age												
15-19	95.0	839	47.2	59.8	29.9	13.1	22.9	5.2	14.5	4.3	2.9	798
20-24	98.0	886	58.3	66.3	25.7	16.6	28.0	4.1	16.1	4.5	1.1	868
25-29	98.1	771	54.0	67.3	24.7	17.6	30.1	5.8	12.8	4.6	1.5	756
30-34	97.9	564	52.7	63.6	28.3	24.7	32.0	4.8	14.0	3.0	0.8	552
35-39	98.7	622	55.7	69.0	30.0	29.8	34.5	6.1	11.9	3.5	0.3	614
40-44	98.9	429	51.5	69.1	33.3	29.7	31.3	5.1	13.6	1.5	0.5	424
45-49	99.4	286	54.0	67.5	34.7	38.4	26.1	5.9	9.4	3.1	1.2	285
Residence												
Urban	98.3	2,225	53.4	62.0	30.0	20.5	37.0	4.9	16.6	4.4	1.2	2,187
Rural	97.1	2,172	53.5	69.5	27.1	23.1	20.8	5.5	10.7	3.0	1.4	2,109
Region												
Monrovia	97.7	1,285	50.6	56.0	29.8	20.6	38.6	3.4	18.1	4.9	1.2	1,256
North Western	98.8	276	73.8	64.0	25.8	13.3	21.4	4.8	15.0	1.3	0.2	272
South Central	97.7	762	66.1	61.0	16.0	15.2	26.2	4.6	21.2	3.7	0.4	745
South Eastern A	97.2	317	61.9	74.5	32.7	30.4	17.2	2.7	12.5	10.3	1.1	308
South Eastern B	94.9	211	49.3	35.7	31.6	20.2	20.8	2.8	12.6	7.5	7.0	200
North Central	97.9	1,546	44.7	78.5	33.1	26.0	27.4	7.9	6.4	1.4	1.2	1,514
Education												
No education	97.2	1,834	54.5	68.8	24.1	24.8	22.3	4.2	11.2	3.2	1.2	1,783
Primary	97.2	1,322	51.7	66.5	31.2	19.0	30.3	4.8	13.2	4.2	1.7	1,285
Secondary +	99.0	1,241	53.7	60.2	32.4	20.3	37.5	7.1	17.8	4.0	1.0	1,228
Wealth quintile												
Lowest	98.0	802	52.2	68.8	22.9	24.4	17.6	6.2	10.1	4.0	1.5	785
Second	96.8	811	53.7	70.6	29.5	24.5	21.4	4.8	12.0	4.0	1.9	785
Middle	96.9	818	53.8	69.0	27.9	18.9	29.1	5.2	8.6	2.5	1.7	793
Fourth	97.4	934	54.7	66.3	31.2	18.8	33.7	5.0	15.1	3.1	1.0	909
Highest	99.1	1,033	52.9	56.2	30.6	22.6	39.6	4.9	20.4	4.9	0.6	1,024
Total	97.7	4,397	53.4	65.7	28.6	21.8	29.1	5.2	13.7	3.8	1.3	4,296

Note: Percentages may add to more than 100.0, since multiple responses were allowed.

The results show that knowledge of malaria is almost universal. Ninety-eight percent of women have heard of malaria, a statistic that varies little by background characteristics.

When asked about symptoms of malaria, the most common responses were chills (mentioned by 66 percent of women) and fever (53 percent). Poor appetite, headache, and joint pain were mentioned by 20-30 percent of women, while weakness, vomiting, and yellow eyes were mentioned by fewer women. Differences in the reporting of malaria symptoms by background characteristics are surprisingly small, with region being the only variable with sizeable differences. Women in Monrovia are particularly likely to cite poor appetite as a symptom of malaria, while those in North Western are most likely to cite fever as a symptom. Women in South Eastern B are the least likely of women in any region to say that chills are a sign of malaria, while women in North Central are the most likely to cite this symptom.

4.1.2 Knowledge of Age Groups Most Affected by Malaria

Women who had heard of malaria were asked which age groups of people are most likely to get a serious case of malaria. Answers are shown in Table 4.2.

Table 4.2 Knowledge of age group most affected by malaria

Among women age 15-49 who have heard of malaria, the percentage who cite specific age groups of people who are most likely to get a serious case of malaria, by background characteristics, Liberia 2009

Background characteristic	Children	Pregnant women	Adults	Elderly	Everyone	Does not know	Number of women
Age							
15-19	70.2	27.5	8.2	10.7	17.4	5.1	798
20-24	76.9	32.5	7.7	9.1	13.9	4.6	868
25-29	74.2	37.9	8.7	8.5	13.1	5.4	756
30-34	75.9	30.8	9.5	10.0	15.5	5.0	552
35-39	75.6	31.7	7.2	11.8	20.8	3.3	614
40-44	76.3	34.9	7.1	8.7	17.5	3.3	424
45-49	72.8	28.7	13.6	13.3	18.4	6.9	285
Residence							
Urban	76.3	33.0	8.7	10.3	16.3	3.3	2,187
Rural	72.7	31.3	8.3	9.8	16.2	6.1	2,109
Region							
Monrovia	75.8	27.1	9.1	10.8	17.9	3.2	1,256
North Western	76.8	28.6	6.8	5.2	19.0	2.8	272
South Central	75.6	36.0	9.3	12.5	20.8	4.5	745
South Eastern A	83.7	40.1	15.6	18.9	12.4	5.9	308
South Eastern B	57.7	24.1	10.1	10.1	20.9	18.0	200
North Central	72.9	34.7	6.2	7.2	12.3	4.4	1,514
Education							
No education	70.8	31.3	9.2	9.8	19.2	7.2	1,783
Primary	74.4	31.1	6.6	10.7	14.9	4.1	1,285
Secondary +	80.1	34.5	9.3	9.6	13.5	1.8	1,228
Wealth quintile							
Lowest	67.3	29.7	10.1	9.9	17.1	9.1	785
Second	74.6	31.6	10.1	10.7	16.2	5.3	785
Middle	72.3	33.7	4.7	6.8	15.1	6.0	793
Fourth	75.4	34.8	7.3	10.6	17.1	2.7	909
Highest	81.0	31.0	10.0	11.6	15.8	1.7	1,024
Total	74.5	32.2	8.5	10.0	16.3	4.7	4,296

Note: Percentages may add to more than 100.0, since multiple responses were allowed.

Three-quarters of women age 15-49 know that children are most likely to be seriously affected by malaria, while almost one-third mentioned that pregnant women are most likely to be seriously affected. One in six (16 percent) say that everyone is likely to be seriously affected by malaria. There are only minor differences by background characteristics, except that women in South Eastern A seem to be more likely than women in other regions to mention children, pregnant women, adults, and the elderly as being particularly vulnerable to malaria.

4.1.3 Knowledge of Causes of Malaria

Ignorance of how malaria is spread inhibits women's ability to take preventive measures. When asked what causes malaria, 84 percent of Liberian women age 15-49 said it is caused by mosquitoes, 39 percent said it is caused by dirty surroundings, and 20 percent said it is caused by dirty water (Table 4.3). Differences by background characteristics are not large, although urban women, those with more education, and those in higher wealth quintiles are more likely than other women to mention mosquitoes, dirty water, and dirty surroundings as causes of malaria.

Table 4.3 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 2009

Background characteristic	Mosquitoes	Dirty water	Dirty surroundings	Beer	Certain food	Does not know any	Number of women
Age							
15-19	80.4	18.0	38.9	0.9	3.0	6.7	798
20-24	83.3	17.0	37.9	0.5	4.8	6.1	868
25-29	84.6	22.1	40.2	0.6	3.0	6.4	756
30-34	86.0	21.0	39.9	0.1	4.1	7.4	552
35-39	86.1	21.3	39.4	0.1	2.6	6.8	614
40-44	88.3	24.3	37.2	0.2	4.1	4.3	424
45-49	84.7	22.9	37.2	0.2	1.8	6.3	285
Residence							
Urban	88.5	21.7	45.4	0.6	3.7	3.4	2,187
Rural	80.0	18.9	32.1	0.3	3.2	9.4	2,109
Region							
Monrovia	89.5	18.4	47.1	0.4	4.0	3.4	1,256
North Western	84.4	16.6	25.2	0.4	0.7	8.9	272
South Central	74.9	19.9	37.9	0.2	3.9	10.9	745
South Eastern A	89.2	25.3	36.3	1.1	10.7	6.7	308
South Eastern B	70.0	16.3	21.4	0.3	5.4	18.0	200
North Central	85.5	22.3	37.7	0.4	1.6	4.6	1,514
Education							
No education	79.8	18.7	34.5	0.3	3.6	9.4	1,783
Primary	83.7	20.1	35.7	0.3	3.3	6.8	1,285
Secondary +	91.6	22.9	48.4	0.7	3.5	1.5	1,228
Wealth quintile							
Lowest	78.1	19.0	25.9	0.5	3.3	11.9	785
Second	80.9	20.1	36.5	0.5	4.2	7.6	785
Middle	82.0	20.5	35.5	0.5	2.5	8.3	793
Fourth	87.5	20.5	46.1	0.7	2.4	3.6	909
Highest	90.7	21.2	46.7	0.1	4.7	2.1	1,024
Total	84.3	20.3	38.9	0.4	3.5	6.4	4,296

Note: Percentages may add to more than 100.0, since multiple responses were allowed.

4.1.4 Knowledge of Ways to Avoid Malaria

Over 90 percent of Liberian women say that there are ways to avoid getting malaria (Table 4.4). Urban women, women in Monrovia, those with more education, and those in wealthier quintiles are more likely to say that malaria is avoidable. Women in South Eastern B (78 percent) are notably less likely to say that there are ways to avoid getting malaria.

Table 4.4 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 2009

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 insecti-cide spray	Keep door and windows closed	Use insect repellant	Keep sur-roundings clean	Cut the grass	Other	Does not know any	Number of women
Age												
15-19	92.2	798	71.0	12.7	7.6	7.5	0.5	57.1	7.3	9.4	3.0	736
20-24	92.1	868	79.4	9.8	10.7	7.0	0.8	53.9	7.3	6.3	3.3	800
25-29	93.0	756	77.9	11.9	11.6	8.9	1.6	55.5	10.2	8.0	3.4	703
30-34	92.3	552	75.3	10.5	12.5	7.6	0.4	56.9	7.0	6.2	4.9	509
35-39	91.4	614	78.1	13.8	11.4	10.0	0.8	58.5	8.1	8.7	1.9	561
40-44	92.7	424	76.5	8.5	8.2	5.1	1.1	57.4	10.8	6.8	2.6	393
45-49	91.9	285	74.9	15.5	13.3	12.8	2.2	54.6	10.3	8.7	2.5	262
Residence												
Urban	94.7	2,187	74.6	15.1	16.7	7.3	1.5	61.4	6.7	8.9	1.6	2,070
Rural	89.7	2,109	78.1	7.8	3.8	9.0	0.4	50.5	10.3	6.4	4.9	1,893
Region												
Monrovia	95.5	1,256	71.8	19.2	21.9	6.0	2.2	58.7	4.7	9.7	1.6	1,199
North Western	91.0	272	89.6	6.0	3.1	4.5	0.7	50.3	5.6	4.4	1.0	248
South Central	93.8	745	70.9	9.2	9.5	6.1	0.0	50.3	4.3	16.8	8.9	698
South Eastern A	92.6	308	90.4	10.2	5.5	12.9	0.3	39.3	14.6	5.2	1.8	285
South Eastern B	77.7	200	76.0	9.2	1.9	1.5	0.2	36.7	8.0	10.4	9.7	155
North Central	90.9	1,514	77.6	7.8	4.5	11.4	0.7	63.7	13.0	2.2	1.6	1,377
Education												
No education	89.4	1,783	74.8	12.6	5.9	9.3	1.1	50.3	9.5	5.7	5.1	1,595
Primary	91.2	1,285	76.3	9.0	7.0	8.2	0.1	53.4	9.0	7.6	3.2	1,172
Secondary +	97.4	1,228	78.3	12.8	20.2	6.4	1.7	66.8	6.6	10.5	0.7	1,196
Wealth quintile												
Lowest	87.3	785	75.4	9.8	3.0	11.4	0.0	42.5	13.8	5.5	5.6	685
Second	90.6	785	80.1	7.4	3.9	10.1	0.5	58.0	10.6	5.1	3.5	711
Middle	90.3	793	77.0	7.0	6.5	8.0	0.5	56.6	8.3	4.9	3.5	716
Fourth	94.6	909	78.0	13.4	11.0	6.0	1.0	59.1	5.5	7.6	3.1	860
Highest	96.7	1,024	72.1	17.6	23.1	6.4	2.2	61.5	5.9	13.2	1.0	990
Total	92.2	4,296	76.3	11.6	10.5	8.1	1.0	56.2	8.4	7.7	3.2	3,963

Note: Percentages may add to more than 100.0, since multiple responses were allowed.

When asked about the main ways to avoid getting malaria, 76 percent of women reported sleeping under a mosquito net and 56 percent reported keeping the surroundings clean. Twelve percent of women mentioned using mosquito coils as a way of avoiding malaria, while 11 percent mentioned using insecticide spray, and 8 percent each mentioned cutting the grass and keeping doors and windows closed. There are surprisingly small differences by background characteristics. For example, the proportion of women who mention sleeping under mosquito nets as a way of avoiding malaria is between 70 and 80 percent of women in all categories except women in both North Western and South Eastern A regions, where the proportion is 90 percent. Women in higher wealth quintiles are more likely than other women to mention mosquito coils and insecticide spray as ways to avoid malaria.

4.1.5 Knowledge of Malaria Treatment

Almost all women know that malaria can be treated. Ninety-eight percent of women say that malaria is treatable, with only slightly lower levels among women in South Eastern B region (Table 4.5).

Table 4.5 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 2009

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	New malaria drug/ ACT	Aspirin, panadol, para-cetemol	Herbs, tradi-tional medicine	Other	Does not know any	Number of women who say malaria can be treated
Age											
15-19	96.8	798	2.1	44.7	20.2	38.0	25.3	1.0	1.3	10.4	772
20-24	97.7	868	3.6	50.2	24.1	50.7	19.0	0.8	1.4	5.7	848
25-29	97.8	756	4.3	49.0	25.7	53.0	21.2	1.4	1.0	5.5	740
30-34	97.2	552	4.8	53.1	28.6	56.9	17.9	1.6	1.8	2.6	536
35-39	97.7	614	4.1	51.2	30.7	51.6	18.3	3.0	1.6	5.0	600
40-44	98.2	424	6.7	52.8	27.7	46.4	19.5	2.3	1.5	5.1	416
45-49	97.3	285	3.3	55.7	23.1	52.6	19.2	3.6	2.1	5.5	277
Residence											
Urban	98.5	2,187	6.1	53.5	32.8	49.8	20.4	1.2	1.6	4.3	2,154
Rural	96.5	2,109	1.7	46.5	17.7	49.0	20.4	2.3	1.2	7.7	2,035
Region											
Monrovia	99.2	1,256	6.1	58.1	34.7	46.0	19.7	1.1	1.8	4.9	1,247
North Western	98.5	272	1.5	29.6	15.1	67.8	16.8	1.0	1.0	5.1	268
South Central	97.7	745	4.9	51.2	23.2	46.7	26.9	3.1	2.5	9.2	728
South Eastern A	97.4	308	2.0	35.1	19.3	63.9	16.0	7.0	2.3	5.2	300
South Eastern B	90.2	200	4.6	61.1	11.0	32.3	27.1	4.7	1.8	9.1	180
North Central	96.8	1,514	2.5	48.2	23.7	49.3	18.4	0.2	0.5	5.2	1,466
Education											
No education	96.5	1,783	1.9	49.5	19.5	47.2	20.4	2.7	1.3	7.1	1,721
Primary	97.1	1,285	2.8	45.8	22.6	46.5	19.5	1.3	1.2	7.9	1,247
Secondary +	99.4	1,228	8.1	55.3	36.8	55.4	21.3	0.7	1.8	2.3	1,220
Wealth quintile											
Lowest	94.6	785	0.5	41.8	15.4	48.6	18.5	3.7	1.2	9.7	743
Second	96.8	785	2.2	49.0	17.6	49.0	21.7	2.1	1.2	6.2	759
Middle	98.0	793	2.1	45.8	21.6	52.4	16.6	1.1	0.9	6.4	777
Fourth	98.5	909	5.2	53.2	29.2	48.2	20.9	1.0	1.8	4.7	896
Highest	99.0	1,024	8.2	57.4	38.5	49.0	23.2	1.1	1.9	3.8	1,014
Total	97.5	4,296	4.0	50.1	25.5	49.4	20.4	1.7	1.4	6.0	4,189

Note: Percentages may add to more than 100.0, since multiple responses were allowed.

When asked what drugs are used to treat malaria, half of women mentioned chloroquine and/or the "new malaria drug," artesunate-amodiaquine combination (ACT). One-quarter of women mentioned quinine, while 20 percent mention aspirin, panadol, or paracetemol. Only a tiny proportion of women reported SP/Fansidar as a drug used to treat malaria.

Knowledge of ACT is quite uniform across background characteristics, though it is slightly lower among the youngest women interviewed (15-19) and among women in South Eastern B. The proportion of women who mention ACT as a malaria treatment is almost identical in urban and rural areas. It is particularly high among women in North Western and South Eastern A regions.

4.1.6 Exposure to Malaria Messages

A crucial element in the fight to eliminate malaria is the ability to reach the population with information and educational materials. In an effort to assess the coverage of communication programs, women interviewed in the LMIS were asked if they had seen or heard any messages about malaria in the few months before the survey.

As shown in Table 4.6, almost 7 in 10 women (69 percent) said they had seen or heard a message about malaria. The proportion is over 60 percent in all categories of background characteristics except among women in South Eastern B, only 27 percent of whom reported that they had seen or heard a malaria message in the few months before the survey. The proportion of women who were exposed to a malaria message increases with education and with wealth.

Table 4.6 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 2009

Background characteristic	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						
	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 bednets	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	64.1	798	34.5	33.9	12.5	46.3	8.9	0.5	512
20-24	68.8	868	39.5	37.1	11.7	42.6	6.1	0.4	597
25-29	69.1	756	36.8	36.6	14.6	41.4	11.2	0.1	522
30-34	69.8	552	36.5	39.3	16.7	44.6	10.3	0.6	385
35-39	69.3	614	37.5	36.2	12.2	44.8	7.8	0.4	425
40-44	75.7	424	45.4	33.1	10.6	43.1	12.0	0.0	321
45-49	66.4	285	47.9	31.6	17.8	48.4	6.9	0.3	189
Residence									
Urban	72.8	2,187	33.6	38.4	13.6	47.4	10.7	0.4	1,592
Rural	64.5	2,109	44.6	32.7	13.0	40.2	7.0	0.2	1,360
Region									
Monrovia	71.9	1,256	24.5	40.0	15.4	53.5	11.1	0.7	903
North Western	63.5	272	37.1	33.0	33.7	51.1	6.2	1.2	173
South Central	62.4	745	59.7	27.4	9.1	45.8	20.3	0.0	465
South Eastern A	67.5	308	20.3	29.3	10.1	81.8	21.6	0.0	208
South Eastern B	26.5	200	27.9	29.1	5.6	58.6	6.4	3.1	53
North Central	75.9	1,514	45.3	37.8	11.3	27.4	1.0	0.0	1,149
Education									
No education	62.3	1,783	43.7	33.1	12.7	42.1	7.6	0.2	1,111
Primary	71.0	1,285	37.0	35.7	11.4	40.7	8.4	0.5	912
Secondary +	75.6	1,228	34.3	39.2	16.0	49.7	11.2	0.4	929
Wealth quintile									
Lowest	57.8	785	39.8	34.8	9.4	38.9	6.6	0.5	454
Second	62.9	785	45.2	32.6	15.0	44.9	8.4	0.2	494
Middle	72.5	793	43.6	35.1	13.8	35.6	4.4	0.4	575
Fourth	73.6	909	37.8	37.0	12.8	43.0	7.9	0.5	669
Highest	74.2	1,024	30.7	37.9	14.8	53.9	15.3	0.2	759
Total	68.7	4,296	38.7	35.8	13.3	44.1	9.0	0.3	2,951

Note: Percentages may add to more than 100.0, because multiple responses were allowed.

When asked about the content of the message, the most commonly mentioned reply was that the message was related to the fact that malaria is a deadly disease ("Malaria kills"), mentioned by 44 percent of women who heard or saw a message. Almost as many women reported seeing or hearing a message about the importance of going to a health facility when having a fever (39 percent of women) or a message about sleeping under a mosquito bed net (36 percent of women). Thirteen percent of women saw or heard a message about the need for pregnant women to take drugs to prevent getting malaria.

There are some differences in the exposure to specific malaria-related messages, especially by region. Messages about the importance of going for treatment when having a fever seem to have the highest coverage among women in South Central region (60 percent) and the lowest in South Eastern A (20 percent). There are also strong regional differences in the proportion of women who have heard or seen messages that malaria can kill, from only 27 percent of women in North Central region to 82 percent of those in South Eastern A region.

Table 4.7 shows the places women say they saw or heard malaria messages. The most commonly cited source is community health workers (58 percent of women), followed by radio (46 percent). All other sources of information were mentioned by less than 10 percent of women. Urban women are more likely than rural women to see or hear malaria messages on the radio and less likely to get such messages from community health workers. Community health workers in North Western and North Central regions appear to be doing a better job in terms of malaria education than their counterparts in other regions.

Table 4.7 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 2009

Background characteristic	Place where malaria message was seen or heard												Number of women who have seen or heard a malaria message
	Radio	Bill-board	Poster	T-Shirt	Leaflet/ fact sheet/ brochure	Tele-vision	Video club	School	Com-munity health worker	Peer edu-cators	Clinic/ health center	Others	
Age													
15-19	44.2	4.9	4.6	2.7	0.0	0.5	1.3	13.5	50.8	10.7	5.8	2.6	512
20-24	44.2	6.6	8.5	1.5	1.5	0.3	0.8	3.8	59.0	11.0	6.1	2.5	597
25-29	43.2	5.7	8.8	2.1	0.1	1.3	0.2	1.7	61.1	7.7	11.5	2.3	522
30-34	43.3	5.9	5.7	1.7	0.0	2.4	0.0	2.3	56.9	7.4	9.6	4.3	385
35-39	46.9	1.8	5.9	1.7	1.0	0.5	0.1	0.2	61.5	7.0	8.5	3.5	425
40-44	51.3	6.9	6.6	0.4	0.0	0.7	0.0	1.1	59.0	7.4	6.6	2.8	321
45-49	62.0	0.6	5.1	2.3	0.7	1.0	0.0	1.2	50.7	8.3	10.1	2.9	189
Residence													
Urban	54.5	7.1	7.2	2.4	0.9	1.6	0.5	4.7	51.7	7.6	7.8	2.3	1,592
Rural	36.5	2.5	6.2	1.2	0.0	0.1	0.4	3.1	64.3	10.1	8.5	3.6	1,360
Region													
Monrovia	60.7	8.7	8.5	3.1	1.5	2.7	0.7	5.0	43.1	7.0	8.2	3.1	903
North Western	40.5	9.5	22.6	7.4	0.2	0.0	0.0	3.0	76.8	24.6	0.0	1.5	173
South Central	54.1	8.7	4.5	1.7	0.0	0.2	0.0	2.9	44.6	13.7	23.9	1.8	465
South Eastern A	23.8	2.5	17.1	0.0	0.2	0.4	0.6	5.4	58.5	14.1	19.4	17.1	208
South Eastern B	27.7	2.3	3.2	0.0	0.4	1.0	0.4	5.0	59.4	2.9	9.0	0.9	53
North Central	37.4	0.5	2.1	0.4	0.1	0.0	0.5	3.3	70.9	5.1	0.8	0.9	1,149
Education													
No education	35.6	2.9	6.8	1.5	0.0	0.1	0.2	0.1	66.1	8.3	9.1	4.3	1,111
Primary	46.9	3.6	4.4	1.3	0.2	0.2	0.7	5.7	52.7	9.9	7.3	2.2	912
Secondary +	58.2	8.9	8.9	2.7	1.5	2.6	0.5	6.7	52.0	8.2	7.8	2.0	929
Wealth quintile													
Lowest	23.0	1.3	8.1	1.2	0.2	0.1	0.0	1.9	69.1	9.3	8.1	7.0	454
Second	34.5	3.7	8.8	1.8	0.1	0.1	1.0	2.5	66.3	9.6	8.6	3.5	494
Middle	48.1	3.9	3.2	1.0	0.6	0.0	0.3	3.3	61.3	7.3	4.6	0.7	575
Fourth	55.3	4.2	5.4	2.1	0.3	0.3	0.3	4.5	55.9	8.7	5.8	2.3	669
Highest	58.2	9.6	8.4	2.6	1.1	3.1	0.5	6.0	43.4	9.0	12.5	2.3	759
Total	46.2	5.0	6.7	1.8	0.5	0.9	0.4	3.9	57.5	8.8	8.1	2.9	2,951

Note: Percentages may add to more than 100.0 because multiple responses were allowed.

Similarly, health workers at clinics and health centers in South Central and South Eastern A regions are reaching a larger percentage of women than those in North Western and North Central regions. There is a steady increase by wealth quintile in the proportion of women who say they saw or heard a malaria message on radio, billboard, and at school.

4.2 Ownership and Use of Mosquito Nets

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, insecticide-treated mosquito nets (ITNs) are regarded as a promising malaria control tool, and when used by all or most members of the community can reduce malaria transmission. The Government of Liberia is committed to achieving coverage of 80 percent of households with ITNs by 2010.

4.2.1 Ownership of Mosquito Nets

The 2009 LMIS household questionnaire included questions on net ownership and re-treatment practices. Table 4.8 provides information on the percentage of households that have any net, an ever-treated net and an ITN according to residence, region and wealth quintile.

Overall, 49 percent of households in Liberia have at least one mosquito net (treated or untreated). This is a big improvement over the household net ownership of 18 percent recorded in 2005, and a sizeable jump in the last two years from the 30 percent recorded in the 2007 LDHS (Figure 4.1). The 2009 LMIS also shows that 19 percent of households have more than one net.

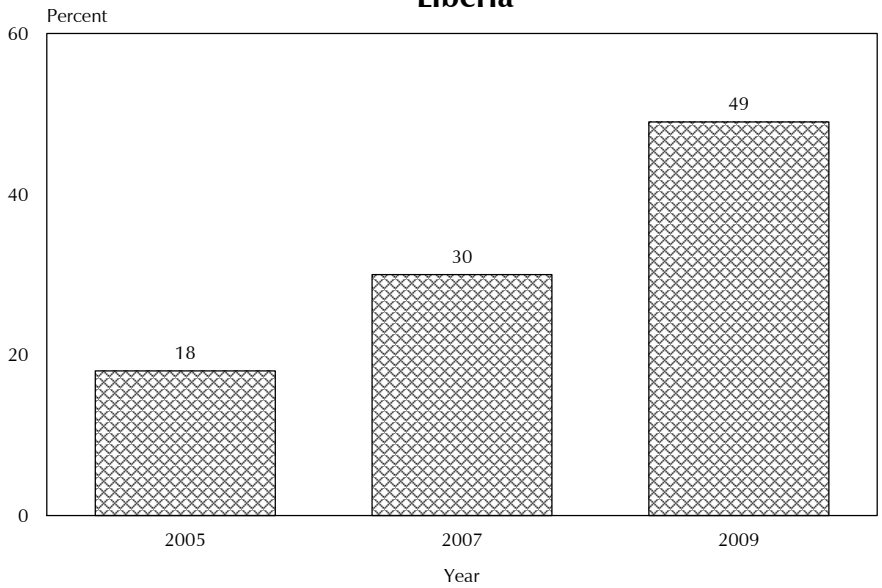
Table 4.8 Ownership of mosquito nets

Percentage of households with at least one and more than one mosquito net (treated or untreated), ever-treated mosquito net and insecticide-treated net (ITN), and the average number of nets per household, by background characteristics, Liberia 2009

Background characteristic	Any type of mosquito net			Ever-treated mosquito net[1]			Insecticide-treated mosquito nets (ITNs)[2]			Number of households
	Percentage with at least one	Percentage with more than one	Average number of nets per household	Percentage with at least one	Percentage with more than one	Average number of ever-treated nets per household	Percentage with at least one	Percentage with more than one	Average number of ITNs per household	
Residence										
Urban	44.5	14.9	0.7	42.1	13.9	0.6	42.0	13.8	0.6	1,940
Rural	52.7	22.4	0.9	51.8	21.8	0.8	51.8	21.8	0.8	2,222
Region										
Monrovia	36.7	9.0	0.5	33.8	7.7	0.4	33.8	7.5	0.4	1,078
North Western	64.4	24.3	1.0	63.0	23.8	1.0	62.9	23.8	1.0	382
South Central	32.4	7.8	0.4	31.6	7.6	0.4	31.6	7.6	0.4	810
South Eastern A	62.2	23.3	0.9	60.7	22.7	0.9	60.6	22.3	0.9	305
South Eastern B	67.2	38.7	1.2	66.0	37.2	1.2	66.0	37.1	1.2	231
North Central	58.0	27.5	1.0	56.7	26.9	1.0	56.6	26.9	1.0	1,355
Wealth quintile										
Lowest	49.0	17.5	0.7	48.1	16.7	0.7	48.0	16.6	0.7	903
Second	55.3	24.7	0.9	54.5	24.2	0.9	54.5	24.1	0.9	860
Middle	54.0	21.9	0.9	52.8	21.7	0.9	52.6	21.6	0.9	785
Fourth	45.1	16.2	0.7	42.9	15.1	0.6	42.9	14.9	0.6	811
Highest	40.9	14.0	0.6	37.7	12.8	0.6	37.7	12.8	0.6	803
Total	48.9	18.9	0.8	47.3	18.1	0.7	47.2	18.0	0.7	4,162

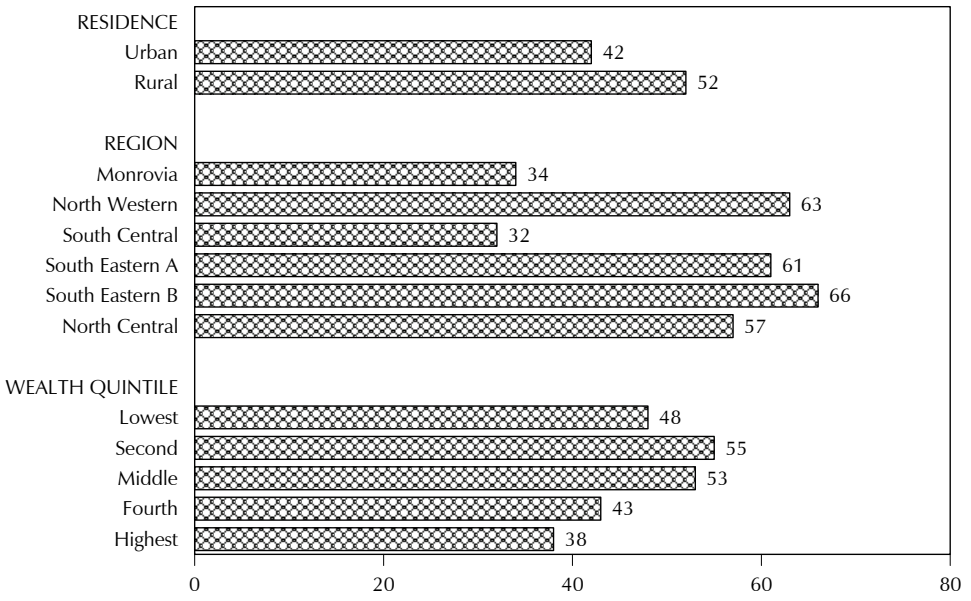
[1] An ever-treated net is 1) a pretreated net or a non-pretreated net which has subsequently been soaked with insecticide at any time.
[2] An insecticide-treated net (ITN) is 1) a factory-treated net that does not require any further treatment, or 2) a pretreated net obtained within the past 12 months,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

Figure 4.1 Trends in Ownership of Any Mosquito Net, Liberia



It is also reassuring to note that almost all nets are ITNs; 47 percent of households report owning an ITN. As shown in Figure 4.2, ITN ownership is higher among rural than urban households (52 versus 42 percent). It ranges from 32 percent of households in South Central region to a high of 66 percent of households in South Eastern B region. Greater Monrovia has one of the lowest levels of net ownership of any region; only 34 percent of households in Monrovia own an ITN. It is interesting to note that the wealthiest households are the least likely to own an ITN. These patterns are plausible because in Liberia, most ITNs are donated to Liberia, so they are distributed free of charge. Prior to the 2009 LMIS, counties with large urban populations such as Montserrado, Nimba, Bong and Bassa, had not benefited from mass ITN distribution. This explains the low coverage of ITNs in these regions.

Figure 4.2 Differentials in Ownership of ITNs



Note: Percentage of households owning at least one insecticide-treated net

LMIS 2009

Households without nets were asked why they did not have one. Responses shown in Table 4.9 indicate that the most common reason given was that nets are not available (59 percent), followed by the cost of nets (24 percent). Citing high cost appears to be more of an issue among households in South Central region and Monrovia, both areas that have relatively lower proportions citing lack of availability as reasons for not owning nets. Households in Monrovia and households in the wealthiest quintile are also more likely than other households to mention not liking to use nets as reasons for not owning one.

Table 4.9 Reason for not having mosquito nets

Among household without mosquito nets, percentage reporting various reasons for not owning a net, by background characteristics, Liberia 2009

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	2.5	50.5	11.3	26.0	13.1	1,076
Rural	1.3	68.3	1.8	22.7	8.7	1,050
Region						
Monrovia	3.5	40.3	16.2	29.5	14.5	682
North Western	0.0	88.7	1.0	4.6	8.4	136
South Central	2.9	43.3	2.6	37.9	18.1	548
South Eastern A	0.0	73.7	1.3	17.9	10.8	115
South Eastern B	0.7	85.0	1.5	5.0	13.7	76
North Central	0.0	84.1	2.0	13.8	0.0	570
Wealth quintile						
Lowest	0.3	68.4	1.6	24.2	8.6	461
Second	0.1	68.4	0.9	25.2	7.6	384
Middle	0.3	65.0	2.9	25.7	9.2	361
Fourth	1.5	53.6	6.5	29.2	12.2	445
Highest	6.4	44.2	19.0	18.3	16.0	475
Total	1.9	59.3	6.6	24.4	10.9	2,127

Note: Percentages may sum to more than 100.0 because more than one reason can be given.

4.2.2 Cost of Mosquito Nets

As part of its program to curtail malaria, the NMCP has been distributing mosquito nets widely, mostly free of charge. In the LMIS, households that owned nets were asked how much they paid for the nets. Table 4.10 shows information on the proportion of nets obtained for free and the average cost for those purchased.

Table 4.10 Cost of mosquito nets

Percent distribution of mosquito nets by whether purchased or obtained free of charge and for those purchased, the mean cost, by background characteristics, Liberia 2009

Background characteristic	For all nets reported by households					Number of nets	For nets that were bought	
	Bought	Obtained free	Don't know	Missing	Total		Mean cost[1]	Number of nets bought
Residence								
Urban	34.6	63.9	0.8	0.7	100.0	1,281	260	443
Rural	10.9	88.0	0.0	1.0	100.0	1,893	235	207
Region								
Monrovia	61.9	36.4	1.6	0.0	100.0	530	272	329
North Western	4.0	95.1	0.1	0.8	100.0	382	*	15
South Central	24.1	74.1	0.2	1.5	100.0	354	218	85
South Eastern A	7.0	91.4	0.1	1.5	100.0	285	(257)	20
South Eastern B	3.4	95.0	0.0	1.6	100.0	281	*	10
North Central	14.3	84.9	0.0	0.8	100.0	1,342	238	192
Wealth quintile								
Lowest	9.5	89.1	0.0	1.4	100.0	650	225	62
Second	8.9	90.0	0.0	1.1	100.0	777	231	69
Middle	15.1	83.7	0.3	0.9	100.0	688	208	104
Fourth	28.9	70.5	0.2	0.5	100.0	554	268	160
Highest	50.6	47.6	1.5	0.3	100.0	504	272	255
Total	20.5	78.3	0.3	0.9	100.0	3,174	252	651

Note: Numbers in parentheses are based on 25-49 unweighted cases, while an asterisk denotes a figure based on fewer than 25 unweighted cases that has been suppressed.
[1] In Liberian dollars

Results show that well over three-quarters of nets (78 percent) are obtained free of charge, with only 21 percent being purchased. Nets in urban areas, especially in Monrovia, are far more likely to be purchased than nets in other areas. More than 3 in 5 nets (62 percent) owned by households in Monrovia were purchased, compared with only 3 percent of nets in South Eastern B region and 4 percent of nets in North Western region. Just over half of nets owned by households in the wealthiest quintile were bought.

Among nets that were purchased, the average cost was 252 Liberian dollars (approximately U.S. $3.80). There is little variation in cost of nets by residence or region.

4.2.3 Use of Mosquito Nets by Children under Five

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. A key factor in acquiring immunity is age. For their first six months of life, children born in areas of heavy malaria transmission are protected from disease, possibly due in part to the presence of antibodies acquired from the mother during pregnancy. This protection is gradually lost, and, until they develop their own immunity to malaria through repeated exposure to *P. falciparum*, young children are highly susceptible to the disease. How rapidly children acquire immunity depends in part on the frequency of exposure to *P. falciparum*, but in areas of high transmission, children are considered immune by their fifth birthday. In areas of low or seasonal malaria transmission, immunity is acquired more slowly or not at all. As a result, in such regions, malaria affects all members of the community regardless of age. Malaria transmission is heavy throughout Liberia, and the Liberian government recognizes children under five years of age as a high risk group and recommends that they be protected by sleeping under insecticide-treated nets.

Table 4.11 shows the information on use of any nets and ITNs by children under five years of age. Just over one-quarter of children (27 percent) were reported to have slept under any net the night before the survey, while 26 percent slept under an ITN. Among children living in a households that own an ITN, only half (51 percent) slept under an ITN the night before the survey. This statistic implies that greater efforts should be made to encourage households to use the bednets that they own.[1]

The proportion of children under five in all households who slept under an ITN the night before the survey declines slightly as age increases. While one-third of infants under one year of age slept under an ITN, the proportion declines to 20-23 percent among children who are three and four years old. Differences in use of ITNs by sex of the child and by urban-rural residence are minimal. Differences by region reflect the data on ownership of ITNs, with the lowest proportions of children sleeping under an ITN appearing for South Central region (17 percent) and for Monrovia (20 percent) (Figure 4.3).

[1] It should be noted that data collection for the LMIS took place from mid-December-February, somewhat after the height of malaria transmission season. This may account for the relatively low use of nets in households that own them. Another reason for low use of nets could be heat, since the period December-February is usually the warmest time of year in Liberia.

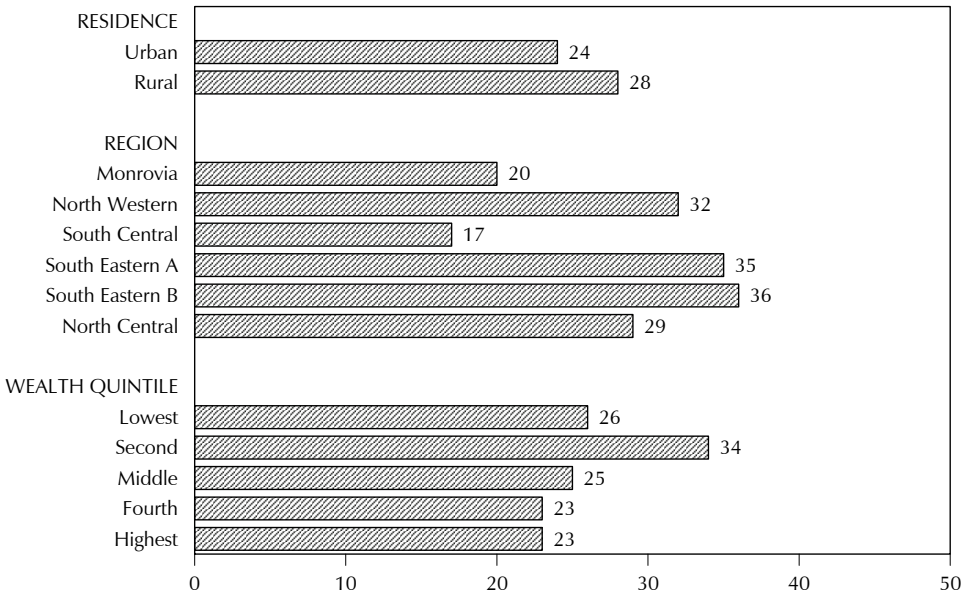
Table 4.11 Use of mosquito nets by children

Among children under five years of age in all households, the percentages who slept the night before the survey under a mosquito net (treated or untreated), under an ever-treated mosquito net, and under an insecticide-treated net (ITN), and among children under five years of age in households with at least one ITN, the percentage who slept the night before the survey under an ITN, by background characteristics, Liberia 2009

	Children under age 5 in all households				Children under age 5 in households with an ITN	
Background characteristic	Percentage who slept under any net the night before the survey	Percentage who slept under an ever-treated net the night before the survey[1]	Percentage who slept under an ITN the night before the survey[2]	Number of children	Percentage who slept under an ITN the night before the survey[2]	Number of children
Age in months						
<1	33.6	33.3	33.2	915	63.5	478
1	29.0	28.1	28.1	980	54.7	504
2	28.7	27.6	27.6	935	52.6	491
3	21.4	20.3	20.3	915	41.5	447
4	23.6	23.0	23.0	981	44.5	507
Sex						
Male	26.6	25.8	25.8	2,413	49.9	1,249
Female	27.9	27.1	27.1	2,312	53.1	1,177
Residence						
Urban	25.6	24.1	24.0	1,796	52.5	822
Rural	28.2	27.9	27.9	2,930	50.9	1,605
Region						
Monrovia	22.0	19.8	19.8	823	50.3	324
North Western	32.7	32.2	32.2	360	49.4	234
South Central	17.2	17.0	17.0	806	44.8	305
South Eastern A	35.6	35.4	35.4	416	58.4	252
South Eastern B	36.4	36.3	36.3	237	52.5	164
North Central	29.5	28.8	28.8	2,083	52.3	1,147
Wealth quintile						
Lowest	25.7	25.6	25.6	1,116	51.0	561
Second	34.9	34.3	34.3	1,080	60.2	616
Middle	25.1	24.7	24.5	985	45.1	535
Fourth	24.3	22.6	22.6	900	48.2	422
Highest	24.5	22.8	22.8	645	50.2	293
Total	27.2	26.5	26.4	4,725	51.4	2,427

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

Figure 4.3 Use of ITNs by Children under Five



Note: Percentage of children under five who slept under an insecticide-treated net the night before the survey.

LMIS 2009

4.2.4 Use of Mosquito Nets by Women

In areas of high malaria transmission, adults acquire immunity to malaria, which protects them from death and severe disease. Pregnancy, however, leads to immune suppression and pregnant women, especially those in their first pregnancies, are at increased risk for severe malaria relative to other adults. In addition, malaria in pregnant women is frequently associated with the development of anemia; it also interferes with the maternal-fetus exchange, leading to low-birth-weight infants. To reduce the risks associated with malaria during pregnancy, pregnant women are recommended to sleep under bed nets; in Liberia, the National Malaria Strategy target is for 80 percent of pregnant women to sleep under ITNs. The 2009 LMIS collected information on usage of nets by women. Table 4.12 shows the proportion of women who slept under mosquito nets the night before the survey, while Table 4.13 provides similar information for women who were pregnant at the time of the survey (Figure 4.4).

Twenty-nine percent of all women and 33 percent of pregnant women reported that they slept under an ITN the night before the survey. Use of ITNs among all women and pregnant women is higher among rural women and those who are less educated. Among all women, use of ITNs is highest for women in South Eastern B and North Western regions, while for pregnant women, it is highest in North Central and North Western regions. Use of ITNs shows no consistent pattern by wealth quintile.

As expected, use of ITNs is considerably higher for women who live in households that own ITNs. Sixty-one percent of all women and 63 percent of pregnant women who live in households with ITNs reported that they slept under an ITN the night before the survey.

Table 4.12 Use of mosquito nets by women

Among all women age 15-49 in all households, the percentage who slept the night before the survey under a mosquito net (treated or untreated), under an ever-treated mosquito net, and under an insecticide-treated net (ITN), and among all women age 15-49 in households with at least one ITN, the percentage who slept the night before the survey under an ITN, by background characteristics, Liberia 2009

	Percentage of all women age 15-49 who slept under:				Percentage of women age 15-49 in households with an ITN who:	
Background characteristic	Any net the night before the survey	An ever-treated net the night before the survey[1]	An ITN the night before the survey[2]	Number of women	Slept under an ITN the night before the survey[2]	Number of women
Residence						
Urban	25.6	24.1	24.0	2,414	57.6	1,007
Rural	34.6	34.0	34.0	2,356	62.8	1,276
Region						
Monrovia	18.4	16.4	16.3	1,394	49.6	458
North Western	42.4	41.7	41.6	299	64.5	193
South Central	20.2	19.6	19.6	826	55.4	292
South Eastern A	37.9	37.6	37.6	344	64.6	200
South Eastern B	43.4	42.9	42.9	228	62.3	157
North Central	39.0	38.3	38.2	1,677	65.2	983
Education						
No education	34.7	33.5	33.4	1,935	66.7	970
Primary	28.3	27.5	27.4	1,396	53.9	711
Secondary +	26.3	25.2	25.2	1,306	59.6	553
Wealth quintile						
Lowest	28.2	27.6	27.5	870	55.9	429
Second	41.7	41.2	41.2	879	71.6	506
Middle	35.7	35.1	34.9	895	63.2	494
Fourth	29.0	27.5	27.3	1,008	60.9	453
Highest	18.7	17.1	17.1	1,117	47.6	401
Total	30.0	29.0	29.0	4,769	60.5	2,282

[1] An ever-treated net is a pretreated net or a non-pretreated net which has subsequently been soaked with insecticide at any time.

[2] An insecticide treated net (ITN) is 1) a factory-treated net that does not require any further treatment, or 2) a pretreated net obtained within the past 12 months, or 3) a net that has been soaked with insecticide within the past 12 months.

Table 4.13 Use of mosquito nets by pregnant women

Among pregnant women age 15-49 in all households, the percentage who slept the night before the survey under a mosquito net (treated or untreated), under an ever-treated mosquito net, and under an insecticide-treated net (ITN), and among pregnant women age 15-49 in households with at least one ITN, the percentage who slept the night before the survey under an ITN, by background characteristics, Liberia 2009

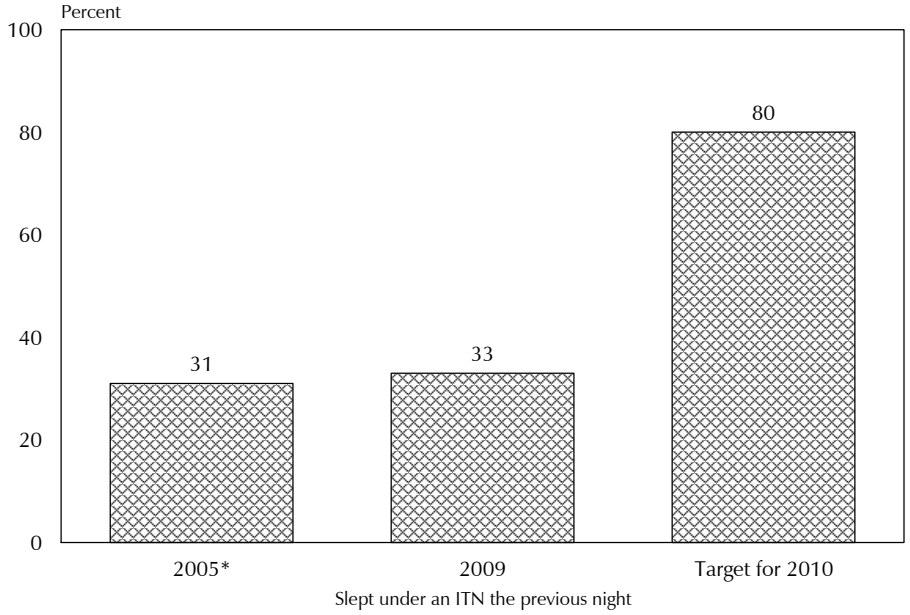
	Percentage of pregnant women age 15-49 who slept under:				Percentage of pregnant women age 15-49 in households with ITN who:	
Background characteristic	Any net the night before the survey	An ever-treated net the night before the survey	An ITN the night before the survey[2]	Number of women	Slept under an ITN the night before the survey[2]	Number of women
Residence						
Urban	30.1	29.3	29.3	204	62.4	96
Rural	36.5	35.6	35.6	268	63.7	150
Region						
Monrovia	16.9	16.9	16.9	96	*	31
North Western	44.8	44.8	44.8	36	59.9	27
South Central	19.1	18.4	18.4	86	*	28
South Eastern A	29.7	29.7	29.7	46	66.2	20
South Eastern B	36.1	34.9	34.9	21	(48.0)	15
North Central	47.8	46.1	46.1	186	69.5	124
Education						
No education	40.4	38.7	38.7	219	72.0	118
Primary	29.0	29.0	29.0	156	51.9	87
Secondary +	25.0	24.8	24.8	92	(59.3)	38
Wealth quintile						
Lowest	31.4	29.9	29.9	113	63.8	53
Second	36.3	35.5	35.5	99	60.2	58
Middle	46.9	46.9	46.9	98	74.3	62
Fourth	29.0	27.5	27.5	101	59.9	47
Highest	20.5	20.5	20.5	60	(47.8)	26
Total	33.8	32.9	32.9	471	63.2	245

Note: Numbers in parentheses are based on 25-49 unweighted cases, while an asterisk denotes a figure based on fewer than 25 unweighted cases that has been suppressed.

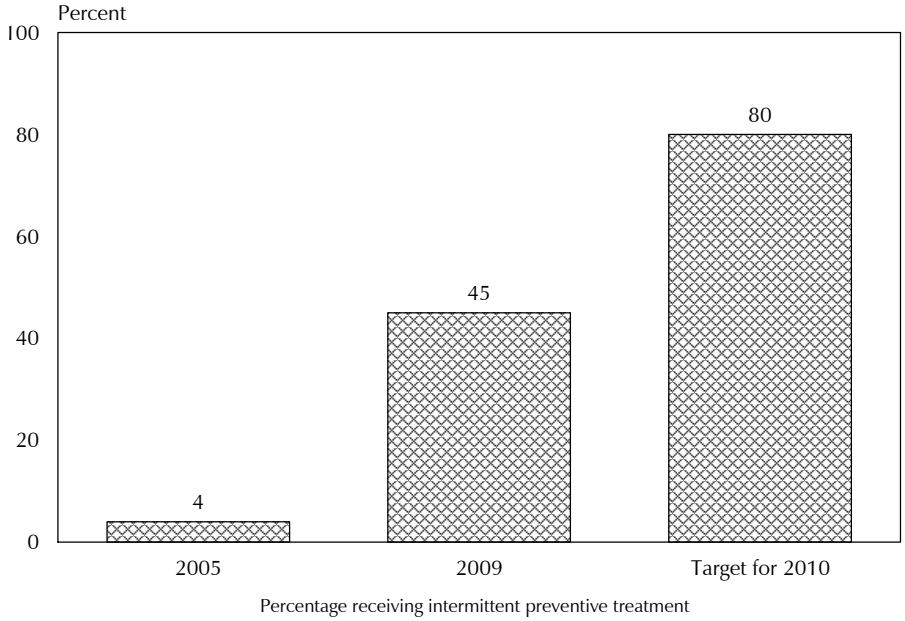
[1] An ever-treated net is a pretreated net or a non-pretreated net which has subsequently been soaked with insecticide at any time.

[2] An insecticide-treated net (ITN) is 1) a factory-treated net that does not require any further treatment, or 2) a pretreated net obtained within the past 12 months, or 3) a net that has been soaked with insecticide within the past 12 months.

Figure 4.4 **Malaria Indicators for Pregnant Women, Liberia**



* Refers to any mosquito net



4.3 INTERMITTENT PREVENTIVE TREATMENT OF MALARIA IN PREGNANCY

As explained above, in areas of high malaria transmission, by the time an individual reaches adulthood, s/he has acquired immunity that protects her/him from 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.

The National Policy for Malaria Control and Prevention (NMCP, 2004) calls for pregnant women to receive intermittent preventive treatment (IPT) to reduce the risks associated with malaria infection. IPT using sulfadoxine-pyrimethamine (SP/Fansidar) was introduced as a replacement to chloroquine prophylaxis, which was no longer effective due to high levels of chloroquine resistance. Current policy states that all pregnant women living in areas of high malaria transmission should receive a minimum of two doses of SP/Fansidar. The first dose should be administered at the beginning of the second trimester; the second dose at the start of the third trimester.

In the 2009 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 yes, 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. Table 4.14 shows the percentage of pregnant women who were counseled about IPT, the percentage who took any antimalarial drugs to prevent malaria, and the percentage who took SP/Fansidar.

Table 4.14 Prophylactic use of antimalarial drugs and use of intermittent preventive treatment (IPT) by women during pregnancy

Percentages of women who were told about intermittent preventive treatment (IPT), who took any antimalarial drugs for prevention, who took SP/Fansidar, and who received IPT during the pregnancy for their last live birth in the two years preceding the survey, by background characteristics, Liberia 2009

			SP/Fansidar		Intermittent preventive treatment		
Background characteristic	Percentage who were told about IPT	Percentage who took any antimalarial drug	Percentage who took any SP/Fansidar	Percentage who took 2+ doses	Percentage who received any SP/Fansidar during a PNC visit	Percentage who received 2 or more doses during PNC visit	Number of women
Residence							
Urban	80.7	69.1	61.8	49.6	58.9	47.1	585
Rural	72.1	62.9	55.6	46.1	53.0	43.9	988
Region							
Monrovia	84.9	71.8	59.9	45.5	57.0	42.6	285
North Western	87.5	76.8	73.4	63.1	70.0	60.1	127
South Central	75.1	64.6	62.1	46.1	61.3	45.3	313
South Eastern A	77.3	66.7	66.7	50.8	65.0	49.5	143
South Eastern B	57.9	44.0	30.8	25.3	27.0	22.0	85
North Central	70.4	62.7	53.4	48.0	49.8	45.1	619
Education							
No education	74.9	64.8	58.9	48.0	55.8	45.7	738
Primary	72.6	64.7	55.3	45.0	52.3	42.1	513
Secondary +	80.6	67.0	59.8	49.7	58.3	48.3	322
Wealth quintile							
Lowest	71.9	60.0	50.2	41.1	47.0	38.6	390
Second	75.4	62.8	56.7	45.2	53.2	42.5	337
Middle	69.4	63.2	59.5	51.7	57.4	49.7	330
Fourth	78.4	69.6	61.5	50.2	59.4	48.2	303
Highest	86.1	75.6	66.3	51.8	63.8	49.4	212
Total	75.3	65.2	57.9	47.4	55.2	45.1	1,573

IPT = Intermittent preventive treatment is treatment with SP/Fansidar during a prenatal care (PNC) visit.

The survey results show that three-quarters of women with a live birth in the two years before the survey were told about IPT, while almost two-thirds (65 percent) of women took some kind of antimalarial medicine for prevention of malaria during the last pregnancy. Most of these women were following the national policy, i.e., 58 percent of women said they took SP/Fansidar—the recommended drug for prevention of malaria during pregnancy in Liberia—at least once during the pregnancy and 47 percent of women took SP/Fansidar two or more times, a huge improvement from the 4 percent reported in the 2005 survey (NMCP, 2006). Slightly smaller percentages of women said that they received the SP/Fansidar during a prenatal care visit; consequently, 45 percent of women received two or more doses of SP/Fansidar, at least one of which was received as part of a prenatal care visit (Figure 4.4),

4.4 Malaria Case Management among Children

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 2009 LMIS asked mothers whether their children under five years 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 4.15 shows the percentage of children under five who had fever in the two weeks preceding the survey and 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 antimalarial drugs, and the percentage taking drugs on the same or next day.

Survey results show that 44 percent of children under five had a fever in the two weeks preceding the survey and, of these, 67 percent took some type of antimalarial drug, with 38 percent taking antimalarials on the same or next day. Almost one-quarter of children with fever were reported to have had a drop of blood taken from a finger or heel. Prevalence of fever is quite uniform across age, residence, region, and mother's education, though it is slightly lower among children in South Eastern B region. The proportion of children with fever who are given antimalarial drugs is somewhat higher among children in urban areas, those whose mothers are better educated, and those in higher wealth quintiles. It is also relatively higher among children in North Central region and Monrovia. Similar patterns exist for treatment with antimalarial drugs the same or the day after the fever started.

Table 4.15 Prevalence and prompt treatment of fever

Percentage of children under age five with fever in the two weeks preceding the survey, and among children with fever, the percentage who had a blood drop taken from a finger or heel, 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 2009

	Children under five		Children under five with fever			
Background characteristic	Percentage with fever in the two weeks preceding the survey	Number of children	Percentage who had blood drop taken	Percentage who took antimalarial drugs	Percentage who took antimalarial drugs same or next day	Number of children
Age (in months)						
<12	40.1	787	21.6	63.5	37.6	316
12-23	51.9	773	23.4	65.1	31.6	401
24-35	48.4	706	22.5	70.5	42.0	342
36-47	41.7	688	23.5	70.0	38.4	287
48-59	35.8	740	26.8	67.3	40.2	265
Residence						
Urban	46.7	1,411	28.4	72.2	42.7	659
Rural	41.7	2,283	20.0	63.7	34.1	951
Region						
Monrovia	49.0	689	33.8	74.4	42.4	337
North Western	40.3	286	21.3	55.4	40.8	115
South Central	41.9	708	11.5	57.3	22.6	297
South Eastern A	44.0	344	13.4	46.5	17.1	151
South Eastern B	32.8	197	12.9	55.6	24.0	65
North Central	43.9	1,471	27.3	76.0	47.6	645
Mother's education						
No education	41.5	1,880	20.2	65.2	35.3	780
Primary	45.2	1,111	24.4	66.0	36.3	502
Secondary +	46.6	703	29.7	73.6	45.2	328
Wealth quintile						
Lowest	39.7	919	20.3	54.3	22.7	365
Second	45.9	816	19.9	65.5	41.6	375
Middle	41.8	755	22.2	70.0	45.1	316
Fourth	44.4	707	26.4	76.9	38.7	314
Highest	48.5	496	31.5	72.8	42.8	240
Total	43.6	3,694	23.4	67.2	37.6	1,610

Details on the types and timing of antimalarial drugs given to children to treat fever are shown in Table 4.16. 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 according to the 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.

Table 4.16 Type and timing of antimalarial drugs

Among children under age five with fever in the two weeks preceding the survey, percentage who took specific antimalarial drugs and percentage who took each type of drug the same or next day after developing the fever, by background characteristics, Liberia 2009

Background characteristic	Percentage of children who took drug:					Percentage of children who took drug the same or next day:					Number of children with fever
	SP/ Fansidar	Chloro-quine	Quinine	ACT	Other anti-malarial	SP/ Fansidar	Chloro-quine	Quinine	ACT	Other anti-malarial	
Age (in months)											
<12	0.2	34.6	4.8	20.8	3.7	0.2	22.3	2.5	10.6	2.0	316
12-23	0.0	29.3	8.5	27.1	1.4	0.0	13.2	3.8	15.1	0.4	401
24-35	0.5	26.0	9.6	34.8	0.5	0.5	14.3	5.4	21.8	0.5	342
36-47	0.6	24.6	7.9	36.0	1.1	0.1	16.5	2.4	19.1	0.5	287
48-59	0.3	24.8	9.8	32.2	1.2	0.3	15.2	6.4	18.0	0.4	265
Residence											
Urban	0.6	31.3	13.2	25.8	2.7	0.4	18.8	7.5	15.5	1.2	659
Rural	0.1	25.8	4.6	32.8	0.8	0.1	14.3	1.7	17.7	0.5	951
Region											
Monrovia	1.0	38.3	16.4	16.8	4.6	0.5	22.7	10.1	8.8	1.5	337
North Western	0.7	12.6	2.7	38.0	2.2	0.7	6.9	2.7	29.9	1.3	115
South Central	0.0	19.1	3.8	33.6	1.3	0.0	8.6	0.5	12.6	0.8	297
South Eastern A	0.0	15.7	4.5	26.3	0.0	0.0	7.4	1.5	8.3	0.0	151
South Eastern B	0.6	32.7	2.0	21.1	0.0	0.6	14.6	0.0	8.8	0.0	65
North Central	0.1	32.1	8.2	35.4	0.5	0.1	20.1	3.7	23.5	0.5	645
Mother's education											
No education	0.4	28.1	5.4	31.5	0.7	0.4	15.7	1.9	17.3	0.2	780
Primary	0.1	27.4	7.9	30.5	0.7	0.1	15.2	4.2	17.0	0.2	502
Secondary +	0.4	29.1	15.0	25.2	5.1	0.0	18.5	8.9	15.5	3.0	328
Wealth quintile											
Lowest	0.0	19.6	4.1	30.1	0.6	0.0	9.2	1.0	12.0	0.4	365
Second	0.5	25.5	5.7	33.5	0.9	0.5	15.9	3.8	21.3	0.4	375
Middle	0.0	26.6	7.0	35.8	1.1	0.0	18.2	3.5	23.4	0.6	316
Fourth	0.0	37.5	8.9	28.6	4.1	0.0	18.3	3.8	15.2	1.9	314
Highest	1.3	34.6	18.4	18.0	1.5	0.8	21.5	10.1	10.7	0.7	240
Total	0.3	28.1	8.1	29.9	1.6	0.2	16.1	4.0	16.8	0.8	1,610

This “new malaria medicine” (ACT) was mentioned by 30 percent of mothers as being used to treat fever in their children under the age of five. This is an encouraging increase from the 3 percent reported to be using ACT as measured in the 2005 MIS (NMCP, 2006) and the 9 percent reported in the 2007 LDHS (LISGIS et al., 2008). Nevertheless, it is discouraging to note that almost the same proportion of children (28 percent) are reported to have received chloroquine for their fever. Eight percent of children received quinine.

Use of ACT tends to increase with the age of the child. It is higher among rural than urban children. Use of ACT is highest among children in North Western and North Central regions and declines as mother’s education increases. Use of ACT shows no consistent pattern by wealth quintile.

Treatment with antimalarial drugs for children with fever tends to be delayed. Only about half of the children who are given an antimalarial drug are given that drug the same day or the next day after getting the fever. Consequently, only 17 percent of children with a fever are treated with ACT the same day or the next day. Prompt treatment with ACT is highest for children in North Western and North Central regions.

Because of the need to treat malaria quickly, it can be useful for parents to have antimalarial drugs at home. In Liberia, however, the policy requires that antimalarial drugs be prescribed by trained health personnel after proper diagnosis. Consequently, it is not recommended for caregivers to have these drugs at home. This may account for the LMIS finding that antimalarial drugs were at home when the child became ill in only 11 percent of the cases (data not shown).

4.5 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 and reduces 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 five in malaria endemic areas. Other causes of anemia include thalassemia, sickle cell disease, and intestinal worms. Promotion of the use of insecticide-treated bednets and deworming medication every six months for children under age five are some of the important measures to reduce anemia prevalence among children.

As mentioned above, malaria is the leading cause of death among children under five 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 all the more important.

All children age 6-59 months living in the households selected for the 2009 LMIS were eligible for hemoglobin and malaria testing. In the 2009 LMIS, the HemoCue system was used to measure the concentration of hemoglobin in the blood and the Paracheck Pf™ rapid diagnostic blood test was used to detect malaria. As shown in Table 4.17, of the 4,110 children age 6-59 months eligible for testing, 98 percent (over 4,000 children) were tested for anemia and malaria. The coverage levels were uniformly high across background characteristics.

Table 4.17 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 2009

Background characteristic	Percentage tested for: Anemia	Malaria with RDT	Malaria slide	Number of children eligible (unweighted)
Age in months				
6-8	87.7	88.1	88.1	252
9-11	98.8	98.8	98.8	244
12-17	98.5	97.8	98.5	453
18-23	98.9	98.7	98.9	475
24-35	98.2	98.2	98.2	865
36-47	97.9	97.7	97.8	897
48-59	98.8	98.7	98.8	924
Sex				
Male	97.2	97.0	97.2	2,062
Female	98.3	98.2	98.3	2,048
Residence				
Urban	97.1	96.9	97.2	1,595
Rural	98.2	98.1	98.1	2,515
Region				
Monrovia	97.2	97.2	97.6	466
North Western	98.1	97.9	97.9	573
South Central	96.3	96.1	96.1	592
South Eastern A	98.7	98.3	98.7	839
South Eastern B	95.8	95.7	95.8	626
North Central	99.1	99.1	99.1	1,014
Mother's education				
No education	98.5	98.5	98.6	1,659
Primary	98.4	98.2	98.4	933
Secondary	97.2	96.8	97.0	495
Missing[1]	96.3	96.1	96.3	1,023
Wealth quintile				
Lowest	98.1	97.9	98.1	1,183
Second	97.3	97.1	97.3	1,099
Middle	97.7	97.7	97.7	770
Fourth	97.6	97.3	97.5	593
Highest	98.3	98.5	98.7	465
Total	97.8	97.6	97.8	4,110

[1] Includes cases in which it was not possible to match child to the mother in the household.

4.5.1 Anemia Prevalence among Children

Table 4.18 shows the percentage of children age 6-59 months classified as having anemia (hemoglobin concentration of less than 11.0 grams per deciliter) by background characteristics.[2] Anemia is a critical public health problem in Liberia, where almost three-fifths (63 percent) of Liberian children 6-59 months old are anemic. Twenty-nine percent of children are mildly anemic, while another 29 percent are moderately anemic, and 5 percent are severely anemic. The proportion of children with anemia decreases substantially with age and is higher among boys than girls. There is little difference in the proportion of children with anemia by urban-rural residence, education of the mother, or wealth quintile. However, anemia appears to be more prevalent among children in Monrovia (71 percent) and South Central region (69 percent) than those in South Eastern A (55 percent).

[2] Given that hemoglobin requirements differ substantially depending on altitude, anemia data are normally adjusted for altitude using the formulas recommended by the U.S. Centers for Disease Control and Prevention (CDC, 1998). However, all of Liberia lies below the lowest level indicated for adjustment, so no adjustments were required.

Table 4.18 Prevalence of anemia in children

Percentage of children age 6-59 months classified as having anemia, by background characteristics, Liberia 2009

Background characteristic	Anemia status by hemoglobin level: Mild (10.0-10.9 g/dl)	Moderate (8.0-9.9 g/dl)	Severe (below 8.0 g/dl)	Any anemia	Number of children
Age in months					
6-8	34.8	41.4	5.3	81.6	247
9-11	36.8	38.0	4.4	79.2	253
12-17	28.7	35.3	7.8	71.8	466
18-23	28.3	34.0	7.4	69.7	502
24-35	27.9	29.1	6.1	63.1	912
36-47	29.5	24.7	2.8	57.0	901
48-59	26.1	22.2	2.4	50.7	979
Sex					
Male	29.3	31.5	4.8	65.7	2,154
Female	28.5	26.6	4.6	59.7	2,106
Mother's interview status					
Interviewed	29.8	28.8	5.3	63.8	3,109
Not interviewed	26.4	30.0	3.3	59.8	1,151
Residence					
Urban	28.7	31.3	5.0	65.1	1,599
Rural	29.0	27.7	4.6	61.3	2,660
Region					
Monrovia	31.0	33.1	6.6	70.7	719
North Western	27.1	33.5	4.4	65.1	326
South Central	33.1	32.6	3.0	68.7	720
South Eastern A	31.5	20.5	2.9	54.9	380
South Eastern B	29.5	25.6	5.9	61.0	203
North Central	26.2	27.6	5.0	58.8	1,911
Mother's education					
No education	31.2	28.7	5.2	65.1	1,615
Primary	28.8	28.7	5.7	63.2	931
Secondary +	27.4	29.0	4.8	61.1	563
Not in household/missing[1]	26.4	30.0	3.3	59.8	1,151
Wealth quintile					
Lowest	29.0	24.8	5.3	59.1	1,017
Second	32.2	28.7	5.5	66.3	979
Middle	24.6	32.5	3.8	61.0	884
Fourth	27.8	32.3	4.3	64.4	806
Highest	31.2	27.7	4.6	63.5	574
Total	28.9	29.1	4.7	62.7	4,260

[1] Includes cases for which it was not possible to match the child to the mother in the household.

4.5.2 Malaria Prevalence among Children

Malaria prevalence among children age 6-59 months was measured in the 2009 LMIS in two ways (Table 4.19). In the field, health technicians used the Paracheck Pf™ rapid diagnostic test (RDT) to diagnose malaria from finger prick blood samples; those children who tested positive for the presence of *P. falciparum* by the RDT were offered treatment with antimalarials. 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 4.19 shows the results of both tests. Using the RDT, 37 percent of children age 6-59 months in Liberia tested positive for malaria. Analysis of blood smears by microscopy revealed a somewhat lower prevalence: 32 percent of children age 6-59 months tested positive. Regardless of which diagnostic test was used, malaria prevalence increases with age, is independent of gender, and decreases with mother's education level and, in general, with household wealth. Malaria prevalence is higher in rural areas (38 percent by microscopy) than urban areas (21 percent by microscopy) and is highest in the North Central region (42 percent by microscopy) (Figure 4.5).

Table 4.19 Prevalence of malaria in children

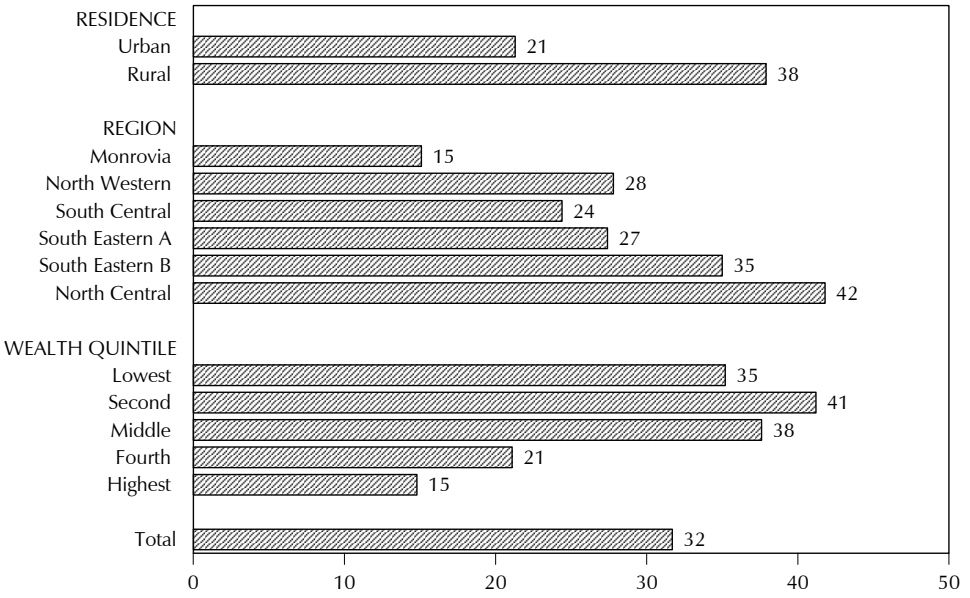
Percentage of children age 6-59 months classified in two tests as having malaria, by background characteristics, Liberia 2009

Background characteristic	Malaria prevalence			
	RDT positive	Number of children tested	Slide positive	Number of children tested
Age in months				
6-8	10.5	248	7.7	248
9-11	21.5	253	14.7	253
12-17	31.1	464	23.7	466
18-23	29.0	502	22.6	502
24-35	37.9	911	33.8	911
36-47	44.5	899	39.7	901
48-59	44.8	979	41.2	979
Sex				
Male	37.1	2,152	32.5	2,154
Female	36.0	2,104	30.8	2,106
Residence				
Urban	26.7	1,597	21.3	1,600
Rural	42.4	2,659	37.9	2,660
Region				
Monrovia	19.4	717	15.1	721
North Western	33.5	325	27.8	325
South Central	32.1	719	24.4	719
South Eastern A	29.6	379	27.4	380
South Eastern B	43.4	203	35.0	203
North Central	45.8	1,911	41.8	1,911
Education				
No education	38.2	1,616	34.0	1,616
Primary	36.2	930	31.2	931
Secondary	22.0	562	15.8	562
Missing[1]	41.5	1,147	36.6	1,150
Wealth quintile				
Lowest	40.2	1,016	35.2	1,017
Second	45.4	979	41.2	979
Middle	40.9	884	37.6	884
Fourth	29.9	803	21.1	805
Highest	17.4	574	14.8	575
Total	36.5	4,255	31.7	4,260

[1] Includes cases for which it was not possible to match the child to the mother in the household.

[3] All slides were read twice, first by any of the six microscopists specially trained as part of the survey and then by one of the three who were designated by the expert malaria consultant as being the better readers. In the roughly 12 percent of cases with discordant results from these two readings, the slide was examined a third time by another of the three best readers.

Figure 4.5 Malaria Prevalence among Children 6-59 Months



Note: Percentage of children age 6-59 months who tested positive for malaria on blood slide

LMIS 2009

The differences in malaria prevalence observed between the Paracheck Pf™ 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 (limit of detection is 5-10 parasites per microliter of blood). In comparison to microscopy, RDTs have the advantage of being quick and easy to use, but are less sensitive.[4] The Paracheck Pf™ RDT, like many other commercially available RDTs, 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 (Moody, 2002), 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 microscopy.

4.6 Cost of Malaria Treatment

One objective of the LMIS was to provide some basic data on malaria-related health care costs for the national health accounts calculations. To meet this objective, the LMIS household questionnaire included four questions to be asked for every household member: whether they had been sick with fever at any time in the previous four weeks and, if so, whether they got any treatment for the fever and if so, where and how much the treatment cost (including provider fees and costs for drugs and tests). In 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 call-backs to interview everyone in the household. Consequently, the information in many cases was reported by someone other than the household member him/herself which may lead to some inaccuracies.

[4] The Paracheck Pf™ RDT was recently evaluated by the WHO (WHO, 2008). In samples with high parasitemia, the test's detection rate was nearly 100 percent; in samples with low parasitemia, however, the detection rate was substantially reduced.

As shown in Table 4.20, 43 percent of Liberians were reported as having fever in the four weeks before the survey. The proportion with fever is highest among children under five (60 percent), after which it declines rapidly to only about 28-29 percent of those age 10-19.[5] It then increases with age. Fever is somewhat more common among women than men and among rural residents than urban residents. It is also most common in North Central (48 percent) and North Western (46 percent) regions and least common in South Eastern B region (30 percent). More than 4 in 5 of those with fever were reported to have received some treatment for the fever.

Table 4.20 Prevalence of fever among household population

Percent distribution of de facto household population by whether people reported having fever in the 4 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, 2009

	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	59.6	39.6	0.8	100.0	4,752	83.5	16.4	0.1	100.0	2,830
5-9	42.4	57.1	0.5	100.0	3,539	80.9	18.9	0.2	100.0	1,500
10-14	27.8	71.7	0.5	100.0	2,715	80.5	19.1	0.4	100.0	754
15-19	28.7	70.7	0.7	100.0	1,939	77.0	22.3	0.7	100.0	556
20-29	39.0	60.1	0.9	100.0	3,362	79.1	20.3	0.7	100.0	1,311
30-39	41.9	57.4	0.6	100.0	2,446	78.2	21.3	0.5	100.0	1,026
40-49	43.2	56.1	0.6	100.0	1,658	82.1	17.7	0.2	100.0	716
50-59	42.7	56.5	0.8	100.0	1,117	78.3	21.3	0.4	100.0	477
60+	47.7	50.7	1.6	100.0	1,021	76.8	22.7	0.6	100.0	487
Sex										
Male	39.6	59.6	0.8	100.0	11,090	80.7	18.9	0.4	100.0	4,395
Female	45.9	53.4	0.7	100.0	11,470	80.6	19.2	0.2	100.0	5,268
Residence										
Urban	40.0	59.4	0.5	100.0	10,376	81.9	17.4	0.6	100.0	4,155
Rural	45.2	53.9	0.9	100.0	12,183	79.6	20.3	0.1	100.0	5,507
Region										
Monrovia	40.2	59.3	0.5	100.0	5,431	83.6	15.4	1.0	100.0	2,184
North Western	46.3	53.1	0.7	100.0	1,586	86.3	13.6	0.0	100.0	734
South Central	43.0	55.9	1.1	100.0	4,221	77.2	22.6	0.2	100.0	1,815
South Eastern A	33.4	65.0	1.6	100.0	1,679	66.4	33.5	0.1	100.0	561
South Eastern B	29.9	69.5	0.6	100.0	1,316	69.4	30.6	0.0	100.0	393
North Central	47.7	51.7	0.6	100.0	8,326	82.6	17.3	0.1	100.0	3,975
Wealth quintile										
Lowest	44.8	53.9	1.2	100.0	4,488	75.6	24.4	0.0	100.0	2,013
Second	45.9	53.3	0.8	100.0	4,500	77.9	22.1	0.1	100.0	2,065
Middle	44.9	54.7	0.5	100.0	4,552	82.6	17.1	0.3	100.0	2,043
Fourth	41.8	58.0	0.3	100.0	4,499	82.6	16.8	0.5	100.0	1,880
Highest	36.7	62.4	0.9	100.0	4,521	85.4	13.8	0.7	100.0	1,661
Total	42.8	56.4	0.7	100.0	22,559	80.6	19.1	0.3	100.0	9,662

Note: Data are based on reports from the respondent to the household questionnaire and not necessarily the household member him/herself. Total includes 5 cases with age missing.

[5] The results shown here differ from those shown in Table 4.15 for several reasons. First, the data in Table 4.20 refer to all children under five listed in the household schedule, while Table 4.15 is based only on children whose mothers were interviewed. Secondly, Table 4.20 refers to fevers in the four weeks before the survey, while Table 4.15 refers to children with fever in the two weeks before the survey.

Table 4.21 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, while 20 percent went to a private hospital or clinic, and 12 percent each went to a pharmacy or shop. Eleven percent of those who got treated got help from a "black bagger" or drug peddler. A total of 81 percent of those with fever sought treatment from one of these five places.

The mean cost of treatment is 162 Liberian dollars (approximately U.S. $2.45). However, as shown in Table 4.21, over one-third of respondents (37 percent) were reported to have received treatment for free. Excluding these, the mean cost for those who paid for treatment for fever is 259 Liberian dollars (approximately U.S. $3.92).

Table 4.21 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, 2009

Background characteristic	Percent distribution by place of treatment	Mean cost (including those with free treatment)	Number of people receiving treatment from source	Percentage receiving free treatment	Mean cost (excluding those with free treatment)	Number of people paying for treatment from source
Government hospital	6.8	117	529	65.8	359	172
Government health center	6.7	59	523	79.9	293	105
Government health clinic	25.8	20	2,010	81.2	104	377
Private hospital/clinic	20.2	445	1,573	12.8	518	1,351
Pharmacy	12.2	150	954	4.7	161	892
Private doctor	2.0	261	153	7.6	284	140
Mobile clinic	0.2	271	14	22.7	*	11
Shop	11.8	139	920	1.3	142	901
Traditional practitioner	1.0	32	81	80.9	*	14
Black bagger, drug peddler	11.4	118	891	2.3	121	867
Other	1.5	47	115	72.5	(187)	29
Does not know	0.2	85	12	36.9	*	3
Missing	0.2	13	15	10.2	*	1
Total	100.0	162	na	36.6	259	na
Number	7,790	na	7,790	na	na	4,863

Note: Data are based on reports from the respondent to the household questionnaire and not necessarily the household member him/herself. Costs are in Liberian dollars. Numbers in parentheses are based on 25-49 unweighted cases, while an asterisk represents a figure based on fewer than 25 cases that has been suppressed.
na = Not applicable

REFERENCES

Boerma, T.J. 1988. Monitoring and evaluation of health interventions: Age- and cause-specific mortality and morbidity in childhood. In *Research and interventions issues concerning infant and child mortality and health,* 195-218. Proceedings of the East Africa Workshop, International Development Research Center, Manuscript Report 200e. Ottawa, Canada.

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.

Centers for Disease Control and Prevention (CDC). 1998. Recommendations to prevent and control iron deficiency in the United States. *Morbidity and Mortality Weekly Report* 47 (RR-3).

Chieh-Johnson, D., A. Cross, A. Way, and J. Sullivan. 1988. *Liberia Demographic and Health Survey 1986*. Monrovia, Liberia: Bureau of Statistics [Liberia], Ministry of Planning and Economic Affairs, and Columbia, Maryland, USA: Institute for Resource Development/ Westinghouse.

Doolan, D.L., C. Dobaño, and J.K. Baird. 2009. Acquired immunity to malaria. *Clinical Microbiology Review* 22(1):13-36.

Gwatkin, D.R., S. Rutstein, K. Johnson, R.P. Pande, and A. Wagstaff. 2000. *Socio-economic differences in health, nutrition and poverty.* HNP/Poverty Thematic Group of the World Bank. Washington, D.C.: The World Bank.

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.

Liberia Institute of Statistics and Geo-Information Services (LISGIS), Ministry of Health and Social Welfare [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.

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

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.

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

Ministry of Planning and Economic Affairs (MPEA) [Liberia], University of Liberia, and United Nations Population Fund (UNFPA). 2000. *Liberia Demographic and Health Survey: 1999/2000.* Vol. 3, *Analytical Report.* Monrovia, Liberia: MPEA.

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. 2004. *National policy for malaria control and prevention*. Monrovia, Liberia: National Malaria Control Program.

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

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare. 2007a. Training manual for management of malaria: Liberia. Participants guide. Version 3. Monrovia, Liberia: National Malaria Control Program (unpublished).

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare. 2007b. Routine malaria treatment report. Monrovia, Liberia: National Malaria Control Program (unpublished).

National Malaria Control Program (NMCP) [Liberia], Ministry of Health and Social Welfare. 2008. *National Malaria Strategic Plan 2009-2013*. Monrovia, Liberia: NMCP.

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.

Rutstein, S.O., and K. Johnson. 2004. *The DHS wealth index*. DHS Comparative Reports No 6. Calverton, Maryland, USA: ORC Macro.

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/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. 2004. *Meeting on the MDG drinking water and sanitation target: A mid-term assessment of progress*. New York: World Health Organization and United Nations Children's Fund.

WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. 2005. *Water for life: Making it happen*. Geneva: World Health Organization and United Nations Children's Fund.

World Health Organization. 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 LMIS sample was designed to produce most of the key malaria 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. Thus, there are eight reporting domains:

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

A.2 SAMPLING FRAME

Liberia conducted a National Population and Housing Census in March 2008, about nine months before the 2009 LMIS. Approximately 7,000 enumeration areas (EAs) had been constructed for the census, covering the entire territory of the country. Table A.1 shows the distribution of the 6,960 non-empty census EAs and the average EA size by county and type of residence. On average, an EA has 99 households—107 in urban areas and 93 in rural areas. Since this is an adequate size for a survey cluster, it was decided that the 2009 LMIS cluster should correspond to a census EA.

Table A.1 Distribution of census enumeration areas (EAs) and average EA size by county and type of residence, Liberia 2008

		Urban		Rural		Total	
Region	County	Number of EAs	Average number of households per EA	Number of EAs	Average number of households per EA	Number of EAs	Average number of households per EA
Greater Monrovia	Monrovia	1,934	109			1934	109
North Western	Bomi	54	72	215	82	269	80
	Gbarpolu	15	110	134	98	149	99
	Grand Cape Mount	23	88	251	91	274	90
South Central	Grand Bassa	128	95	340	109	468	105
	Margibi	146	122	285	93	431	103
	Montserrado	100	110	181	104	281	
North Central	Bong	255	82	672	73	927	76
	Lofa	133	113	366	95	499	100
	Nimba	172	120	606	104	778	107
South Eastern A	Grand Gedeh	72	92	101	119	173	108
	River Cess	5	102	144	101	149	101
	Sinoe	23	116	195	68	218	73
South Eastern B	Grand Kru	9	60	122	69	131	68
	Maryland	64	115	107	125	171	121
	River Gee	27	92	81	96	108	95
Total		3,160	107	3,800	93	6,960	99

Source: Preliminary results of National Population and Housing Census 2008

Table A.2 shows the distribution of the residential population enumerated in the census by county and urban-rural residence. In Liberia, 47 percent of the population lives in urban areas, with 28 percent in the capital city of Monrovia. The sample allocation of the 2009 LMIS was based on these distributions.

Table A.2 Census residential population by county and residence, percent urban and percent distribution by county, Liberia 2008

Region	County	Urban	Rural	Percent urban	Total	Percent of national
Greater Monrovia	Monrovia	949,381	0	100.0	949,381	27.8
North Western	Bomi	15,512	66,036	19.0	81,548	2.4
	Gbarpolu	7,440	73,274	9.2	80,714	2.4
	Grand Cape Mount	8,359	119,729	6.5	128,088	3.8
South Central	Grand Bassa	57,248	166,766	25.6	224,014	6.6
	Margibi	82,824	115,283	41.8	198,107	5.8
	Montserrado	54,997	77,993	41.4	132,990	
North Central	Bong	100,951	225,591	30.9	326,542	9.6
	Lofa	80,478	187,458	30.0	267,936	7.9
	Nimba	108,768	358,063	23.3	466,831	13.7
South Eastern A	Grand Gedeh	40,358	85,447	32.1	125,805	3.7
	River Cess	2,280	63,427	3.5	65,707	1.9
	Sinoe	14,451	90,238	13.8	104,689	3.1
South Eastern B	Grand Kru	3,309	53,708	5.8	57,017	1.7
	Maryland	44,619	91,615	32.8	136,234	4.0
	River Gee	16,908	50,329	25.1	67,237	2.0
Total		1,587,883	1,824,957	46.5	3,412,840	100.0

Source: Preliminary results of National Population and Housing Census 2008

A.3 SAMPLING PROCEDURE AND SAMPLE ALLOCATION

The sample for the 2009 LMIS was a stratified sample selected in two stages. The first stage involved selecting 150 EAs with probability proportional to size, using the number of households residing in the EA at the time of the census as a measure of size. Stratification was achieved by separating every county into urban and rural areas. Thus, there were 31 sampling strata—15 rural strata and 16 urban strata (including Monrovia). Samples were selected independently in each stratum, with a predetermined number of EAs to be selected (Table A.3). Implicit stratification was achieved in each stratum by sorting the sampling frame according to district and clan within each stratum.

In the second stage, a fixed number of households (30) was selected in each of the sampled EAs, using an equal probability systematic sampling, from a list of households residing in the EA. Since the census was still fresh (March 2008), it was decided to use the census household results as sampling frame for household selection in the second stage in order to avoid having to undertake a costly separate household listing operation. This involved borrowing the census questionnaire books for each of the selected EAs or clusters and copying information for all the occupied residential households recorded in the census book. These lists served as the sampling frame for household selection. In order to prevent bias, interviewers were instructed to interview only the pre-selected households, with no replacements of households.

Table A.3 Sample allocation of clusters by region, county and residence, number of households selected, and expected number of households interviewed by county and region, 2009 LMIS

Region	County name	Number of urban EAs	Number of rural EAs	Total number of EAs by county	Total number of EAs by region	Number of households selected	Expected number of households interviewed by county	Expected number of households interviewed by region
Greater Monrovia	Monrovia	25	0	25	25	750	675	675
North Western	Bomi	2	7	9	25	270	243	675
	Gbarpolu	2	4	6		180	162	
	Grand Cape Mount	2	8	10		300	270	
South Central	Grand Bassa	3	7	10	25	300	270	675
	Margibi	5	4	9		270	243	
	Montserrado	3	3	6		180	162	
North Central	Bong	3	6	9	25	270	243	675
	Lofa	3	3	6		180	162	
	Nimba	3	7	10		300	270	
South Eastern A	Grand Gedeh	4	5	9	25	270	243	675
	River Cess	2	6	8		240	216	
	Sinoe	2	6	8		240	216	
South Eastern B	Grand Kru	2	4	6	25	180	162	675
	Maryland	6	7	13		390	351	
	River Gee	2	4	6		180	162	
Total		69	81	150	150	4,500	4,050	4,050

Table A.3 shows the allocation of clusters by county and by urban-rural residence. Allocation was equal at the regional level, with 25 clusters in each. These 25 clusters were then allocated to each county and to its urban and rural areas proportionately. Table A.3 also shows the number of households selected and the expected number of interviewed households by region and county. Sample allocation was not proportional at the regional or the county level, since otherwise the smallest county would have received too small a sample size.

Among the 150 clusters selected, 69 were in urban areas and 81 were in rural areas. The total number of households selected in the 2009 LMIS was 4,500, with 2,070 in urban areas and 2,430 in rural areas. Note that urban areas were slightly under-sampled because of the disparity in the proportion urban across the counties.

All women age 15-49 years who were either permanent residents of the households in the sample or visitors present in the 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. It was estimated that the LMIS sample would result in approximately 3,850 completed interviews with women age 15-49 and 3,200 children under five.

A.4 SAMPLING WEIGHTS

Because of the nonproportional allocation of the sample to the different reporting domains, sampling weights will be required for any analysis using 2009 LMIS data to ensure the actual representativity of the sample. Because the 2009 LMIS sample is a two-stage stratified cluster sample, sampling weights were calculated based on sampling probabilities which were calculated separately for each sampling stage and for each cluster. The following notations apply:

P_{1hi} first-stage sampling probability of the i^{th} cluster in stratum h
P_{2h} second-stage 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 households in the stratum *h*. The probability of selecting the i^{th} cluster in stratum *h* was calculated as follows:

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

Let g_{hi} (g_{hi}=25 for all *h* and *i* for 2009 LMIS) be the number of households selected in the i^{th} cluster in stratum *h*. The second stage selection probability for each household in the cluster was calculated as follows:

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

The overall selection probability of each household in cluster *i* of stratum *h* was 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:

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

Household standard sampling weights for households and women were obtained by adjusting the above calculated weight to compensate for household nonresponse and women's nonresponse, respectively, and then normalized to produce a number of weighted cases equal to the number of unweighted cases for both households and individuals at the national level. The normalized weights are valid for estimation of proportions and means at any level of aggregation, but are not valid for estimation of totals. All children under five in the selected households were eligible for the survey. Therefore, for indicators based on children in the household, the household weight was used; for indicators based on children of women interviewed, the child's mother's weight was used.

A.5 SURVEY IMPLEMENTATION

Table A.4 shows data regarding response rates by residence and region.

Table A.4 Sample implementation

Percent distribution of households and eligible women by results of the household and individual interviews, and household, eligible women and overall response rates, according to urban-rural residence and region, Liberia 2009

	Residence		Region						
Result	Urban	Rural	Monrovia	North Western	South Central	South Eastern A	South Eastern B	North Central	Total
Selected households									
Completed (C)	91.2	94.1	91.7	91.9	88.4	94.4	92.2	98.1	92.8
Household present but no competent respondent at home (HP)	1.2	0.2	1.1	0.4	1.7	0.1	0.3	0.1	0.6
Postponed (P)	0.0	0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Refused (R)	0.2	0.1	0.4	0.3	0.3	0.0	0.0	0.0	0.2
Dwelling not found (DNF)	2.6	1.3	1.3	2.7	5.9	0.1	1.4	0.1	1.9
Household absent (HA)	2.1	2.1	2.0	3.2	2.4	2.0	2.2	0.9	2.1
Dwelling vacant/address not a dwelling (DV)	1.8	1.2	2.3	0.8	0.5	2.8	2.0	0.4	1.5
Dwelling destroyed (DD)	0.7	0.9	0.8	0.7	0.7	0.5	1.8	0.3	0.8
Other (O)	0.2	0.0	0.4	0.0	0.1	0.0	0.0	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 sampled households	2,065	2,420	750	741	750	752	740	752	4,485
Household response rate (HRR)[1]	95.8	98.3	97.0	96.5	91.8	99.7	98.0	99.7	97.1
Eligible women									
Completed (EWC)	97.2	97.7	96.8	97.4	94.5	99.1	97.4	98.9	97.5
Not at home (EWNH)	2.0	1.2	2.4	1.3	3.7	0.4	1.7	0.4	1.6
Postponed (EWP)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Refused (EWR)	0.2	0.1	0.2	0.0	0.3	0.1	0.1	0.1	0.2
Partly completed (EWPC)	0.2	0.1	0.2	0.2	0.6	0.0	0.0	0.1	0.2
Incapacitated (EWI)	0.2	0.5	0.1	0.7	0.7	0.1	0.4	0.2	0.4
Other (EWO)	0.1	0.4	0.1	0.4	0.1	0.3	0.4	0.2	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of women	2,263	2,249	881	547	671	797	721	895	4,512
Eligible women response rate (EWRR)[2]	97.2	97.7	96.8	97.4	94.5	99.1	97.4	98.9	97.5
Overall response rate (ORR)[3]	93.1	96.0	94.0	94.0	86.8	98.8	95.4	98.6	94.7

[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] Using the number of eligible women falling into specific response categories, the eligible woman response rate (EWRR) is calculated as:

$$\frac{100 * EWC}{EWC + EWNH + EWP + EWR + EWPC + EWI + EWO}$$

[3] The overall response rate (ORR) is calculated as:

$$ORR = HRR * EWRR/100$$

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 on the part of either the interviewer or the respondent, and data entry errors. Although numerous efforts were made during the implementation of the 2009 Liberia Malaria Indicator Survey (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 2009 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 between 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 2009 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 2009 LMIS is a Macro SAS procedure. This procedure used the Taylor linearization method of variance estimation for survey estimates that are means or proportions. The Jackknife repeated replication method is used for variance estimation of more complex statistics such as fertility and mortality rates.

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.

The Jackknife repeated replication method derives estimates of complex rates from each of several replications of the parent sample, and calculates standard errors for these estimates using simple formulae. Each replication considers *all but one* cluster in the calculation of the estimates. Pseudo-independent replications are thus created. In the 2009 LMIS, there were 150 non-empty clusters. Hence, 150 replications were created. The variance of a rate *r* is calculated as follows:

$$SE^2(r) = var(r) = \frac{1}{k(k-1)} \sum_{i=1}^{k} (r_i - r)^2$$

in which

$$r_i = kr - (k-1)r_{(i)}$$

where r is the estimate computed from the full sample of 150 clusters,
$r_{(i)}$ is the estimate computed from the reduced sample of 149 clusters (i^{th} cluster excluded), and
k is the total number of clusters.

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 2009 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 5 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). In the case of the total fertility rate, the number of unweighted cases is not relevant, as there is no known unweighted value for woman-years of exposure to child-bearing.

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 0.264 and its standard error is 0.014. Therefore, to obtain the 95 percent confidence limits, one adds and subtracts twice the standard error to the sample estimate, i.e., 0.264±2×0.014. There is a high probability (95 percent) that the *true* proportion of children under five who slept under an ITN the night before the survey is between 0.236 and 0.292.

For the total sample, the value of the DEFT, averaged over all variables for women, is 1.67. 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 1.67 over that in an equivalent simple random sample.

Table B.1 List of selected variables for sampling errors, Liberia 2009

Variable	Type of estimate	Base population
No education	Proportion	All women 15-49
At least some secondary education	Proportion	All women 15-49
Prenatal care from skilled professional	Proportion	Last birth of women 15-49 with a live birth In past 5 years
Total fertility rate (past 3 years)	Rate	All women
Neonatal mortality rate (past 10 years)*	Rate	Births in past 10 (5) years
Post-neonatal mortality rate (past 10 years)*	Rate	Births in past 10 (5) years
Infant mortality rate (past 10 years)*	Rate	Births in past 10 (5) years
Child mortality rate (past 10 years)*	Rate	Births in past 10 (5) years
Under five mortality rate (past 10 years)*	Rate	Births in past 10 (5) years
Ownership of at least 1 insecticide-treated net (ITN)	Proportion	Households
Child slept under an ITN last night	Proportion	Children under 5 in household
Woman slept under an ITN last night	Proportion	All women 15-49 in household
Received 2+ doses of SP/Fansidar during prenatal care visit (IPT)	Proportion	Last birth of women 15-49 with a live birth in past 2 years
Child has fever in past 2 weeks	Proportion	Children under 5 in woman's birth history
Child took ACT	Proportion	Children under 5 with fever in past 2 weeks
Child has anemia (any)	Proportion	Children 6-59 months tested for anemia
Child has malaria (based on rapid test)	Proportion	Children 6-59 months tested for malaria

* 5 years at the national level

Table B.2 Sampling errors for National sample, Liberia MIS 2009

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	0.417	0.013	4397	4397	1.702	0.030	0.392	0.442
At least some secondary education	0.282	0.013	4397	4397	1.851	0.045	0.257	0.307
Prenatal care from skilled professional	0.953	0.007	2762	2687	1.652	0.007	0.939	0.966
Ownership of at least one ITN	0.472	0.015	4162	4162	1.941	0.032	0.442	0.502
Child slept under an ITN last night	0.264	0.014	4484	4725	1.691	0.053	0.236	0.292
Woman slept under an ITN last night	0.290	0.014	4513	4769	1.758	0.047	0.262	0.317
Received 2+ doses of SP/Fansidar during antenatal visit	0.451	0.022	1644	1573	1.736	0.048	0.407	0.494
Child has fever in past 2 weeks	0.436	0.013	3833	3694	1.513	0.031	0.409	0.463
Child took ACT	0.299	0.022	1600	1610	1.718	0.072	0.256	0.342
Child has anemia	0.627	0.016	4019	4260	2.027	0.025	0.596	0.659
Child has malaria (based on rapid test)	0.365	0.020	4012	4255	2.429	0.055	0.325	0.406
Total fertility rate (past 3 years)	5.885	0.268	na	12468	1.931	0.045	5.350	6.421
Neonatal mortality (past 5 years)	38.04	4.296	4232	4064	1.377	0.113	29.45	46.64
Post-neonatal mortality (past 5 years)	34.51	3.314	4244	4080	1.051	0.096	27.88	41.14
Infant mortality (past 5 years)	72.55	5.469	4255	4086	1.274	0.075	61.62	83.49
Child mortality (past 5 years)	45.13	5.583	4233	4061	1.464	0.124	33.96	56.29
Under-five mortality (past 5 years)	114.41	6.311	4324	4150	1.196	0.055	101.79	127.03

na = Not applicable

Table B.3 Sampling errors for Urban sample, Liberia MIS 2009

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	0.267	0.013	2199	2225	1.429	0.051	0.240	0.294
At least some secondary education	0.461	0.017	2199	2225	1.553	0.036	0.428	0.494
Prenatal care from skilled professional	0.990	0.004	1192	1138	1.271	0.004	0.983	0.998
Ownership of at least one ITN	0.420	0.021	1884	1940	1.842	0.050	0.378	0.462
Child slept under an ITN last night	0.240	0.021	1747	1796	1.678	0.088	0.198	0.282
Woman slept under an ITN last night	0.240	0.013	2263	2414	1.194	0.052	0.215	0.265
Received 2+ doses of SP/Fansidar during antenatal visit	0.471	0.043	631	585	2.079	0.092	0.384	0.557
Child has fever in past 2 weeks	0.467	0.020	1504	1411	1.452	0.043	0.426	0.507
Child took ACT	0.258	0.019	664	659	1.009	0.072	0.220	0.295
Child has anemia	0.651	0.026	1550	1599	1.962	0.039	0.599	0.702
Child has malaria (based on rapid test)	0.267	0.017	1546	1597	1.414	0.063	0.234	0.301
Total fertility rate (past 3 years)	4.229	0.222	na	6282	1.326	0.052	3.786	4.672
Neonatal mortality (past 10 years)	48.11	6.023	3063	2818	1.245	0.125	36.06	60.16
Post-neonatal mortality (past 10 years)	41.41	4.640	3067	2822	1.147	0.112	32.13	50.69
Infant mortality (past 10 years)	89.52	6.937	3072	2824	1.160	0.077	75.64	103.39
Child mortality (past 10 years)	53.28	6.963	3001	2750	1.269	0.131	39.36	67.21
Under-five mortality (past 10 years)	138.03	8.919	3106	2853	1.215	0.065	120.19	155.87

na = Not applicable

Table B.4 Sampling errors for Rural sample, Liberia MIS 2009

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	0.571	0.020	2198	2172	1.853	0.034	0.532	0.610
At least some secondary education	0.099	0.012	2198	2172	1.829	0.118	0.075	0.122
Prenatal care from skilled professional	0.925	0.012	1570	1549	1.759	0.013	0.902	0.949
Ownership of at least one ITN	0.518	0.020	2278	2222	1.945	0.039	0.477	0.559
Child slept under an ITN last night	0.279	0.018	2737	2930	1.664	0.064	0.243	0.315
Woman slept under an ITN last night	0.340	0.024	2250	2356	2.154	0.070	0.292	0.388
Received 2+ doses of SP/Fansidar during antenatal visit	0.439	0.023	1013	988	1.477	0.053	0.392	0.485
Child has fever in last 2 weeks	0.417	0.017	2329	2283	1.510	0.041	0.383	0.451
Child took ACT	0.328	0.034	936	951	2.020	0.104	0.260	0.396
Child has anemia	0.613	0.021	2469	2660	2.141	0.034	0.572	0.655
Child has malaria (based on rapid test)	0.424	0.031	2466	2659	2.875	0.074	0.361	0.487
Total fertility rate (last 3 years)	7.518	0.331	na	6186	2.073	0.044	6.856	8.179
Neonatal mortality (last 10 years)	43.77	5.027	4808	4653	1.498	0.115	33.71	53.82
Post-neonatal mortality (last 10 years)	64.00	5.177	4805	4656	1.308	0.081	53.64	74.35
Infant mortality (last 10 years)	107.76	7.533	4821	4669	1.583	0.070	92.70	122.83
Child mortality (last 10 years)	69.55	6.935	4674	4532	1.707	0.100	55.68	83.42
Under-five mortality (last 10 years)	169.81	8.632	4876	4721	1.444	0.051	152.55	187.08

na = Not applicable

Table B.5 Sampling errors for Monrovia sample, Liberia MIS 2009

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	0.213	0.015	853	1285	1.036	0.068	0.184	0.242
At least some secondary education	0.538	0.025	853	1285	1.453	0.046	0.488	0.588
Prenatal care from skilled professional	0.988	0.007	390	581	1.201	0.007	0.975	1.001
Ownership of at least one ITN	0.338	0.031	688	1078	1.705	0.091	0.277	0.400
Child slept under an ITN last night	0.198	0.025	521	823	1.261	0.124	0.149	0.247
Woman slept under an ITN last night	0.163	0.018	881	1394	1.255	0.112	0.127	0.199
Received 2+ doses of SP/Fansidar during antenatal visit	0.426	0.050	193	285	1.400	0.118	0.325	0.527
Child has fever in past 2 weeks	0.490	0.029	464	689	1.216	0.060	0.431	0.549
Child took ACT	0.168	0.029	224	337	1.087	0.172	0.110	0.226
Child has anemia	0.707	0.027	454	719	1.312	0.039	0.652	0.762
Child has malaria (based on rapid test)	0.194	0.028	453	717	1.471	0.147	0.137	0.251
Total fertility rate (past 3 years)	3.509	0.229	na	3600	1.173	0.065	3.051	3.967
Neonatal mortality (past 10 years)	56.13	8.740	933	1393	1.015	0.156	38.65	73.61
Post-neonatal mortality (past 10 years)	30.41	6.114	927	1384	1.072	0.201	18.18	42.64
Infant mortality (past 10 years)	86.54	10.734	935	1395	1.030	0.124	65.08	108.01
Child mortality (past 10 years)	55.52	12.687	889	1334	1.152	0.229	30.15	80.90
Under-five mortality (past 10 years)	137.26	12.909	945	1411	0.936	0.094	111.44	163.08

na = Not applicable

Table B.6 Sampling errors for North Western sample, Liberia MIS 2009

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	0.653	0.037	533	276	1.800	0.057	0.578	0.727
At least some secondary education	0.107	0.016	533	276	1.208	0.152	0.074	0.139
Prenatal care from skilled professional	0.919	0.060	364	193	4.171	0.065	0.800	1.039
Ownership of at least one ITN	0.629	0.050	681	382	2.677	0.079	0.529	0.729
Child slept under an ITN last night	0.322	0.045	625	360	2.082	0.140	0.232	0.412
Woman slept under an ITN last night	0.416	0.052	547	299	2.257	0.126	0.311	0.521
Received 2+ doses of SP/Fansidar during antenatal visit	0.601	0.089	242	127	2.823	0.148	0.424	0.778
Child has fever in past 2 weeks	0.403	0.045	525	286	1.971	0.112	0.313	0.494
Child took ACT	0.380	0.072	210	115	2.079	0.189	0.236	0.523
Child has anemia	0.651	0.015	562	326	0.720	0.023	0.621	0.681
Child has malaria (based on rapid test)	0.335	0.058	561	325	2.555	0.174	0.218	0.452
Total fertility rate (past 3 years)	7.863	0.486	na	792	1.473	0.062	6.892	8.835
Neonatal mortality (past 10 years)	35.70	6.855	1081	575	1.278	0.192	21.99	49.42
Post-neonatal mortality (past 10 years)	82.88	13.151	1083	576	1.102	0.159	56.57	109.18
Infant mortality (past 10 years)	118.58	16.363	1085	577	1.378	0.138	85.85	151.30
Child mortality (past 10 years)	78.17	9.694	1054	559	0.960	0.124	58.78	97.55
Under-five mortality (past 10 years)	187.48	20.045	1102	585	1.387	0.107	147.39	227.57

na = Not applicable

Table B.7 Sampling errors for South Central sample, Liberia MIS 2009

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	0.508	0.024	634	762	1.220	0.048	0.460	0.557
At least some secondary education	0.183	0.031	634	762	1.990	0.167	0.122	0.245
Prenatal care from skilled professional	0.968	0.010	396	492	1.160	0.010	0.948	0.989
Ownership of at least one ITN	0.316	0.025	663	810	1.376	0.079	0.266	0.366
Child slept under an ITN last night	0.170	0.017	638	806	1.018	0.101	0.136	0.204
Woman slept under an ITN last night	0.196	0.020	671	826	1.193	0.102	0.156	0.235
Received 2+ doses of SP/Fansidar during antenatal visit	0.453	0.034	243	313	1.116	0.076	0.384	0.522
Child has fever in past 2 weeks	0.419	0.022	563	708	1.000	0.053	0.375	0.463
Child took ACT	0.336	0.051	230	297	1.514	0.153	0.233	0.439
Child has anemia	0.687	0.026	570	720	1.301	0.038	0.634	0.740
Child has malaria (based on rapid test)	0.321	0.047	569	719	2.134	0.147	0.226	0.415
Total fertility rate (past 3 years)	6.180	0.539	na	2170	2.403	0.087	5.102	7.257
Neonatal mortality (past 10 years)	40.70	9.696	1196	1483	1.545	0.238	21.30	60.09
Post-neonatal mortality (past 10 years)	59.61	5.604	1209	1500	0.790	0.094	48.41	70.82
Infant mortality (past 10 years)	100.31	11.331	1199	1487	1.266	0.113	77.65	122.97
Child mortality (past 10 years)	83.95	17.860	1193	1469	2.070	0.213	48.23	119.67
Under-five mortality (past 10 years)	175.83	11.661	1215	1506	0.930	0.066	152.51	199.16

na = Not applicable

Table B.8 Sampling errors for South Eastern A sample, Liberia MIS 2009

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	0.564	0.041	790	317	2.344	0.074	0.481	0.647
At least some secondary education	0.117	0.018	790	317	1.566	0.153	0.081	0.153
Prenatal care from skilled professional	0.922	0.025	549	229	2.184	0.027	0.873	0.971
Ownership of at least one ITN	0.606	0.041	710	305	2.222	0.068	0.524	0.688
Child slept under an ITN last night	0.354	0.046	905	416	2.181	0.129	0.262	0.445
Woman slept under an ITN last night	0.376	0.046	798	344	2.285	0.123	0.283	0.468
Received 2+ doses of SP/Fansidar during antenatal visit	0.495	0.055	342	143	2.076	0.111	0.385	0.605
Child has fever in past 2 weeks	0.440	0.021	804	344	1.110	0.048	0.398	0.482
Child took ACT	0.263	0.029	360	151	1.135	0.110	0.205	0.320
Child has anemia	0.549	0.018	828	380	1.016	0.032	0.513	0.584
Child has malaria (based on rapid test)	0.296	0.036	825	379	2.064	0.120	0.224	0.367
Total fertility rate (past 3 years)	7.499	0.299	na	912	0.992	0.040	6.902	8.097
Neonatal mortality (past 10 years)	56.64	11.081	1709	731	1.654	0.196	34.47	78.80
Post-neonatal mortality (past 10 years)	63.68	10.831	1705	731	1.700	0.170	42.02	85.34
Infant mortality (past 10 years)	120.32	10.241	1712	732	1.233	0.085	99.83	140.80
Child mortality (past 10 years)	68.48	5.663	1665	709	0.912	0.083	57.15	79.80
Under-five mortality (past 10 years)	180.55	10.984	1728	739	1.130	0.061	158.58	202.52

na = Not applicable

Table B.9 Sampling errors for South Eastern B sample, Liberia MIS 2009

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	0.455	0.030	702	211	1.594	0.066	0.395	0.515
At least some secondary education	0.175	0.021	702	211	1.480	0.121	0.133	0.218
Prenatal care from skilled professional	0.797	0.039	455	141	2.118	0.050	0.718	0.876
Ownership of at least one ITN	0.660	0.035	682	231	1.929	0.053	0.590	0.730
Child slept under an ITN last night	0.363	0.045	697	237	2.113	0.124	0.273	0.453
Woman slept under an ITN last night	0.429	0.041	721	228	1.824	0.094	0.348	0.510
Received 2+ doses of SP/Fansidar during antenatal visit	0.220	0.043	266	85	1.765	0.197	0.134	0.307
Child has fever in past 2 weeks	0.328	0.029	629	197	1.474	0.088	0.270	0.386
Child took ACT	0.211	0.054	211	65	1.822	0.254	0.104	0.318
Child has anemia	0.610	0.021	600	203	1.067	0.035	0.568	0.653
Child has malaria (based on rapid test)	0.434	0.032	599	203	1.528	0.075	0.369	0.499
Total fertility rate (past 3 years)	6.632	0.469	na	600	1.339	0.071	5.693	7.571
Neonatal mortality (past 10 years)	31.60	4.907	1272	406	1.062	0.155	21.78	41.41
Post-neonatal mortality (past 10 years)	47.81	8.345	1269	404	1.051	0.175	31.12	64.50
Infant mortality (past 10 years)	79.41	9.442	1275	407	1.138	0.119	60.53	98.29
Child mortality (past 10 years)	48.95	7.021	1236	394	1.007	0.143	34.91	62.99
Under-five mortality (past 10 years)	124.47	9.945	1290	411	0.998	0.080	104.58	144.36

na = Not applicable

Table B.10 Sampling errors for North Central sample, Liberia MIS 2009

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	0.465	0.024	885	1546	1.451	0.052	0.416	0.514
At least some secondary education	0.198	0.019	885	1546	1.420	0.096	0.160	0.236
Prenatal care from skilled professional	0.960	0.009	608	1051	1.118	0.009	0.942	0.978
Ownership of at least one ITN	0.566	0.034	738	1355	1.842	0.059	0.499	0.634
Child slept under an ITN last night	0.288	0.026	1098	2083	1.414	0.091	0.235	0.340
Woman slept under an ITN last night	0.382	0.028	895	1677	1.463	0.074	0.325	0.438
Received 2+ doses of SP/Fansidar during antenatal visit	0.451	0.040	358	619	1.525	0.089	0.370	0.532
Child has fever in past 2 weeks	0.439	0.025	848	1471	1.365	0.058	0.388	0.489
Child took ACT	0.354	0.044	365	645	1.597	0.124	0.266	0.442
Child has anemia	0.588	0.032	1005	1911	1.949	0.054	0.525	0.652
Child has malaria (based on rapid test)	0.458	0.036	1005	1911	2.054	0.078	0.387	0.529
Total fertility rate (past 3 years)	6.821	0.506	na	4395	1.636	0.074	5.810	7.832
Neonatal mortality (past 10 years)	43.70	6.831	1680	2883	1.125	0.156	30.04	57.36
Post-neonatal mortality (past 10 years)	58.82	7.607	1679	2884	1.222	0.129	43.61	74.04
Infant mortality (past 10 years)	102.53	10.877	1687	2895	1.319	0.106	80.77	124.28
Child mortality (past 10 years)	54.11	5.494	1638	2816	0.848	0.102	43.12	65.10
Under-five mortality (past 10 years)	151.09	13.144	1702	2921	1.354	0.087	124.80	177.38

na = Not applicable

DATA QUALITY TABLES

Appendix C

Table C.1 Household age distribution

Single-year age distribution of the de facto household population by sex (weighted), Liberia 2009

	Female		Male			Female		Male	
Age	Number	Percent	Number	Percent	Age	Number	Percent	Number	Percent
0	461	4.0	488	4.4	36	149	1.3	121	1.1
1	455	4.0	512	4.6	37	121	1.1	88	0.8
2	477	4.2	453	4.1	38	161	1.4	137	1.2
3	452	3.9	473	4.3	39	114	1.0	111	1.0
4	477	4.2	505	4.6	40	130	1.1	124	1.1
5	488	4.3	422	3.8	41	75	0.7	64	0.6
6	340	3.0	378	3.4	42	122	1.1	137	1.2
7	336	2.9	373	3.4	43	69	0.6	81	0.7
8	324	2.8	316	2.9	44	59	0.5	70	0.6
9	288	2.5	272	2.5	45	88	0.8	111	1.0
10	333	2.9	277	2.5	46	54	0.5	88	0.8
11	284	2.5	244	2.2	47	41	0.4	52	0.5
12	294	2.6	305	2.8	48	84	0.7	95	0.9
13	240	2.1	237	2.1	49	46	0.4	67	0.6
14	267	2.3	234	2.1	50	111	1.0	73	0.7
15	172	1.5	234	2.1	51	82	0.7	42	0.4
16	193	1.7	225	2.0	52	80	0.7	70	0.6
17	145	1.3	172	1.5	53	72	0.6	48	0.4
18	231	2.0	202	1.8	54	57	0.5	60	0.5
19	190	1.7	177	1.6	55	53	0.5	47	0.4
20	200	1.7	202	1.8	56	63	0.6	50	0.5
21	134	1.2	137	1.2	57	29	0.3	21	0.2
22	188	1.6	209	1.9	58	54	0.5	51	0.5
23	240	2.1	169	1.5	59	26	0.2	25	0.2
24	187	1.6	153	1.4	60	62	0.5	35	0.3
25	188	1.6	158	1.4	61	24	0.2	25	0.2
26	208	1.8	126	1.1	62	29	0.3	41	0.4
27	123	1.1	141	1.3	63	40	0.4	13	0.1
28	186	1.6	151	1.4	64	15	0.1	25	0.2
29	136	1.2	127	1.1	65	39	0.3	38	0.3
30	165	1.4	155	1.4	66	16	0.1	18	0.2
31	116	1.0	94	0.9	67	26	0.2	22	0.2
32	126	1.1	136	1.2	68	30	0.3	29	0.3
33	97	0.8	106	1.0	69	20	0.2	22	0.2
34	109	0.9	89	0.8	70+	249	2.2	204	1.8
35	121	1.1	130	1.2	Don't know/ missing	5	0.0	5	0.0
					Total	11,470	100.0	11,090	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, interviewed women age 15-49, and percentage of eligible women who were interviewed (weighted), by five-year age groups, Liberia 2009

Age group	Household population of women age 10-54	Interviewed women age 15-49		Percentage of eligible women
		Number	Percent	
10-14	1,418	na	na	na
15-19	930	891	19.2	95.9
20-24	949	929	20.0	97.9
25-29	841	822	17.7	97.7
30-34	613	591	12.8	96.5
35-39	667	657	14.2	98.5
40-44	456	446	9.6	97.9
45-49	314	300	6.5	95.4
50-54	403	na	na	na
15-49	4,769	4,636	100.0	97.2

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 schedule.
na = Not applicable

Table C.3 Completeness of reporting

Percentage of observations with information missing for selected demographic and health questions (weighted), Liberia 2009

Subject	Reference group	Percentage with information missing	Number of cases
Birth date	Births in the past 15 years		
Month only		0.30	10,047
Month and year[1]		0.03	10,047
Age at death	Deceased children born in past 15 years	0.00	1,681
Respondent's education	All women age 15-49	0.48	4,397
Anemia			
Children	Living children age 6-59 months (from the household questionnaire)	1.85	4,338

[1] Both year and age missing

Table C.4 Births by calendar years

Number of births, percentage with complete birth date, sex ratio at birth, and calendar year ratio by calendar year, according to living (L), dead (D), and total (T) children (weighted), Liberia 2009

	Number of births			Percentage with complete birth date[1]			Sex ratio at birth[2]			Calendar year ratio[3]		
Calendar year	L	D	T	L	D	T	L	D	T	L	D	T
2009	40	2	42	100.0	100.0	100.0	104.9	na	114.5	na	na	na
2008	813	35	849	100.0	100.0	100.0	101.2	150.0	102.8	na	na	na
2007	765	47	811	100.0	100.0	100.0	122.7	135.6	123.4	100.5	81.2	99.2
2006	708	80	788	100.0	100.0	100.0	98.1	116.5	99.8	96.8	130.3	99.4
2005	697	76	773	100.0	100.0	100.0	95.5	118.9	97.6	97.4	82.2	95.7
2004	723	105	828	99.9	100.0	99.9	108.8	106.4	108.5	103.8	97.6	102.9
2003	697	139	836	100.0	99.7	99.9	85.7	118.3	90.4	108.1	120.8	110.0
2002	566	126	692	99.7	99.7	99.7	111.4	92.4	107.7	96.9	93.5	96.3
2001	471	129	600	99.6	98.4	99.3	120.7	81.1	110.8	85.0	92.3	86.5
2000	542	155	696	99.6	98.6	99.4	104.0	116.9	106.8	118.5	114.5	117.5
2005-2009	3,023	240	3,263	100.0	100.0	100.0	104.1	127.1	105.6	na	na	na
2000-2004	2,999	655	3,653	99.8	99.2	99.7	104.2	102.6	104.0	na	na	na
1995-1999	2,011	663	2,674	99.5	98.8	99.4	97.6	128.8	104.5	na	na	na
1990-1994	1,476	663	2,139	99.7	98.8	99.4	101.2	117.0	105.9	na	na	na
<1989	1,748	869	2,616	99.9	99.6	99.8	103.2	117.9	107.8	na	na	na
All	1,256	3,089	14,346	99.8	99.2	99.7	102.4	117.2	105.4	na	na	na

na = Not applicable

[1] Both year and month of birth given

[2] (Bm/Bf)x100, where Bm and Bf are the numbers of male and female births, respectively

[3] [2Bx/(Bx-1+Bx+1)]x100, where Bx is the number of births in calendar year x

Table C.5 Reporting of age at death in days

Distribution of reported deaths under one month of age by age at death in days and the percentage of neonatal deaths reported to occur at ages 0-6 days, for five-year periods of birth preceding the survey (weighted), Liberia 2009

	Number of years preceding the survey				Total
Age at death (days)	0-4	5-9	10-14	15-19	0-19
<1	50	66	50	42	209
1	29	20	19	12	80
2	13	19	15	11	58
3	6	15	10	2	34
4	6	4	9	8	27
5	3	1	2	2	8
6	1	4	9	2	16
7	10	16	15	22	62
8	3	3	0	1	7
9	3	3	5	1	12
10	0	6	2	2	11
12	2	2	1	0	6
13	0	1	1	0	3
14	8	10	18	10	46
15	1	1	3	1	6
16	2	0	0	2	5
17	0	4	1	1	5
18	2	3	0	3	8
20	0	3	2	0	5
21	1	2	4	1	8
22	0	1	2	0	2
23	1	0	0	0	1
27	1	0	0	0	1
28	0	5	0	0	5
29	0	0	0	0	0
30	0	0	1	2	3
Total 0-30	142	190	169	125	627
Percent early neonatal[1]	76.6	68.3	67.5	62.9	68.9

[1] 0-6 days /0-30 days

Table C.6 Reporting of age at death in months

Distribution of reported deaths under two years of age by age at death in months and the percentage of infant deaths reported to occur at age under one month, for five-year periods of birth preceding the survey, Liberia 2009

Age at death (months)	Number of years preceding the survey				Total
	0-4	5-9	10-14	15-19	0-19
<1[a]	142	190	169	125	627
1	11	21	12	7	51
2	14	36	20	28	98
3	18	29	37	27	111
4	18	24	33	23	98
5	4	23	15	20	62
6	9	30	24	30	93
7	10	30	26	17	83
8	6	28	16	23	74
9	14	38	22	28	102
10	3	5	11	3	22
11	2	4	11	11	29
12	23	47	32	35	137
13	2	17	15	7	41
14	0	6	17	3	27
15	3	1	3	3	9
16	4	8	4	12	28
17	2	2	7	4	15
18	0	3	8	11	21
19	1	5	2	3	11
20	1	4	1	2	8
21	0	5	0	5	10
22	2	3	0	1	6
23	0	2	3	2	8
1 year	15	23	9	8	56
Total 0-11	251	459	397	342	1,449
Percent neonatal[1]	56.6	41.4	42.6	36.7	43.3

[a] Includes deaths under one month reported in days
[1] Under one month/under one year

INVOLVED IN THE 2009 LIBERIA MALARIA INDICATOR SURVEY

Appendix ***D***

Team Supervisors

Andrew Tellewoyan
Fred Tuazama
Jemael Johnson
George Juah
Georgetta Cooper
Rose Padmore Jebor
Roxana Kekulah
H. Eusebio Bollie
Vashti Goe
D. Samuel Tiah
Robert M. Jallah

Interviewers

Gayflor M. Zayzay
Yarso K. Tellewoyan
Jenekai Kiahon
Kumba Fokoe
Stephen Freeman
Eddie Elliott
Jartu Paye
Ebba Ojantoe Togbah
J. Wellington Barchue
Dora Koloweah
Charlesetta Neor Teh
Decontee Gbargee
Albertha G. Porte
Jamesetta Davies
Roland Kruah
Victoria Gonmah
Siatta Porte
Richard Davis
Christopher Simmonds
Patrick Wreh
Zoema T. Kargbo
Pearl Yoryor Kruah

Team Health Technicians

Edwin Fallal
Charles Blay
Charlesetta Kenneh
Goshen Gileh
Solomon Budoen
Hawa Darame
Beyan Gwama
Foldesi Bernard
Sam Gibson
Precilla Gbolor
Josiah George
Iye Fallah
Omeme Willie
Ben Kabah
Frankline Tokpa
George Dahn
Mlanwin Brown
Varshel Harris
William Kanneh
Fahn Taweh
Gralakpa Gorvego
Mardea Woods

Team Drivers

Mohammed Roggers
Saykou Kanneh
Moses Doebo
Anthony Morris
Ama Dukuly
Boima Diggs
Alexander Clarke
James Kpadeh
John Smith
Jusu Morris
Samuel Johnson
Jacob Dugbo

Field Monitors

Robert Johnson
David Taylor
Joe Kerkulah
Beebee Smith-Wesley
Emmanuel Dahn

Drivers for Monitors

Othello Mason	Boima Morris
Morris Kamara	Samuel Sieder
James Glekeh	

Malaria Microscopists

Henry Langford (Supervisor)	Aaron T. Momulu
Samuel D. Worgee	Nyononpine Williams
Mohammed Gbenga	Julie P. Blie
Nyilah Opati	

External Quality Assurance Microscopists

Vera Yatta Walker	Matthew G. Kwaidah
Andrew Samorlu	

Administrative Staff

Tolbert Nyenswah	Principal investigator
Lewis Kpoto	Principal investigator
Edward Liberty	Principal investigator
Sanford Wesseh	Local consultant
Yah M. Zolia	Project director--NMCP
Emmanuel Dahn	Assistant project director--NMCP
Francis Wreh	Survey director--LISGIS
Augustine Fayiah	Project coordinator--LISGIS
Johnson Q.Kei	Assistantt project coordinator--LISGIS
Henry Kohar	Laboratory coordinator-NMCP
John Bryant	Logistician--LISGIS
Amadu Sheriff	Driver--LISGIS
Sarah Collins	Radio operator
Albert Cephas	Support staff
Samuel Kollie	Support staff
Stanley Vah	Support staff
Victor Koko	Office assistant--NMCP
Gloria Guezo	Secretary/typist--NMCP
Samuel Sieder	Driver--NMCP
Ruth Ricks	Accountant--NMCP
J. Tugbeh Williams	Driver-consultants
Tabadeh P. Collins	Stock keeper

Data Processing Staff

Gabriel Thompson	Data processing supervisor
Levi Hinneh	Assistant data processing supervisor
Joseph Alade	Information technology officer
Sema Toe	Office editor
Oscar B. Joboe	Secondary editor
Blamo Sieh	General technician
Mercy Hardy	Questionnaire administrator
Chrispin Williams	Data entry operator
Fedesco Freeman	Data entry operator
Emmanuel Hiana	Data entry operator
Sharon Moses	Data entry operator
Mardia Baryogar	Data entry operator

Technical Committee Members

Sanford Wisseh	Chairman-MOH&SW
Dr. Joel Jones	Member-NMCP/MOH&SW
Tolbert Nyenswah	Member-NMCP/MOH&SW
Yah Zolia	Member-NMCP/MOH&SW
Gabriel Thompson	Member-NMCP/MOH&SW
Emmanuel Dahn	Member-NMCP/MOH&SW
Paye Nyansaiye	Member-NMCP/MOH&SW
Chris Dagadu	Member-HPD/MOH&SW
Joseph Alade	Member-NMCP/MOH&SW
Dr. Louise Kpoto	Member-MOH&SW
Francis Wreh	Member-LISGIS
Johnson Kei	Member-LISGIS
Augustine Fayiah	Member-LISGIS
Dr. Eugene Dolopei	Member-Medical College, Univ. of Liberia
Dr. Kassahun Belay	Member-USAID/Liberia
Kaa Williams	Member-USAID/Liberia
Dr. Ben Terkula Alagh	Member-UNICEF/Liberia
Dr. Fatumo Bolay	Member-World Health Organization/Liberia

Report Reviewers

Dr. Joel J. Jones	NMCP
Tolbert Nyenswah	NMCP
Genevieve Barrow	MOH&SW
Dr. Peter Clement	WHO
Dr. Kassahun Belay	USAID/PMI
Dr. Eugene Dolopei	Medical College
Daniel Somah	NMCP
Kaa Williams	USAID/PMI
Roland Nyanama	UNDP
Dr. James Duworko	USAID
Victor Koko	NMCP
Yah Zolia	NMCP

ICF Macro Staff

Anne Cross	Dean Garrett
Kia Reinis	Jasbir Sangha
Ladys Ortiz	Nsobya Sam Lubwama (consultant)
Elizabeth Britton	Kaye Mitchell
Sidney Moore	Joanna Lowell
Barbara Yang	Christopher L. Gramer

QUESTIONNAIRES

Appendix E

2009 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 0 ☐
INTERVIEWER'S NAME	________	________	________	INT. NUMBER ☐☐☐
RESULT*	________	________	________	RESULT ☐
NEXT VISIT: DATE	________	________		TOTAL NUMBER OF VISITS ☐
TIME	________	________		

*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 __ and I'm from the Ministry of Health. We are talking to people all over the country about malaria. I would like to ask you some questions. I hope you will agree. The information you give will help the government to plan health services.
The survey usually takes about 15 to 20 minutes to complete.

The information you give will be kept confidential and will not be shared with anyone other than members of the survey team.
You do not have to participate in the survey. If I ask 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. However, we hope you will participate in the survey since your views are important.

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	WOMEN AGE 15-49		CHILD-REN < 5
	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 5-14 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)?	CIRCLE LINE NUM-BER OF ALL WOMEN AGE 15-49	Is (NAME) currently pregnant?	CIRCLE LINE NUM-BER OF ALL CHILD-REN AGE 0-5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
01			M F 1 2	YES NO 1 2	YES NO 1 2	IN YEARS	01	YES NO/DK 1 2	01
02			1 2	1 2	1 2		02	1 2	02
03			1 2	1 2	1 2		03	1 2	03
04			1 2	1 2	1 2		04	1 2	04
05			1 2	1 2	1 2		05	1 2	05
06			1 2	1 2	1 2		06	1 2	06
07			1 2	1 2	1 2		07	1 2	07
08			1 2	1 2	1 2		08	1 2	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 = NIECE/NEPHEW BY BLOOD
10 = NIECE/NEPHEW BY MARRIAGE
11 = OTHER RELATIVE
12 = ADOPTED/FOSTER/ STEPCHILD
13 = 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'.
	(11)	(12)	(13)	(14)
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. 13: 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 = SHOP
09 = TRADITIONAL PRACTITIONER
10 = BLACK BAGGER, DRUG PEDDLAR
96 = OTHER
98 = DOES NOT KNOW

HOUSEHOLD SCHEDULE

LINE NO.	USUAL RESIDENTS AND VISITORS	RELA-TION-SHIP	SEX	RESIDENCE		AGE	WOMEN AGE 15-49		CHILD-REN < 5
	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 5-14 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)?	CIRCLE LINE NUM-BER OF ALL WOMEN AGE 15-49	Is (NAME) currently pregnant?	CIRCLE LINE NUM-BER OF ALL CHILD-REN AGE 0-5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
09			M F 1 2	Y N 1 2	Y N 1 2	IN YEARS	09	Y N 1 2	09
10			1 2	1 2	1 2		10	1 2	10
11			1 2	1 2	1 2		11	1 2	11
12			1 2	1 2	1 2		12	1 2	12
13			1 2	1 2	1 2		13	1 2	13
14			1 2	1 2	1 2		14	1 2	14
15			1 2	1 2	1 2		15	1 2	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'.
(1)	(11)	(12)	(13)	(14)
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. 13: 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 = SHOP
09 = TRADITIONAL PRACTITIONER
10 = BLACK BAGGER, DRUG PEDDLAR
96 = OTHER
98 = DOES NOT KNOW

HOUSEHOLD CHARACTERISTICS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES			SKIP
101	Where do you people get your drinking water from?	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 _____ (SPECIFY)	96		
102	What type of toilet do you use here?	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 _____ (SPECIFY)	96		
103	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	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
104	What do you use for cooking--coal, gas, wood?	ELECTRICITY . . . . . 01 GAS CYLINDER . . . . . 02 KEROSENE STOVE . . . . . 03 FIRE COAL / COAL / CHARCOAL . . . . . 04 WOOD . . . . . 05 NO FOOD COOKED IN HOUSEHOLD . . . 95 OTHER _____ 96 (SPECIFY)	
105	MAIN MATERIAL OF THE **FLOOR** OF THE HOUSEHOLD. 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)	
106	MAIN MATERIAL OF THE **ROOF** OF THE HOUSEHOLD. RECORD OBSERVATION.	NATURAL ROOFING THATCH/PALM LEAF . . . . . 11 RUDIMENTARY ROOFING PALM/BAMBOO/MATS . . . . . 21 WOOD PLANKS . . . . . 22 TARPAULIN, PLASTIC . . . . . 23 FINISHED ROOFING ZINC, METAL . . . . . 31 WOOD . . . . . 32 CERAMIC TILES . . . . . 34 CONCRETE, CEMENT . . . . . 35 ASBESTOS SHEETS, SHINGLES . . . 36 OTHER _____ 96 (SPECIFY)	
107	MAIN MATERIAL OF THE OUTSIDE **WALLS** OF THE HOUSEHOLD. RECORD OBSERVATION.	NATURAL WALLS MUD AND STICKS . . . . . 11 CANE/PALM/TRUNKS . . . . . 12 STRAW, THATCH MATS . . . . . 13 RUDIMENTARY WALLS MUD BRICKS . . . . . 21 PLYWOOD, REUSED WOOD . . . . . 22 CARDBOARD, PLASTIC . . . . . 23 FINISHED WALLS CEMENT OR STONE BLOCKS . . . . . 31 BRICKS . . . . . 32 WOOD PLANKS/SHINGLES . . . . . 33 OTHER _____ 96 (SPECIFY)	
108	How many rooms in this household are used for sleeping?	ROOMS	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES			SKIP
109	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	
110	Does your household have any mosquito nets that can be used while sleeping?	YES	1		→ 112
		NO	2		
111	Why doesn't your household have any mosquito nets? CIRCLE ALL MENTIONED.	NO MOSQUITOES	A		→ 201
		NOT AVAILABLE	B		
		DON'T LIKE TO USE NETS	C		
		TOO EXPENSIVE	D		
		OTHER _____ (SPECIFY)	X		
112	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS	☐		

		NET #1	NET #2	NET #3
113	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
114	How many months ago did your household obtain the mosquito net? IF LESS THAN ONE MONTH, WRITE '00'	MOS AGO . . . . . ☐☐ 37 OR MORE MONTHS AGO . . . 95 NOT SURE 98	MOS AGO . . . . . ☐☐ 37 OR MORE MONTHS AGO . . . 95 NOT SURE 98	MOS AGO . . . . . ☐☐ 37 OR MORE MONTHS AGO . . . 95 NOT SURE 98
115	Did you buy the net or was it given to you free?	BOUGHT . . . . 1 FREE . . . . 2 (SKIP TO 117) DON'T KNOW 8	BOUGHT . . . . 1 FREE . . . . 2 (SKIP TO 117) DON'T KNOW 8	BOUGHT . . . . 1 FREE . . . . 2 (SKIP TO 117) DON'T KNOW 8
116	How much did you pay for the net? IF DK, WRITE '998'.	COST IN LIB. $ ☐☐☐	COST IN LIB. $ ☐☐☐	COST IN LIB. $ ☐☐☐
117	OBSERVE OR ASK THE BRAND/ TYPE OF MOSQUITO NET.	**LONG-LASTING INSECTI-CIDE TREATED NET** OLYSET . . . . . 11 PERMANET . . . . . 12 OTHER/DK BRAND BUT ITN . . . 16 (SKIP TO 121) OTHER . . . . 96 DK BRAND 98	**LONG-LASTING INSECTI-CIDE TREATED NET** OLYSET . . . . . 11 PERMANET . . . . . 12 OTHER/DK BRAND BUT ITN . . . 16 (SKIP TO 121) OTHER . . . . 96 DK BRAND 98	**LONG-LASTING INSECTI-CIDE TREATED NET** OLYSET . . . . . 11 PERMANET . . . . . 12 OTHER/DK BRAND BUT ITN . . . 16 (SKIP TO 121) OTHER . . . . 96 DK BRAND 98
118	When you got the net, was it already treated with an insecticide to kill or repel mosquitos?	YES . . . . 1 NO . . . . 2 NOT SURE 8	YES . . . . 1 NO . . . . 2 NOT SURE 8	YES . . . . 1 NO . . . . 2 NOT SURE 8
119	Since you got the mosquito net, was it ever soaked or dipped in a liquid to kill or repel mosquitos?	YES . . . . 1 NO . . . . 2 (SKIP TO 121) NOT SURE 8	YES . . . . 1 NO . . . . 2 (SKIP TO 121) NOT SURE 8	YES . . . . 1 NO . . . . 2 (SKIP TO 121) NOT SURE 8
120	How many months ago was the net last soaked or dipped? IF LESS THAN ONE MONTH, WRITE '00'	MOS AGO . . . . . ☐☐ 25 OR MORE MONTHS AGO . . . 95 NOT SURE 98	MOS AGO . . . . . ☐☐ 25 OR MORE MONTHS AGO . . . 95 NOT SURE 98	MOS AGO . . . . . ☐☐ 25 OR MORE MONTHS AGO . . . 95 NOT SURE 98
121	Did anyone sleep under this mosquito net last night?	YES . . . . 1 NO . . . . 2 (SKIP TO 123) NOT SURE 8	YES . . . . 1 NO . . . . 2 (SKIP TO 123) NOT SURE 8	YES . . . . 1 NO . . . . 2 (SKIP TO 123) NOT SURE 8
122	Who slept under this mosquito net last night? RECORD THE PERSON'S 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. . . . . . ☐☐
123		GO BACK TO 113 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 201.	GO BACK TO 113 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 201.	GO TO 113 IN FIRST COL. OF A NEW QUESTIONRE.; OR, IF NO MORE NETS, TO 201

		CHILD 1	CHILD 2	CHILD 3
201	CHECK COLUMN 10. WRITE THE LINE NUMBER AND NAME FOR ALL CHILDREN 0-5 YEARS IN Q. 202 IN ORDER BY LINE NUMBER. IF MORE THAN 6 CHILDREN, USE ADDITIONAL QUESTIONNAIRES. **BE SURE TO FILL Qs. 209 AND 211.**			
202	LINE NUMBER FROM COLUMN 10 NAME FROM COLUMN 2	LINE NUMBER . . . ☐☐ NAME _____	LINE NUMBER . . . ☐☐ NAME _____	LINE NUMBER . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY CHILD'S MONTH AND YEAR 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 2003 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215)
205	CHECK 203: IS CHILD AGE 0-5 MONTHS, I.E., WAS CHILD BORN IN MONTH OF INTERVIEW OR FIVE PREVIOUS MONTHS?	0-5 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215) OLDER 2	0-5 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215) OLDER 2	0-5 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215) OLDER 2
206	LINE NUMBER OF PARENT OR ADULT RESPONSIBLE FOR CHILD. RECORD '00' IF NOT LISTED.	LINE NUMBER . . . ☐☐	LINE NUMBER . . . ☐☐	LINE NUMBER . . . ☐☐
207	READ **ANEMIA** CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR CHILD. CIRCLE CODE AND SIGN.	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2
208	READ **MALARIA** CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR CHILD. CIRCLE CODE AND SIGN.	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2
	CONDUCT TESTS FOR WHICH CONSENT IS GRANTED AND CONTINUE TO 209			
209	RECORD RESULT CODE OF **ANEMIA** TEST.	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 211)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 211)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 211)
210	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA PAMPHLET.	G/DL ☐☐.☐	G/DL ☐☐.☐	G/DL ☐☐.☐
211	RECORD RESULT CODE OF **MALARIA** TEST	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 215)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 215)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 215)
212	BAR CODE LABEL PASTE BAR CODE HERE AND ON SLIDE AND ON TRANSMITTAL FORM.			
213	RESULT OF **MALARIA** TEST	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 215) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 215) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 215) OTHER 6
214	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD. ASK ABOUT ANY TREATMENT THE CHILD HAS ALREADY RECEIVED.	ACCEPTED MEDICINE 1 (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6
215		GO BACK TO 203 IN NEXT COLUMN IN THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE ADDITIONAL QUESTIONNAIRE(S); IF NO MORE CHILDREN, END INTERVIEW		

		CHILD 4	CHILD 5	CHILD 6
202	LINE NUMBER FROM COLUMN 10 NAME FROM COLUMN 2	LINE NUMBER . . . ☐☐ NAME _____	LINE NUMBER . . . ☐☐ NAME _____	LINE NUMBER . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY CHILD'S MONTH AND YEAR 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 2003 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215)
205	CHECK 203: IS CHILD AGE 0-5 MONTHS, I.E., WAS CHILD BORN IN MONTH OF INTERVIEW OR FIVE PREVIOUS MONTHS?	0-5 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215) OLDER 2	0-5 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215) OLDER 2	0-5 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 215) OLDER 2
206	LINE NUMBER OF PARENT OR ADULT RESPONSIBLE FOR CHILD. RECORD '00' IF NOT LISTED.	LINE NUMBER . . . ☐☐	LINE NUMBER . . . ☐☐	LINE NUMBER . . . ☐☐
207	READ **ANEMIA** CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR CHILD. CIRCLE CODE AND SIGN.	GRANTED 1 _____ (SIGN) REFUSED 2	GRANTED 1 _____ (SIGN) REFUSED 2	GRANTED 1 _____ (SIGN) REFUSED 2
208	READ **MALARIA** CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR CHILD. CIRCLE CODE AND SIGN.	GRANTED 1 _____ (SIGN) REFUSED 2	GRANTED 1 _____ (SIGN) REFUSED 2	GRANTED 1 _____ (SIGN) REFUSED 2
	CONDUCT TESTS FOR WHICH CONSENT IS GRANTED AND CONTINUE TO 209			
209	RECORD RESULT CODE OF **ANEMIA** TEST.	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 211)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 211)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 211)
210	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA PAMPHLET.	G/DL ☐☐.☐	G/DL ☐☐.☐	G/DL ☐☐.☐
211	RECORD RESULT CODE OF **MALARIA** TEST	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 215)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 215)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 215)
212	BAR CODE LABEL PASTE BAR CODE HERE AND ON SLIDE AND ON TRANSMITTAL FORM.			
213	RESULT OF **MALARIA** TEST	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 215) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 215) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 215) OTHER 6
214	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD. ASK ABOUT ANY TREATMENT THE CHILD HAS ALREADY RECEIVED.	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6
215		GO BACK TO 203 IN NEXT COLUMN IN THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE ADDITIONAL QUESTIONNAIRE(S); IF NO MORE CHILDREN, END INTERVIEW		

CONSENT STATEMENT FOR ANEMIA TEST

As part of this survey, we are asking that children all over the country take an **anemia** test. Anemia is a serious health problem that usually results from poor nutrition, infection, or disease. This survey will help the government to develop programs to prevent and treat anemia.

We request that all children born in 2003 or later participate in the anemia testing part of this survey and give a few drops of blood from a finger. The equipment used in taking 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 confidential.

Do you have any questions about the anemia test?

You can say yes to the test or you can say no. It is up to you to decide.
Will you allow (NAME(S) OF CHILD(REN) to participate in the **anemia** test?

CONSENT STATEMENT FOR MALARIA TEST

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 request that all children born in 2003 or later participate in the malaria testing part of this survey and give a few drops of blood from a finger. The equipment used in taking 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).

The blood will be tested for malaria immediately and the result will be told to you right away. The result will be kept confidential.

Do you have any questions about the malaria test?

You can say yes to the test or you can say no. It is up to you to decide.
Will you allow (NAME(S) OF CHILD(REN) to participate in the **malaria** test?

TREATMENT FOR CHILDREN WITH POSITIVE MALARIA TESTS

IF MALARIA TEST IS POSITIVE: 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.

BEFORE PROVIDING ACT, FIRST ASK IF THE CHILD IS ALREADY TAKING OTHER DRUGS AND IF SO, ASK TO SEE THEM. IF CHILD IS ALREADY TAKING ACT, CHECK ON THE DOSE ALREADY AVAILABLE. BE CAREFUL NOT TO OVERTREAT.

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)	**Amodiaquine (153 mg.)**	**Artesunate (50 mg.)**
Less than 5 kgs.	Nothing	Nothing
5-7 kgs.	1/4 tablet once a day for 3 days	1/2 tablet once a day for 3 days
8-10 kgs.	1/2 tablet once a day for 3 days	1/2 tablet once a day for 3 days
11-13 kgs.	3/4 tablet once a day for 3 days	1 tablet once a day for 3 days
14-16 kgs.	1 tablet once a day for 3 days	1 tablet once a day for 3 days
17-19 kgs.	1 tablet once a day for 3 days	1 1/2 tablets once a day for 3 days
Amodiaquine and Artesunate (ACT) are to be taken together once a day for 3 days. IF CHILD WEIGHS LESS THAN 5 KGS., DO NOT LEAVE DRUGS. TELL PARENT TO TAKE CHILD TO HEALTH FACILITY.		

2009 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 0
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 _____ and I'm from the Ministry of Health. We are talking to people all over the country about malaria. I would like to ask you some questions. I hope you will agree. The information you give will help the government to plan health services. The survey usually takes about 10 to 20 minutes to complete.

The information you give will be kept confidential and will not be shared with anyone other than members of our survey team. You do not have to participate in the survey. If I ask 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. However, we hope you will participate in the survey since your views are important.

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	How long have you been living continuously in (NAME OF CURRENT PLACE OF RESIDENCE)? IF LESS THAN ONE YEAR, RECORD '00' YEARS.	YEARS . . . . . [ ][ ] ALWAYS . . . . . 95 VISITOR 96	→ 104
103	Just before you moved here, did you live in a city, in a town, or in a village?	CITY . . . . . 1 TOWN . . . . . 2 VILLAGE 3	
104	In what month and year were you born?	MONTH . . . . . [ ][ ] DON'T KNOW MONTH . . . . . 98 YEAR . . . . . [ ][ ][ ][ ] DON'T KNOW YEAR 9998	
105	How old are you? COMPARE AND CORRECT 104 AND/OR 105 IF INCONSISTENT.	AGE IN COMPLETED YEARS [ ][ ]	
106	Have you ever attended school?	YES . . . . . 1 NO 2	→ 110
107	What is the highest level of school you attended: primary, secondary, or higher?	PRIMARY . . . . . 1 SECONDARY . . . . . 2 HIGHER 3	
108	What is the highest grade you completed?	GRADE . . . . . [ ][ ]	
109	CHECK 108: PRIMARY ☐ SECONDARY OR HIGHER ☐		→ 111
110	Now I would like you to read this sentence to me. SHOW SENTENCES TO RESPONDENT. IF RESPONDENT CANNOT READ WHOLE SENTENCE, PROBE: Can you read any part of the sentence to me?	CANNOT READ AT ALL . . . . . 1 ABLE TO READ ONLY PARTS OF SENTENCE . . . . . 2 ABLE TO READ WHOLE SENTENCE. . 3 NO CARD WITH REQUIRED LANGUAGE _____ 4 (SPECIFY LANGUAGE) BLIND/VISUALLY IMPAIRED 5	
111	What is your religion?	CHRISTIAN . . . . . 1 MUSLIM . . . . . 2 TRADITIONAL RELIGION . . . . . 3 NO RELIGION . . . . . 4 OTHER _____ 6 (SPECIFY)	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
112	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	

SENTENCES FOR READING (Q.110):

1. The child is reading a book.
2. Farming is hard work.
3. Parents should care for their children.
4. The rains were heavy this year.

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, RECORD '00'.	TOTAL . . . . . [ ][ ]	
209	CHECK 208: So in all, you have belly born ____ (TOTAL) children in your life. Is that correct? YES ☐ NO ☐ → PROBE AND CORRECT 201-208 AS NECESSARY.		
210	CHECK 208: ONE OR MORE BIRTHS ☐ NO BIRTHS Q.208 IS '00' ☐ → 224		

211 Now I want the names of all the children you born, whether still alive or not, starting with the first one.

RECORD NAMES OF ALL THE BIRTHS IN 212. RECORD TWINS AND TRIPLETS ON SEPARATE LINES.
(IF THERE ARE MORE THAN 12 BIRTHS, USE AN ADDITIONAL QUESTIONNAIRE STARTING WITH THE SECOND ROW).

212 What is/was the name of your (first/next) child? (NAME)	213 Were any of these births twins?	214 Is (NAME) a boy or a girl?	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 IF DEAD: How old was (NAME) when he/she died? IF '1 YR', PROBE: How many months old was (NAME)? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN TWO YEARS; OR YEARS.	221 Did you born any other child between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
01	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (NEXT BIRTH)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	
02	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
03	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
04	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
05	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
06	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
07	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH

212 What name was given to your next baby? (NAME)	213 Were any of these births twins?	214 Is (NAME) a boy or a girl?	215 In what month and year was (NAME) born? PROBE: What is his/her birthday?	216 Is (NAME) still alive?	217 IF LIVING: How old was (NAME) at his/her last birthday? 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 IF DEAD: How old was (NAME) when he/she died? IF '1 YR', PROBE: How many months old was (NAME)? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN TWO YEARS; OR YEARS.	221 Were there any other live births between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
08	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
09	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
10	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
11	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
12	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . . 1 MONTHS . 2 YEARS . . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH

222	Did you born any child since the birth of (NAME OF LAST BIRTH)? IF YES, RECORD BIRTH(S) IN TABLE.	YES . . . . . 1 NO 2

223 COMPARE 208 WITH NUMBER OF BIRTHS IN HISTORY ABOVE AND MARK:

NUMBERS ARE SAME ☐ NUMBERS ARE DIFFERENT ☐→ (PROBE AND RECONCILE)

CHECK: FOR EACH BIRTH: MONTH AND YEAR OF BIRTH IS RECORDED.

FOR EACH LIVING CHILD: CURRENT AGE IS RECORDED. ☐☐

224 CHECK 215 AND ENTER THE NUMBER OF BIRTHS IN 2003 OR LATER.
IF NONE, RECORD '0' AND CONTINUE TO Q. 225. ☐

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
225	Are you pregnant now?	YES . . . . . 1 NO . . . . . 2 UNSURE 8	→ 227
226	How many months pregnant are you? RECORD NUMBER OF COMPLETED MONTHS.	MONTHS . . . . . ☐☐	
227	CHECK 224: ONE OR MORE BIRTHS IN 2003 OR LATER ☐ ↓ NO BIRTHS IN 2003 OR LATER ☐ →		→ 501

SECTION 3. PREGNANCY AND INTERMITTENT PREVENTIVE TREATMENT

301	CHECK 212 AND 215: ENTER IN 302 THE NAME AND LINE NUMBER OF THE MOST RECENT BIRTH SINCE 2003 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 LINE NUMBER FROM 212	NAME OF LAST BIRTH _____ LINE 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 drugs 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 DON'T KNOW 8	☐ → 401
305	What drugs 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	ENTER IN THE TABLE THE LINE NUMBER, NAME, AND SURVIVAL STATUS OF EACH BIRTH IN 2003 OR LATER. ASK THE QUESTIONS ABOUT ALL OF THESE BIRTHS. BEGIN WITH THE LAST BIRTH. (IF THERE ARE MORE THAN 3 BIRTHS, USE AN ADDITIONAL QUESTIONNAIRE, STARTING WITH THE FIRST COLUMN). Now I would like to ask you some questions about the health of your children. (We will talk about each one separately.)			
402	LINE NUMBER FROM 212	LAST BIRTH LINE NUMBER . . . . [ ][ ]	NEXT-TO-LAST BIRTH LINE NUMBER . . . . [ ][ ]	SECOND-FROM-LAST BIRTH LINE 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 FIRST 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 FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8
405	How many days ago did the fever start? IF LESS THAN ONE DAY, WRITE '00'.	DAYS AGO . [ ][ ] DON'T KNOW 98	DAYS AGO . [ ][ ] DON'T KNOW 98	DAYS AGO . [ ][ ] DON'T KNOW 98
406	Did you seek advice or treatment for the fever from any source?	YES . . . . 1 NO . . . . 2 (SKIP TO 411)	YES . . . . 1 NO . . . . 2 (SKIP TO 411)	YES . . . . 1 NO . . . . 2 (SKIP TO 411)
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 CLINIC . . . . C OTHER PUBLIC ______ D (SPECIFY) **PRIVATE MEDICAL SEC.** PVT. HOSPITAL/ CLINIC . . . . E PHARMACY . . . . F PVT DOCTOR . . . . G MOBILE CLINIC . H OTHER PRIVATE MED. ______ I (SPECIFY) **OTHER SOURCE** SHOP . . . . J TRADITIONAL PRACTITIONER K OTHER ______ X (SPECIFY)	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . . B GOVT HEALTH CLINIC . . . . C OTHER PUBLIC ______ D (SPECIFY) **PRIVATE MEDICAL SEC.** PVT. HOSPITAL/ CLINIC . . . . E PHARMACY . . . . F PVT DOCTOR . . . . G MOBILE CLINIC . H OTHER PRIVATE MED. ______ I (SPECIFY) **OTHER SOURCE** SHOP . . . . J TRADITIONAL PRACTITIONER K OTHER ______ X (SPECIFY)	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . . B GOVT HEALTH CLINIC . . . . C OTHER PUBLIC ______ D (SPECIFY) **PRIVATE MEDICAL SEC.** PVT. HOSPITAL/ CLINIC . . . . E PHARMACY . . . . F PVT DOCTOR . . . . G MOBILE CLINIC . H OTHER PRIVATE MED. ______ I (SPECIFY) **OTHER SOURCE** SHOP . . . . J TRADITIONAL PRACTITIONER K 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 410)	TWO OR MORE CODES CIRCLED ☐ ↓ ONLY ONE CODE CIRCLED ☐ (SKIP TO 410)	TWO OR MORE CODES CIRCLED ☐ ↓ ONLY ONE CODE CIRCLED ☐ (SKIP TO 410)
409	Where did you first go for advice or treatment? USE LETTER CODE FROM 407.	FIRST PLACE . . . . ☐	FIRST PLACE . . . . ☐	FIRST PLACE . . . . ☐
410	When the fever started, how long it took for you to carry the child for advice or treatment? IF THE SAME DAY, RECORD '00'.	DAYS . . . . . . ☐☐	DAYS . . . . . . ☐☐	DAYS . . . . . . ☐☐
411	Is (NAME) still sick with a fever?	YES . . . . 1 NO . . . . 2 DON'T KNOW 8	YES . . . . 1 NO . . . . 2 DON'T KNOW 8	YES . . . . 1 NO . . . . 2 DON'T KNOW 8
411A	At any time during the illness, 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 illness, did (NAME) take any drugs for the illness?	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 FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501) DON'T KNOW 8
413	What drugs did (NAME) take? Any other drugs? RECORD ALL MENTIONED. IF SHE DOES NOT KNOW THE TYPE OF DRUG, SHOW HER THE TYPICAL ANTIMALARIAL DRUGS. IF SHE STILL IS NOT SURE, ASK TO SEE THE DRUGS.	**ANTIMALARIAL DRUGS** SP/FANSIDAR . . . . A CHLOROQUINE . B QUININE . . . . C NEW MALARIA MEDICINE (ACT) D OTHER ANTI-MALARIAL ________ E (SPECIFY) **OTHER DRUGS** ASPIRIN . . . . F ACETAMINOPHEN G IBUPROFEN . . . . H 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) **OTHER DRUGS** ASPIRIN . . . . F ACETAMINOPHEN G IBUPROFEN . . . . H 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) **OTHER DRUGS** ASPIRIN . . . . F ACETAMINOPHEN G IBUPROFEN . . . . H 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 FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 501)

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ______	NEXT-TO-LAST BIRTH NAME ______	SECOND-FROM-LAST BIRTH NAME ______
415	Did you already have (NAME OF DRUG FROM 413) at home when the child became ill? ASK SEPARATELY FOR EACH OF THE DRUGS 'A' THROUGH 'E' THAT THE CHILD IS RECORDED AS HAVING TAKEN IN 413. IF YES FOR ANY DRUG, CIRCLE CODE FOR THAT DRUG. IF NO FOR ALL DRUGS, CIRCLE 'Y'.	ANTIMALARIAL DRUGS SP/FANSIDAR . . . . A CHLOROQUINE . B QUININE . . . . C NEW MALARIA MEDICINE-ACT D OTHER ANTI-MALARIAL . . . . E NO DRUG AT HOME . Y	ANTIMALARIAL DRUGS SP/FANSIDAR . . . . A CHLOROQUINE . B QUININE . . . . C NEW MALARIA MEDICINE-ACT D OTHER ANTI-MALARIAL . . . . E NO DRUG AT HOME . Y	ANTIMALARIAL DRUGS SP/FANSIDAR . . . . A CHLOROQUINE . B QUININE . . . . C NEW MALARIA MEDICINE-ACT D OTHER ANTI-MALARIAL . . . . E NO DRUG AT HOME . Y
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 DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8
418	For how many days did (NAME) take the SP/Fansidar? IF 7 DAYS OR MORE, WRITE '7'.	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ DON'T KNOW 8
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 DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8
421	For how many days did (NAME) take the chloroquine? IF 7 DAYS OR MORE, WRITE '7'.	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ 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)

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ________	NEXT-TO-LAST BIRTH NAME ________	SECOND-FROM-LAST BIRTH NAME ________
423	How long after the fever started did (NAME) first take quinine?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8
424	For how many days did (NAME) take the quinine? IF 7 DAYS OR MORE, WRITE '7'.	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ 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 DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8
427	For how many days did (NAME) take the ACT? IF 7 DAYS OR MORE, WRITE '7'.	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ 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 DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE DAYS AFTER FEVER . . . . . 3 FOUR OR MORE DAYS AFTER FEVER . . 4 DON'T KNOW 8
430	For how many days did (NAME) take the (OTHER ANTIMALARIAL)? IF 7 DAYS OR MORE, WRITE '7'.	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ DON'T KNOW 8	DAYS . . . . ☐ 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 1st 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 illness 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 OTHER _____ X (SPECIFY) DOES NOT KNOW ANY . . . . . Z	
503	Which age group of people are most likely to get a serious case of 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 ways to avoid getting malaria?	YES . . . . . 1 NO 2	 → 507
506	What are the ways to avoid 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 → 509
508	What drugs 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: _____

EDITOR'S OBSERVATIONS

NAME OF EDITOR: _____ DATE: _____