RWANDA

Malaria Indicator Survey (MIS)

2013

REPUBLIC OF RWANDA

Rwanda
Malaria Indicator Survey
2013

Malaria and Other Parasitic Diseases Division-RBC
Ministry of Health
Kigali, Rwanda

ICF International
Rockville, Maryland, USA

April 2014

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The 2013 Rwanda Malaria Indicator Survey (2013 RMIS) was implemented by the Malaria and Other Parasitic Diseases Division-RBC (MAL & OPD Division-RBC), Ministry of Health. The funding was provided by the Government of Rwanda, the United States Agency for International Development (USAID), and the Global Fund to Fight AIDS, Tuberculosis and Malaria. ICF International provided technical assistance through The DHS Program, a USAID-funded program providing support and technical assistance for population and health surveys in countries worldwide.

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PREFACE

It is with pleasure that the Ministry of Health presents this report on the 2013 Rwanda Malaria Indicator Survey (2013 RMIS). The report follows an earlier Demographic and Health Survey conducted in 2010/2011.

The 2013 RMIS is a nationally representative, household-based survey that provides data on malaria indicators, which are used to assess the progress of a malaria control program. The control program is geared toward meeting Millennium Development Goals.

As a result of the 2013 RMIS, significant improvements in all of the basic malaria indicators have been confirmed, including the use of long-lasting mosquito nets, which increased slightly, from 81 percent in 2010 to 83 percent in 2013 when the proportion of households with at least one insecticide-treated net (ITN) for every two people was estimated to be 43 percent. Sixty-one percent of the Rwandan population slept under an ITN the night before the survey, while three out of four children and pregnant women slept under an ITN the previous night. Three of ten (29 percent) Rwandan children had a fever in the two weeks prior to the survey and, of these children, 68 percent sought advice or treatment and 30 percent had blood taken from a finger for testing. Among children who had a fever, 11 percent took ACT, the recommended malaria treatment in Rwanda; 70 percent of those who received ACT took it on the day of diagnosis.

The survey was implemented by the Malaria and Other Parasitic Diseases Division of the Rwanda Biomedical Center (RBC) in collaboration with the National Institute of Statistics of Rwanda, and technical assistance was provided by ICF International.

The 2013 RMIS was financially supported by the Government of Rwanda, the Global Fund (GF) against HIV, TB & Malaria, and the President's Malaria Initiative (PMI) through the United States Agency for International Development (USAID).

The success of the 2013 RMIS implementation is due to the availability and collaboration of the survey respondents. The response rate was estimated to be more than 98 percent. This high rate of response ensures that the results presented in this report reflect achievements in key malaria control indicators in Rwanda.

I would like to request that all partners make use of the information presented in this report as they implement projects to sustain achievement.

My thanks go to the Malaria and Other Parasitic Diseases Division of the RBC (Ministry of Health), and to ICF International for their diligence during the preparation and implementation of the survey.

I strongly advise increased efforts to continue in the fight against malaria and to strengthen the commitment of the Government of Rwanda in its efforts to eliminate deaths from malaria.

Together, we can eliminate malaria.

Dr Agnes BINAGWAHO
Minister of Health

ACKNOWLEDGMENTS

The primary objective of the 2013 Rwanda Malaria Indicator Survey (2013 RMIS) was to provide up-to-date information on the prevention of malaria to policymakers, planners, and researchers. The findings of this survey will guide future planning, strategy implementation, and identification of areas of improvement for malaria control in Rwanda.

This survey was conducted with the support and participation of a large number of individuals and organizations. We would like to express our gratitude to all of them.

First, our appreciation goes to all of the households and respondents who participated in the survey. Without their participation and support, the data needed for planning would not have been collected.

Gratitude also goes to the supervisors and interviewers for their diligent efforts. The commitment of the entire field staff of the 2013 RMIS helped ensure success of the survey. Similarly, the data processing team is commended.

Our sincere thanks go to local leaders for their assistance and contributions to the smooth implementation of the survey.

We thank the Ministry of Health for the support offered by staff in providing leadership and advocacy.

We also express our gratitude to many international organizations for their vital financial assistance, as the contributions of the President's Malaria Initiative and the Global Fund were of immense importance to the accomplishments of the survey.

The dedicated members of the RMIS Steering Committee are thanked for their outstanding and enthusiastic management of the technical, administrative, and logistical phases of the survey, and National Institute of Statistics support is gratefully acknowledged.

Finally, our special appreciation goes to the technical staffs of both the Malaria and Other Parasitic Diseases Division of the RBC (Ministry of Health) and ICF International. Without their participation and support, the much needed data for planning would not have been collected.

HEAD OF MALARIA & OTHER
PARASITIC DISEASES DIVISION
RWANDA BIOMEDICAL CENTER

Dr Corine Karema
Head of Malaria & Other Parasitic Diseases Division-RBC

RWANDA

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INTRODUCTION 1

1.1 COUNTRY PROFILE

1.1.1 Geography

Rwanda is a landlocked country in central Africa, situated 1,200 kilometers from the Indian Ocean to the east and 2,000 kilometers from the Atlantic Ocean to the west. It lies between latitude 1°4' and latitude 2°51' south and longitude 28°63' and longitude 30°54' east. The surface area of 26,338 square kilometers is bordered by Uganda to the north, Tanzania to the east, the Democratic Republic of the Congo to the west, and Burundi to the south (see map on facing page).

Rwanda forms part of the highlands of eastern and central Africa, with mountainous characteristics and an average elevation of 1,700 meters. The country can be divided into three distinct geographical regions.

Western and north-central Rwanda consists of the mountains and foothills of the Congo-Nile Divide, the Virunga volcano range, and the northern highlands. This region is characterized by rugged mountains intercut by steep valleys, with elevations generally exceeding 2,000 meters. The Divide itself rises to 3,000 meters at its highest point but is dwarfed by the volcano range, where the highest peak, Mount Karisimbi, reaches 4,507 meters. The Congo-Nile Divide slopes westward to Lake Kivu, which lies 1,460 meters above sea level in the Rift Valley trough.

In Rwanda's center, mountainous terrain gives way to rolling hills that give the country its nickname, "Land of a Thousand Hills." Here the average elevation varies between 1,500 and 2,000 meters. The area is also referred to as the central plateau. Further east lays a vast region known as the "eastern plateaus," where the hills level gradually into flat lowlands interspersed with a few hills and lake-filled valleys. The elevation of this region generally is below 1,500 meters.

Because of its elevation, Rwanda enjoys a temperate, sub-equatorial climate with average yearly temperatures around 18.5°C. The average annual rainfall is 1,250 millimeters, which accumulates over two rainy seasons of differing lengths that alternate with one long and one short dry season. The climate varies somewhat from region to region, depending on the altitude. The volcano range and northern highlands are generally cooler and wetter, with an average temperature of 16°C and an average rainfall above 1,300 millimeters. The maximum rainfall is 1,600 millimeters above the Divide and the volcanic range. The hilly central region receives an average of 1,000 to 1,300 millimeters of rain per year, while rainfall on the eastern plateau, where the climate is relatively warmer and drier, generally falls below 1,000 millimeters and can be as low as 800 millimeters. Although Rwanda enjoys more or less constant temperatures, the climate is known to vary from year to year, with extreme variations in rainfall sometimes resulting in flooding or, more often, drought. These extremes have a profound impact on agricultural production

Rwanda has a dense network of rivers and streams, which drain into the Congo River on the western slope of the Congo-Nile Divide, and into the Nile River in the rest of the country via the Akagera River, which receives all the streams of this watershed. Water resources also include several lakes surrounded by wetlands. Deforestation caused mainly by land clearing for agricultural expansion has resulted in mostly anthropic vegetation, with only a few small areas of natural forestland (representing 7 percent of the country) remaining on the Congo-Nile Divide and the slopes of the volcanic range (MINITERE and CGIS-NUR, 2007).

1.1.2 Malaria

Malaria has been the main cause of morbidity and mortality in Rwanda for several years, with periodic epidemics in high-altitude areas. The Malaria and Other Parasitic Diseases Division (MAL & OPD Division), a national institution spearheading the effort to combat malaria, has adopted a strategy of pre-elimination by 2017 through universal coverage of key malaria control prevention and treatment interventions. This plan would contribute to the achievement of the Millennium Development Goals set forth in the Vision 2020 strategic plan for the national health sector.

Rwanda has achieved significant reductions in the burden of malaria over the past decade. In 2005, Malaria was the number 1 killer of children under age 5. In 2008, Malaria had dropped to the number 3 position, and by 2011 had dropped further to number 11. They key to success has been an aggressive government-led roll out of an integrated mix of prevention, treatment, and mosquito control activities, with emphasis on strengthening of the health system. Rwanda's success stems from political commitment, countrywide vision, vigilant leadership from top to bottom, and inherent responsibility from the highest levels of the system down to the village level of volunteer community health workers (CHWs).

Although long-lasting insecticide-treated mosquito nets (LLINs) have been shown for years to effectively prevent malaria when used often and widely in the community, Rwanda has also benefited from a scale-up of artemisinin combination therapy (ACT).

Since 2005, more than 11 million LLINs have been distributed, including 6.1 million since December 2009 with the support of the Global Fund to Fight AIDS, Malaria and Tuberculosis, the President's Malaria Initiative, UNICEF, and the Government of Rwanda. Most of the LLINs were distributed to children under age 5 during integrated measles vaccination campaigns in September 2006 (1.4 million) and in April 2010 (1.6 million. LLINs were also distributed through the Expanded Program on Immunization (EPI) for under-5 children and antenatal care (ANC) clinics for pregnant women (2.4 million distributed from 2005 onward), and through a massive household distribution campaign in 2010 (2.2 million). Other groups receiving LLINs included people living with HIV, the poor, and boarding school students.

The 2007-08 Interim DHS and 2010 DHS in Rwanda were nationally representative household surveys to measure the prevalence of malaria infection among children. The most recent survey (2010 RDHS) found that 1.4 percent of children ages 6-59 months were confirmed malaria-positive, and 1.3 percent of children had severe anaemia (<8 g/dl). The survey also provided other malaria-related indicators, such as ownership and use of mosquito nets and treatment of childhood fevers.

There was considerable improvement from 2007-2008 to 2010 in all malaria indicators. This was characterized by an 86 percent decline in malaria incidence between 2005 and 2011; an 87 percent decline in outpatient malaria cases between 2005 and 2011; a 74 percent decline in inpatient malaria deaths between 2005 and 2011; and a 71 percent decline in malaria test positivity rate between 2005 and 2011. According to the 2010 DHS, malaria prevalence decreased from 2.6 percent in 2008 to 1.4 percent in 2010 in children under age 5 and from 1.4 percent in 2008 to 0.7 percent in 2010 in pregnant women.

The government of Rwanda has developed national policies to combat malaria, including efforts to distribute mosquito nets and to introduce newer, more effective, antimalarial drug treatments.

1.2 OBJECTIVES AND METHODOLOGY OF THE SURVEY

1.2.1 Objectives

The objectives of the 2013 Rwanda Malaria Indicator Survey (RMIS) were to collect data on (1) ownership and utilization of treated mosquito nets and (2) knowledge of symptoms, causes, treatments, and prevention of malaria.

A related objective was to produce survey results in a timely manner and to ensure that the data were disseminated to a wide audience of potential users in government and nongovernmental organizations within and outside of Rwanda. Most survey indicators were produced separately for each of the five provinces.

Key indicators were malaria-specific and general.

Malaria indicators:

- Ownership of insecticide-treated mosquito nets
- Usage of insecticide-treated mosquito nets among persons in the household, children under age 5, and pregnant women
- Proportion of children under age 5 with recent fever who were treated with timely, appropriate antimalarial drugs
- Proportions of mothers who know the symptoms, treatments, and prevention of malaria

General indicators:

- Source of household drinking water; type of toilet facility
- Household socioeconomic status (wealth quintile)

1.2.2 Questionnaires

The 2013 RMIS involved two questionnaires: a Household Questionnaire and a Woman's Questionnaire for all women age 15-49 in the selected households. Both of these instruments were based on the model Demographic and Health Survey Phase III and the model Roll Back Malaria (RBM) Malaria Indicator Survey (MIS) questionnaires developed by the MEASURE DHS program, as well as on previous surveys conducted in Rwanda, including the 2007-08 Rwanda Interim DHS (RIDHS) and the 2010 Rwanda Demographic and Health Survey (RDHS). The MAL & OPD Division reviewed the draft questionnaires with potential stakeholders, including government health agencies and interested donor groups.

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, education, and relationship to the head of household. The main purpose of the Household Questionnaire was to identify women eligible for individual interview. Questions on ownership and use of mosquito nets were included in the Household Questionnaire as were questions about proxy indicators for wealth such as ownership of various durable goods, dwelling unit characteristics, and land.

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

- Background characteristics (age, education, media exposure, employment, religion, and so on)
- Reproductive history (number of births, date of last birth, current pregnancy status, and antimalarial treatment for children under age 5 with recent fever)
- Knowledge about malaria symptoms, causes, and prevention

1.2.3 Sample Design

The sample for the 2013 RMIS was designed to provide malaria indicator estimates for the country as a whole and for separate urban and rural areas. Survey estimates are also be reported for the provinces (South, West, North, and East provinces) and Kigali City.

A representative sample of 4,772 households was selected for the 2013 RMIS. The sample was selected in two stages. In the first stage, 159 villages (also known as clusters or enumeration areas) were selected with probability proportional to village size. Village size is determined by the number of households residing in the village. Then, a complete mapping and listing of all households in the selected villages was conducted. The resulting lists of households served as the sampling frame for the second stage of sample selection. Households were systematically selected from those lists for participation in the survey.

All women age 15-49 who were either permanent residents of the households or visitors present in the household on the night before the survey were eligible for interviews.

1.2.4 Sample Coverage

All of the 159 clusters selected for the sample were surveyed for the 2013 RMIS. A total of 4,772 households was selected, of which 4,769 households were identified and occupied at the time of the survey. Among these households, 4,766 completed the Household Questionnaire, yielding a response rate of nearly 100 percent (Table 1.1).

In the 4,766 households surveyed, 5,164 women age 15-49 were identified as being eligible for the individual interview. Interviews were completed with 5,135 of these women, yielding a response rate of 99.4 percent. The response rates were slightly higher in rural areas than in urban areas.

Table 1.1 Results of the household and individual interviews

Number of households, number of interviews, and response rates, according to residence (unweighted), Rwanda 2013

	Residence		
Result	Urban	Rural	Total
Household interviews			
Households selected	841	3,931	4,772
Households occupied	839	3,930	4,769
Households interviewed	837	3,929	4,766
Household response rate[1]	99.8	100.0	99.9
Interviews with women age 15-49			
Number of eligible women	1,056	4,108	5,164
Number of eligible women interviewed	1,049	4,086	5,135
Eligible women response rate[2]	99.3	99.5	99.4

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

1.2.5 Training and Fieldwork Data Collection

Training for pretesting occurred from January 9 to January 18, 2013. Fifteen women and men were trained to administer the RMIS survey questionnaire and household listing update. Four days of fieldwork were followed by one day of interviewer debriefing and testing. Pretest fieldwork was conducted in 80 households in two rural and two urban villages outside of Kigali City. All pretest participants attended the main training and served as team leaders/field editors for the main survey.

For the main data collection, the Mal & OPD Division recruited and trained 50 participants from 21 January to 1 February 2013 on how to use the RMIS survey instruments, including the household listing update, questionnaires, and fieldwork practice. The training consisted of instruction regarding interviewing techniques and field procedures, a detailed review of items on the questionnaires, and mock interviews and role plays. Instruction and practice on updating a household listing was also included in the main training. At the end of the training 48 participants were organized into 12 data collection teams consisting of a team leader/field editor, and three interviewers. The National Institute of Statistics of Rwanda (NISR) assisted in training for the household listing update.

Fieldwork was launched immediately upon the conclusion of field staff training. Fieldwork supervision was conducted by the MAL & OPD Division through regular visits to teams to review their work and monitor data quality. Additional contact between the central office and the teams was maintained through cell phones. Fieldwork was conducted from February 17, 2013, through April 26, 2013. Questionnaires were regularly delivered to MAL & OPD Division headquarters.

1.2.6 Data Processing

Processing of the 2013 RMIS data began as soon as questionnaires were received from the field. Completed questionnaires were returned from the field to MAL & OPD Division headquarters, where they were entered and edited by data processing personnel who were specially trained for this task. Processing the data concurrently with data collection allowed for regular monitoring of team performance and data quality. Field check tables were regularly generated during data processing to check various data quality parameters. As a result, feedback was given on a regular basis, encouraging teams to continue their high quality work and to correct areas in need of improvement. Feedback was individually tailored to each team. Data entry, which included 100 percent double entry to minimize errors in keying and data editing, was completed on May 10, 2013. Data cleaning and finalization was completed on June 3, 2013.

CHARACTERISTICS OF HOUSEHOLDS AND WOMEN 2

Key Findings

- Eight in ten households have access to improved sources of water.
- About two-thirds of households use an improved toilet facility, while about one-third uses a nonimproved facility or no facility at all.
- In Rwanda, only 15 percent of households have electricity.
- Three in four Rwandan households own agricultural land, and 59 percent possess one or more farm animals.
- Four in five women age 15-49 in Rwanda are literate.

This chapter provides a descriptive summary of basic demographic and socioeconomic characteristics of households and women living within them who were interviewed in the 2013 Rwanda Malaria Indicator Survey (RMIS). A household is defined by the survey as a person or a group of persons, related or unrelated, who live and eat from the same cooking "pot." The Household Questionnaire collects information on age, sex, and relationship to the head of the household for all usual residents and visitors who spent the night preceding the interview in the household (see Appendix E). This method of data collection allows analysis of results for either the *de jure* or the *de facto* populations. The Household Questionnaire also obtains information on housing facilities (e.g., source of water supply, sanitation facilities) and household possessions. Selected items are used to create an index of relative wealth for the household, which is described later in this chapter. This chapter also profiles the women who live in the household and their basic characteristics, including age at the time of the survey, religion, residence, education, literacy, and wealth.

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

2.1 HOUSEHOLD ENVIRONMENT

The physical characteristics of the dwelling in which a household lives are important determinants of the health status of household members, especially children. They can also be used as indicators of the socioeconomic status of households. Results are presented both in terms of households and of the *de jure* population.

2.1.1 Drinking Water

One of the Millennium Development Goals (MDGs) that Rwanda and other countries have adopted is to increase the percentage of the population with sustainable access to an improved water source in both urban and rural areas (United Nations General Assembly, 2000). Improved water sources include piped water; water from a public standpipe, tube well, or borehole; and water from a protected well or spring. Water that must be fetched from an improved source may be contaminated during transport or storage. Thus, a long distance to an improved source of water may limit the quantity of suitable drinking water available to a household.

Table 2.1 Household drinking water

Percent distribution of households and de jure population by source of drinking water, time to obtain drinking water, and treatment of drinking water, according to residence, Rwanda 2013

	Households			Population		
Characteristics	Urban	Rural	Total	Urban	Rural	Total
Source of drinking water						
Improved source	97.3	76.4	79.3	97.8	76.5	79.4
Piped into dwelling/yard/plot	40.6	1.6	7.0	43.1	1.7	7.4
Public tap/standpipe	32.6	25.1	26.2	30.1	24.8	25.5
Tube well or borehole	1.7	2.2	2.2	1.7	2.5	2.4
Protected dug well	0.2	1.9	1.6	0.3	2.0	1.8
Protected spring	21.5	44.6	41.4	21.9	44.5	41.4
Rain water	0.0	1.0	0.9	0.0	1.1	0.9
Bottled water	0.6	0.0	0.1	0.6	0.0	0.1
Nonimproved source	2.7	23.6	20.7	2.2	23.5	20.6
Unprotected dug well	1.0	1.5	1.5	0.5	1.5	1.3
Unprotected spring	1.6	12.3	10.8	1.7	12.5	11.0
Tanker truck/cart with drum	0.0	0.3	0.2	0.0	0.2	0.2
Surface water	0.1	9.5	8.2	0.0	9.3	8.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Time to obtain drinking water (round trip)						
Water on premises	41.7	3.1	8.4	44.0	3.3	8.9
Less than 30 minutes	32.5	41.5	40.3	32.0	40.7	39.5
30 minutes or longer	25.5	55.3	51.2	23.9	55.9	51.5
Don't know/missing	0.3	0.1	0.1	0.2	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	660	4,106	4,766	2,799	17,666	20,465

Table 2.1 shows the percent distribution of households and the de jure population by source of drinking water and time to obtain drinking water, according to residence. The results show that 79 percent of both the households and the population have access to improved sources of water. In urban areas, 97 percent of the households have access to improved sources of water compared with 76 percent of households in rural areas. Piped water to the dwelling or to a public tap is the main source of drinking water for households in urban areas (73 percent), whereas in rural areas the main source of drinking water is a public tap or protected spring (70 percent). Overall, 41 percent of households get water from a protected spring. The most commonly used nonimproved source of water is an unprotected spring (11 percent).

Only 8 percent of households have a source of drinking water on the premises. Availability is substantially higher in urban households (42 percent) than in rural households (3 percent). Fifty-one percent of the households take 30 minutes or longer to travel round trip to obtain water; that includes 55 percent of the rural households and 26 percent of the urban households.

2.1.2 Household Sanitation Facilities

Increasing the percentage of the population with access to improved sanitation in both urban and rural areas is another indicator of the MDGs. Households without proper sanitation facilities are at higher risk of exposure to diarrheic diseases than those with improved sanitation facilities. Improved sanitation facilities are defined as follows: connection to a public sewer, connection to a septic system, pour-flush latrine, simple pit latrine with a slab, ventilated, improved pit latrine (VIL), or composting toilet. According to the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation of 2005 (WHO/UNICEF, 2005), a household is classified as having an improved toilet if the toilet is used only by members of one household (i.e., it is not shared with other households) and if the facility used by the household separates the waste from human contact.

Table 2.2 shows that about one in every two households (48 percent) use an improved, not shared sanitation facility, while 36 percent use a nonimproved facility. The difference between households in urban areas and those in rural areas that use improved, not shared facilities is small (46 percent and 48 percent respectively). The most commonly used improved, not shared toilet facility is the pit latrine with slab (47 percent of all households). Less than one percent of households use a facility that flushes to a piped sewer system and is not shared, and practically all of these households are urban households.

Table 2.2 Household sanitation facilities

Percent distribution of households and de jure population by type of toilet/latrine facilities, according to residence, Rwanda 2013

	Households			Population		
Type of toilet/latrine facility	Urban	Rural	Total	Urban	Rural	Total
Improved, not shared facility						
Flush/pour flush to septic tank	4.4	0.0	0.7	6.1	0.0	0.9
Flush/pour flush to pit latrine	2.1	0.2	0.4	2.4	0.2	0.5
Ventilated improved pit (VIP) latrine	0.7	0.2	0.3	0.7	0.2	0.3
Pit latrine with slab	38.8	47.7	46.5	44.4	51.0	50.1
Composting toilet	0.0	0.3	0.2	0.0	0.2	0.2
Total	46.1	48.4	48.1	53.6	51.8	52.0
Shared facility[1]						
Flush/pour flush to pit latrine	0.6	0.1	0.2	0.9	0.1	0.2
Ventilated improved pit (VIP) latrine	0.4	0.1	0.1	0.6	0.1	0.1
Pit latrine with slab	38.3	11.5	15.2	30.7	9.7	12.6
Composting toilet	0.0	0.1	0.1	0.0	0.1	0.1
Total	39.3	11.8	15.6	32.2	9.9	13.0
Non-improved facility						
Flush/pour flush not to sewer/septic tank/pit latrine	0.1	0.0	0.0	0.2	0.0	0.0
Pit latrine without slab/open pit	14.2	36.8	33.7	14.0	36.1	33.0
Bucket	0.0	0.0	0.0	0.0	0.0	0.0
No facility/bush/field	0.3	2.8	2.5	0.1	2.1	1.8
Missing	0.0	0.1	0.1	0.0	0.1	0.1
Total	14.6	39.7	36.3	14.2	38.3	35.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	660.0	4,106	4,766	2,799	17,666	20,465

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

2.1.3 Housing Characteristics

Table 2.3 presents information on household characteristics such as electricity, flooring material, rooms used for sleeping, and use of various types of fuel for cooking. These characteristics reflect the household's socioeconomic situation and may influence environmental conditions that have a direct bearing on household members' health and welfare.

In Rwanda, only 15 percent of households have electricity. The proportion of households with electricity is much higher in urban areas (62 percent) than in rural areas (8 percent). Earth or sand is the most common flooring material, used by 78 percent of all households. As expected, rural households are substantially more likely to have floors made of earth or sand (85 percent) than urban households (37 percent). Overall, 20 percent of the households have floors made of cement. Use of cement floors is more common among households in urban areas than in rural areas (56 percent compared with 14 percent).

The number of rooms a household uses for sleeping is an indicator not only of a household's socioeconomic level but also of crowding in the household, which can facilitate the spread of disease. Respondents were asked how many rooms were used for sleeping, regardless of whether they were bedrooms. One in four households (25 percent) had only one room for sleeping, 43 percent of the households had two sleeping rooms, and 32 percent had three or more sleeping rooms in the house. Households in rural areas are more likely to have two sleeping rooms than households in the urban areas (45 and 31 percent, respectively), while urban households are slightly more likely to have three or more sleeping rooms than rural households (35 and 32 percent, respectively).

Table 2.3 shows that wood is the fuel most commonly used for cooking, reported by 83 percent of households. Use of wood is more commonly reported in rural areas (91 percent) than in urban areas (38 percent). Twelve percent of all households interviewed use charcoal for cooking: 53 percent in urban areas compared with 5 percent in rural areas. Ninety-eight percent of all households use solid fuel for cooking: 93 percent in urban areas and 99 percent in rural areas.

Table 2.3 Household characteristics

Percent distribution of households by housing characteristics and percentage using solid fuel for cooking, according to residence, Rwanda 2013

Housing characteristics	Residence		Total
	Urban	Rural	
Electricity			
Yes	61.5	7.7	15.2
No	38.5	92.2	84.8
Missing	0.0	0.1	0.1
Total	100.0	100.0	100.0
Flooring material			
Earth, sand	37.4	84.6	78.1
Dung	0.3	1.2	1.1
Wood/planks	0.0	0.0	0.0
Ceramic tiles	5.8	0.1	0.9
Cement	56.3	14.0	19.9
Carpet	0.1	0.0	0.0
Other	0.0	0.1	0.1
Missing	0.0	0.0	0.0
Total	100.0	100.0	100.0
Rooms used for sleeping			
One	34.0	23.5	25.0
Two	31.4	44.6	42.8
Three or more	34.5	31.7	32.1
Missing	0.2	0.2	0.2
Total	100.0	100.0	100.0
Cooking fuel			
Electricity	0.1	0.0	0.0
LPG/natural gas/biogas	1.0	0.0	0.2
Kerosene	0.9	0.0	0.2
Coal/lignite	0.0	0.1	0.1
Charcoal	53.2	5.2	11.8
Wood	37.7	90.5	83.2
Straw/shrubs/grass	2.0	3.3	3.1
Agricultural crop	0.0	0.1	0.1
Animal dung	0.0	0.1	0.1
No food cooked in household	4.9	0.7	1.2
Total	100.0	100.0	100.0
Percentage using solid fuel for cooking[1]	93.0	99.3	98.4
Number	660	4,106	4,766

LPG = Liquid petroleum gas
[1] Includes coal/lignite, charcoal, wood, straw/shrubs/grass, agricultural crops, and animal dung.

2.2 HOUSEHOLD POSSESSIONS

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

Table 2.4 shows by place of residence the percentage of households possessing or owning various household effects, means of transport, agricultural land, and farm animals. Overall, 62 percent of households own a radio. Households in urban areas are more likely than those in rural areas to own a radio (73 percent compared with 61 percent). Eight percent of households own a television: 40 percent in urban areas and 3 percent in rural areas. A mobile telephone is owned by 56 percent of households (82 percent in urban areas and 51 percent in rural areas). Finally, 2 percent of households have a refrigerator; 10 percent in urban areas compared with less than 1 percent in rural areas.

Table 2.4 Household possessions

Percentage of households possessing various household effects, means of transportation, agricultural land, and livestock/farm animals by residence, Rwanda 2013

Possession	Residence		Total
	Urban	Rural	
Household effects			
Radio	73.2	60.6	62.3
Television	39.5	3.0	8.1
Mobile telephone	82.4	51.4	55.7
Non-mobile telephone	0.4	0.3	0.3
Refrigerator	9.8	0.2	1.6
Means of transport			
Bicycle	8.4	15.2	14.2
Motorcycle/scooter	3.3	1.6	1.9
Car/truck	6.8	0.3	1.2
Ownership of agricultural land	41.2	80.3	74.9
Ownership of farm animals[1]	30.7	63.1	58.6
Number	660	4,106	4,766

[1] Cattle, cows, bulls, horses, donkeys, goats, sheep or chickens.

Table 2.4 also shows the proportion of households owning various means of transport. Fourteen percent of households own a bicycle (8 percent in urban areas and 15 percent in rural areas). Only 2 percent of households own a motorcycle or scooter, and 1 percent owns a car or truck. Ownership of a car or truck is more common among urban than rural households (7 percent in the urban areas and less than 1 percent in rural areas).

Agricultural land is owned by 75 percent of all households (80 percent in rural areas and 41 percent in urban areas), and farm animals are owned by 59 percent of households (63 percent in rural areas and 31 percent in urban areas).

2.3 WEALTH INDEX

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

Table 2.5 shows the distribution of the de jure household population into five wealth quintiles based on wealth index, by residence and province. These distributions indicate the degree to which wealth is evenly (or unevenly) distributed by geographic area. The urban population is much more likely to fall in the higher wealth quintiles than the rural population. Sixty-seven percent of the urban population is in the highest quintile compared with only 13 percent of the rural population. At the other extreme, only 7 percent of the urban population falls in the lowest wealth quintile, compared with 22 percent of the rural population. Variations are also observed regionally, with South Province having the highest percentage of population in the lowest wealth quintile (33 percent) compared with Kigali City (4 percent) and East Province (9 percent). West Province has the lowest percentage in the highest quintile (7 percent).

Table 2.5 Wealth quintiles

Percent distribution of the de jure population by wealth quintiles, and the Gini Coefficient, according to residence and region, Rwanda 2013

Residence/region	Wealth quintile					Total	Number of persons	Gini coefficient
	Lowest	Second	Middle	Fourth	Highest			
Residence								
Urban	6.7	8.2	5.1	12.7	67.2	100.0	2,799	0.25
Rural	22.1	21.8	22.4	21.2	12.5	100.0	17,666	0.19
Province								
Kigali	4.1	3.1	5.0	10.8	76.9	100.0	2,105	0.19
South	33.0	21.8	18.5	17.6	9.2	100.0	4,982	0.21
West	26.5	24.9	25.0	16.3	7.3	100.0	4,881	0.20
North	18.9	25.6	22.1	19.1	14.2	100.0	3,277	0.38
East	8.7	16.9	21.5	30.1	22.8	100.0	5,220	0.32
Total	20.0	20.0	20.0	20.0	20.0	100.0	20,465	0.27

2.4 POPULATION BY AGE AND SEX

Age and sex are important demographic variables and are the primary basis of demographic classification. Table 2.6 shows the distribution of the de facto household population in the 2013 RMIS by five-year age groups, according to sex and residence. A total of 20,272 people were enumerated in the survey, and there were fewer males than females; the overall sex ratio[1] is 890 males per 1,000 females. The sex ratio in urban areas is 982 males per 1,000 females, and in rural areas it is 876 males to 1,000 females. Eighty-six percent of the population lives in rural areas.

Table 2.6 Household population by age, sex, and residence

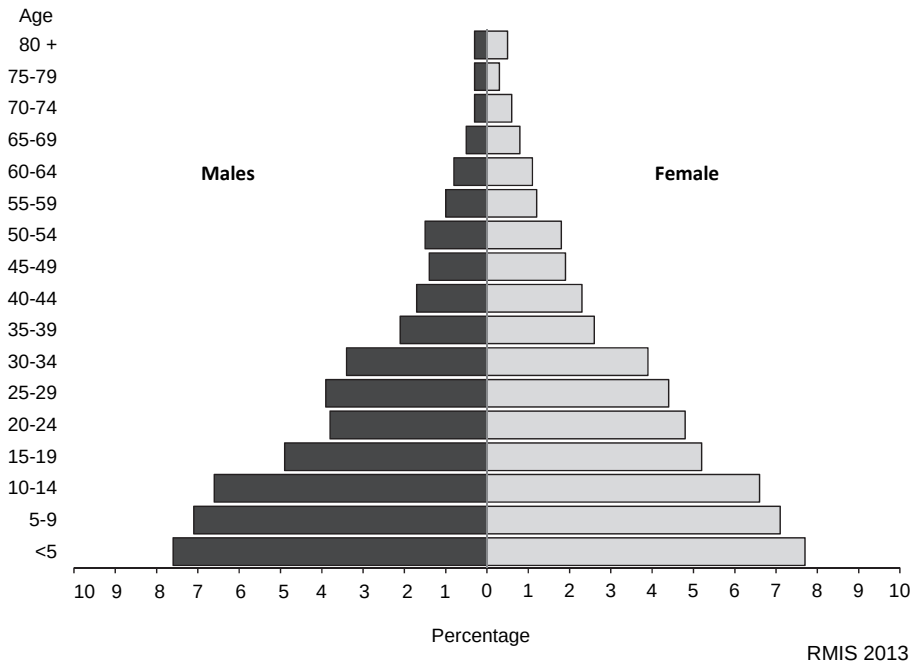
Percent distribution of the de facto household population by five-year age groups, according to sex and residence, Rwanda 2013

Age	Urban			Rural					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
<5	13.9	13.2	13.6	16.6	14.6	15.6	16.2	14.5	15.3
5-9	12.7	10.5	11.6	15.6	14.0	14.7	15.2	13.5	14.3
10-14	11.4	11.2	11.3	14.5	12.8	13.6	14.0	12.6	13.3
15-19	10.9	13.6	12.2	10.2	9.4	9.8	10.3	9.9	10.1
20-24	10.6	13.1	11.8	7.7	8.4	8.1	8.2	9.0	8.6
25-29	12.5	9.8	11.2	7.6	8.1	7.8	8.3	8.3	8.3
30-34	8.5	8.3	8.4	7.0	7.2	7.1	7.2	7.3	7.3
35-39	5.3	4.9	5.1	4.2	4.9	4.6	4.4	4.9	4.7
40-44	3.8	3.7	3.8	3.5	4.4	4.0	3.5	4.3	4.0
45-49	3.4	2.6	3.0	3.0	3.7	3.4	3.1	3.6	3.3
50-54	2.5	2.5	2.5	3.2	3.6	3.4	3.1	3.4	3.3
55-59	1.7	1.3	1.5	2.2	2.5	2.3	2.1	2.3	2.2
60-64	1.0	1.8	1.4	1.8	2.1	2.0	1.7	2.1	1.9
65-69	0.5	1.0	0.7	1.1	1.6	1.4	1.0	1.5	1.3
70-74	0.7	0.8	0.8	0.6	1.2	0.9	0.6	1.1	0.9
75-79	0.1	0.6	0.4	0.6	0.7	0.6	0.5	0.6	0.6
80 +	0.4	1.0	0.7	0.6	0.9	0.8	0.6	0.9	0.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	1,380	1,406	2,786	8,166	9,320	17,486	9,546	10,726	20,272

The population age pyramid shows a substantially larger proportion of persons in younger age groups than in older age groups for each sex (Figure 2.1). The age pyramid is wide at the base, narrowing gradually as it reaches the upper age limits, an indication of relatively high fertility and high mortality.

[1] Sex ratio is the demographic concept that measures the proportion of males to females in a given population. It is usually measured as the number of males per 100 females.

Figure 2.1
Population pyramid



2.5 HOUSEHOLD COMPOSITION

Table 2.7 presents information on the household composition, including the sex of the head of the household and the household size. 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 large households. Moreover, where the size of the household is large, crowding can lead to health problems.

Table 2.7 shows that households in Rwanda are predominantly headed by men (71 percent), a common finding in most African countries. The proportion of households headed by women is higher in rural areas than in urban areas (30 percent and 24 percent, respectively).

Overall, the mean size of a household in Rwanda is four persons, with most households having between two and six members.

Table 2.7 Household composition

Percent distribution of households by sex of head of household and by household size; mean size of household, according to residence, Rwanda 2013

Characteristics	Residence		Total
	Urban	Rural	
Household headship			
Male	75.6	70.0	70.8
Female	24.4	30.0	29.2
Total	100.0	100.0	100.0
Number of usual members			
0	0.0	0.0	0.0
1	11.2	6.7	7.3
2	14.0	11.7	12.0
3	18.7	19.0	19.0
4	13.7	19.3	18.6
5	15.5	17.4	17.2
6	11.7	12.0	12.0
7	6.1	7.6	7.4
8	3.6	3.5	3.5
9+	5.3	2.6	3.0
Total	100.0	100.0	100.0
Mean size of households	4.2	4.3	4.3
Number of households	660	4,106	4,766

2.6 CHARACTERISTICS OF FEMALE RESPONDENTS

2.6.1 General Characteristics

Table 2.8 presents the distribution of women age 15-49 by selected background characteristics. The proportion of women by age group declines gradually as age increases; from 21 percent for the youngest age group (15-19), to 19 percent for age 20-24, to only 9 percent for age 40-44, and to 8 percent for age 45-49. This reflects the comparatively young age structure of the population. The proportion of women age 15-49 living in rural areas is much higher (78 percent) than for women living in urban areas (22 percent). By region, the smallest percentages of women live in Kigali City (12 percent) and in North province (16 percent) compared with 26 percent in East province and 23 percent each in South and West provinces. Nearly all Rwandan women belong to various denominations of Christianity (98 percent). Two percent are Muslim, and less than 1 percent has no religion. Educational achievement is concentrated at the primary level. Fourteen percent of women age 15-49 have never been to school. Sixty-seven percent have primary education, and 17 percent have secondary education. Only 2 percent of women have an education higher than secondary school. Women are evenly distributed by wealth quintile. Roughly one-fifth of respondents fall into each wealth quintile (19 to 20 percent), with slightly more women in the highest quintile (23 percent).

Table 2.8 Background characteristics of respondents

Percent distribution of women age 15-49 by selected background characteristics, Rwanda 2013

Background characteristic	Weighted percent	Number of women: Weighted number	Number of women: Unweighted number
Age			
15-19	20.9	1,072	1,094
20-24	19.0	973	971
25-29	17.5	897	910
30-34	15.4	791	776
35-39	10.6	542	545
40-44	9.1	467	452
45-49	7.6	391	387
Religion			
Catholic	42.5	2,183	2,162
Protestant	42.1	2,164	2,162
Adventist	12.9	661	653
Muslim	1.7	88	118
No religion	0.7	38	40
Residence			
Urban	22.2	1,141	1,427
Rural	77.8	3,994	3,708
Region			
Kigali	12.3	629	900
South	23.3	1,195	1,214
West	22.9	1,175	1,131
North	15.8	813	792
East	25.8	1,323	1,098
Education			
No education	13.8	708	700
Primary	67.0	3,443	3,374
Secondary	16.9	866	914
More than secondary	2.3	118	147
Wealth quintile			
Lowest	18.7	961	959
Second	18.9	971	928
Middle	19.6	1,007	957
Fourth	20.0	1,029	967
Highest	22.7	1,168	1,324
Total 15-49	100.0	5,135	5,135

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

2.6.2 Education Attainment of Women

Education is a key determinant of women's socioeconomic status. Studies have consistently shown that educational attainment has a strong effect on health behaviors and attitudes. Generally, 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 management of health care for her children.

Table 2.9 shows the percent distribution of women age 15-49 by highest level of schooling attended or completed, and median years completed, according to background characteristics. The results show that 52 percent of women age 15-49 have attended primary school, and 17 percent have completed it. Additionally, 11 percent of women have some secondary education, and 4 percent have completed it. As mentioned, only 2 percent of women have more than secondary education. Younger women have higher levels of education than older women. For example, only 4 percent of women age 15-24 have no education compared with 36 percent of women age 45-49. Similarly, 22 percent of women age 15-24 have some secondary education compared with just 1 percent of women age 45-49. West province has the highest proportion of women with no education (18 percent) compared with 13 percent in South province and 6 percent in Kigali City. Table 2.9 also shows the correlation between education and economic status. The poorer a woman is, the less likely she is to have an education; one in four women (25 percent) in the lowest wealth quintile has no education compared with 5 percent of women in the highest wealth quintile. Overall, the median number of years of education among women age 15-49 is 4.6 years. The median number of years of education varies inconsistently with age. For urban women, the median is higher (5.6 years) than for rural women (4.4 years). The median number of years of education also varies across province, with Kigali City having the highest number of completed years (5.7) compared with four or five years in the other provinces. The median number of years of education increases noticeably with wealth.

Table 2.9 Educational attainment: Women

Percent distribution of women age 15-49 by highest level of schooling attended or completed, and median years completed, according to background characteristics, Rwanda 2013

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	4.2	50.1	18.3	21.7	4.5	1.2	100.0	4.9	2,046
15-19	1.5	51.2	20.2	25.6	1.3	0.1	100.0	4.9	1,072
20-24	7.2	48.9	16.2	17.4	7.9	2.4	100.0	4.8	973
25-29	12.5	54.8	16.6	3.9	7.8	4.4	100.0	4.2	897
30-34	16.9	53.9	18.8	4.0	3.0	3.3	100.0	4.3	791
35-39	20.4	54.4	16.0	3.7	2.4	3.0	100.0	4.7	542
40-44	26.7	50.2	15.6	2.2	3.7	1.6	100.0	5.1	467
45-49	35.9	47.5	12.5	1.4	1.5	1.2	100.0	4.5	391
Residence									
Urban	6.0	35.4	19.9	16.5	11.1	11.1	100.0	5.6	794
Rural	15.2	54.8	16.7	9.6	3.1	0.7	100.0	4.4	4,341
Region									
Kigali	5.8	34.0	19.8	15.7	12.2	12.5	100.0	5.7	629
South	12.9	57.6	15.7	9.3	3.5	1.0	100.0	4.3	1,195
West	17.5	54.1	17.8	7.3	2.4	0.9	100.0	4.2	1,175
North	13.7	50.3	19.0	12.9	3.4	0.7	100.0	4.8	813
East	15.1	53.8	15.4	11.1	3.6	0.9	100.0	4.4	1,323
Wealth quintile									
Lowest	24.7	60.1	10.8	3.9	0.6	0.0	100.0	3.4	961
Second	18.8	59.7	16.3	4.4	0.8	0.0	100.0	4.0	971
Middle	13.1	58.3	17.7	9.4	1.3	0.1	100.0	4.3	1,007
Fourth	9.8	52.6	19.4	13.5	4.4	0.3	100.0	4.9	1,029
Highest	4.7	32.0	20.8	20.0	12.8	9.8	100.0	5.8	1,168
Total	13.8	51.8	17.2	10.6	4.3	2.3	100.0	4.6	5,135

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

2.6.3 Literacy of Women

The level of literacy among the population is an important factor in design and delivery of health messages and interventions. Female respondents who had only primary education were shown a card with a short sentence and asked to read the complete sentence or part of it to assess their literacy. The percentage of women considered literate included those who could read the entire sentence or part of the sentence and women who had secondary or higher education. Table 2.10 shows the distribution of female respondents by level of schooling attended and literacy, and the percentage literate, according to background characteristics.

The results show that, overall, 80 percent of women age 15-49 in Rwanda are literate. Younger women are more literate that older women; 88 percent of women age 15-24 are literate compared with 60 percent of women age 45-49. Urban-rural differences also exist: 90 percent of urban women are literate compared with 79 percent of rural women. The proportion of women who are literate is lowest in West province (75 percent) and in the lowest wealth quintile (65 percent).

Table 2.10 Literacy: Women

Percent distribution of women age 15-49 by level of schooling attended and level of literacy, and percentage literate, according to background characteristics, Rwanda 2013

		No schooling or primary school								
Background characteristic	Secondary school or higher	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 of women
Age										
15-24	32.9	47.3	8.2	11.0	0.1	0.1	0.4	100.0	88.4	2,046
15-19	35.7	49.6	6.7	7.7	0.1	0.1	0.1	100.0	92.0	1,072
20-24	29.9	44.7	9.9	14.7	0.0	0.1	0.7	100.0	84.4	973
25-29	17.5	52.4	10.3	19.5	0.0	0.0	0.2	100.0	80.3	897
30-34	11.6	55.6	9.5	23.3	0.0	0.0	0.0	100.0	76.7	791
35-39	12.3	53.6	10.4	23.5	0.0	0.0	0.1	100.0	76.3	542
40-44	13.9	48.3	9.1	28.7	0.0	0.0	0.0	100.0	71.3	467
45-49	7.1	40.0	13.0	40.0	0.0	0.0	0.0	100.0	60.0	391
Residence										
Urban	42.8	40.6	6.5	9.8	0.0	0.0	0.4	100.0	89.8	794
Rural	17.1	51.3	10.0	21.3	0.0	0.1	0.2	100.0	78.5	4,341
Region										
Kigali	43.4	42.4	6.2	7.5	0.0	0.0	0.5	100.0	92.0	629
South	17.8	51.2	10.0	20.9	0.1	0.0	0.0	100.0	79.0	1,195
West	14.4	50.9	9.9	24.8	0.0	0.1	0.0	100.0	75.1	1,175
North	20.0	53.4	7.3	18.6	0.0	0.0	0.7	100.0	80.7	813
East	20.1	48.4	11.5	19.9	0.0	0.1	0.1	100.0	79.9	1,323
Wealth quintile										
Lowest	6.4	45.2	12.9	35.3	0.0	0.0	0.2	100.0	64.5	961
Second	8.5	54.2	12.2	25.1	0.0	0.0	0.1	100.0	74.8	971
Middle	13.8	56.6	10.4	18.7	0.1	0.1	0.3	100.0	80.7	1,007
Fourth	23.8	54.3	7.7	14.1	0.0	0.1	0.0	100.0	85.8	1,029
Highest	47.5	39.6	5.2	7.5	0.0	0.0	0.3	100.0	92.3	1,168
Total	21.1	49.7	9.5	19.5	0.0	0.1	0.2	100.0	80.2	5,135

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

MALARIA PREVENTION 3

Key Findings

- More than four of five (83 percent) Rwandan households own at least one insecticide-treated net (ITN), and 43 percent of households have at least one ITN for every two people that stayed in the house the night before the survey.
- Two in three people (66 percent) have access to an ITN, so 66 percent of Rwandans could sleep under a mosquito net if every net in a household were used by two people.
- Sixty-one percent of the Rwandan population slept under an ITN the night before the survey, while three in four (74 percent) children and pregnant women (74 percent) slept under an ITN the previous night.

This chapter presents the indicators that relate to primary malaria control interventions. Malaria control efforts in Rwanda have focused on the ownership and use of insecticide-treated nets (ITNs), in particular long-lasting insecticide-treated nets (LLINs), and providing prompt, effective treatment (within 24 hours of onset of symptoms) with artemisinin combination therapy (ACT). Additional information, such as preferred color of the mosquito net and preferred time to wash the net, has been critical for improving net ownership and use.

3.1 PREVENTION

Nets and window screens have long been considered useful protection against mosquitoes and other insects (Lindsay and Gibson, 1988). Nets reduce the human-mosquito contact by acting as a physical barrier and thus reducing the number of bites (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).

Nets are impregnated with synthetic pyrethroids, the only insecticide currently used for this purpose. This class of insecticides was developed to imitate the effects of the natural insecticide, pyrethrum (made from dried chrysanthemum flowers), but the pyrethroids are more stable in sunlight. Currently, ITNs are regarded as a promising malaria control tool and, when used by all or most members of the community, can reduce malaria transmission. ITNs have been shown to reduce malaria transmission by as much as 90 percent under trial conditions (Lengeler, 2004). Long-lasting insecticidal nets (LLINs) are a special type of ITN. An LLIN is a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around the fibers. To qualify as an LLIN, the net must retain its effective biological activity without re-treatment for repeated washes and for three years of use under field conditions (WHO/Global Malaria Program, 2007). The current generation of LLINs lasts three to five years, after which point the net should be replaced. Vector control using ITNs is a key intervention in malaria control.

Since 2005 prevention was adopted as the main strategy for controlling malaria, through use of long lasting insecticidal mosquito nets (LLINs) as well as appropriate, timely treatment of malaria cases with antimalarial drugs and early diagnosis. The government of Rwanda launched aggressive nationwide campaigns in 2006 and 2010 to scale up malaria control. Malaria has since been one focus of the country's comprehensive poverty reduction strategy, which includes health policy reforms and an overall investment in health. Rwanda has benefited from massive distribution of LLINs and a scale-up of artemisinin combination therapy (ACT). In 2005 and 2010, Mal & OPD Division distributed, respectively, 1.4 million and 5.9 million LLINs, to families with children under age 5 during an integrated measles vaccination campaign and to the general population through a household distribution campaign.

3.1.1 Ownership of Mosquito Nets

The ownership and use of treated mosquito nets is the primary prevention strategy for reducing malaria transmission in Rwanda. Since 2005, Rwanda has been moving to the use of LLINs, which are heavy duty and pre-treated. In the past five years, more than 11.3 million ITNs have been distributed countrywide in Rwanda. Since 2006, the ITN policy has included (1) free distribution of LLINs to all children under age 5 every three years during vaccination campaigns or maternal and child health weeks, (2) free distribution of ITNs to pregnant women at their first visit to an ANC clinic, and (3) free distribution of ITNs to children during their final visit under the Expanded Program of Immunization for measles immunization. In addition, there has been universal coverage of LLINs since 2010, with free distribution of one LLIN per two persons through household campaigns. To increase coverage, timely mass ITN distribution campaigns are conducted. This chapter presents the findings on household ownership of mosquito nets and use of mosquito nets among children under age 5 and pregnant women.

All household respondents in the 2013 RMIS were asked whether their household owned any mosquito nets and, if so, how many and what type. Interviewers were instructed to look at the nets whenever possible. Table 3.1 shows that 84 percent of all households owned at least one net, 83 percent owned at least one ITN, and 83 percent owned at least one LLIN. On average, Rwandan households own 1.6 ITNs or LLINs per household, compared with an average of 1.7 of any type of net per household. It is evident that practically all of the mosquito nets owned by households in Rwanda are LLINs.

Table 3.1 Household possession of mosquito nets

Percentage of households with at least one mosquito net (treated or untreated), insecticide-treated net (ITN), and long-lasting insecticidal net (LLIN); average number of nets, ITNs, and LLINs per household; and percentage of households with at least one net, ITN, and LLIN per two persons who stayed in the household last night, by background characteristics, Rwanda 2013

Background Characteristic	Percentage of households with at least one mosquito net			Average number of nets per household			Number of house-holds	Percentage of households with at least one net for every two persons who stayed in the household last night[1]			Number of households with at least one person who stayed in the household last night
	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)		Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	
Residence											
Urban	84.6	83.1	83.1	1.9	1.8	1.8	660	51.5	50.2	50.1	658
Rural	83.3	82.6	82.5	1.6	1.6	1.6	4,106	42.3	41.5	41.4	4,103
Region											
Kigali	85.7	83.8	83.8	1.9	1.8	1.8	514	52.7	51.1	51.0	513
South	86.4	85.9	85.9	1.7	1.7	1.7	1,170	45.2	44.4	44.4	1,169
West	80.6	80.1	80.1	1.5	1.5	1.5	1,078	34.4	33.9	33.9	1,077
North	85.3	85.3	85.3	1.7	1.7	1.7	756	47.4	47.4	47.4	755
East	81.2	79.8	79.7	1.6	1.6	1.6	1,248	44.0	42.4	42.3	1,247
Wealth quintile											
Lowest	77.4	76.5	76.5	1.3	1.3	1.3	1,037	35.9	35.1	35.1	1,037
Second	81.0	80.4	80.3	1.5	1.4	1.4	999	39.2	38.6	38.4	997
Middle	85.4	85.0	85.0	1.7	1.7	1.7	913	43.9	43.3	43.3	913
Fourth	88.1	87.9	87.9	1.9	1.9	1.9	891	46.6	46.2	46.2	890
Highest	86.6	84.6	84.6	2.0	1.9	1.9	927	53.7	51.6	51.6	923
Total	83.5	82.6	82.6	1.7	1.6	1.6	4,766	43.6	42.7	42.6	4,761

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

As seen in Table 3.1, ITN ownership is practically the same between urban households and rural households (83 percent each). By province, household ownership of ITNs is slightly lower in the West and East provinces than in other regions. For example, 80 percent of households in the West and East provinces own an ITN compared with 86 percent in the South province and 85 percent in the North province. Households belonging to the poorest household wealth quintile are less likely to own mosquito nets than households in other wealth quintiles. Seventy-seven percent of the households in the lowest wealth quintile own an ITN; in contrast, 85 percent in the highest wealth quintile own at least one ITN.

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

Overall, 43 percent of households in Rwanda have reached universal ITN coverage; that is, slightly more than two in five households have at least one ITN for every two persons who slept in the household the night before the survey. Universal ITN coverage is higher among urban households compared with rural households (50 percent and 42 percent, respectively). Thirty-four percent of households in the West province have at least one ITN for every two people, compared with 51 percent of households in Kigali City. By wealth quintile, the highest proportion of households with universal ITN coverage is found within the highest wealth quintile (52 percent).

Table 3.2 Household possession of mosquito nets

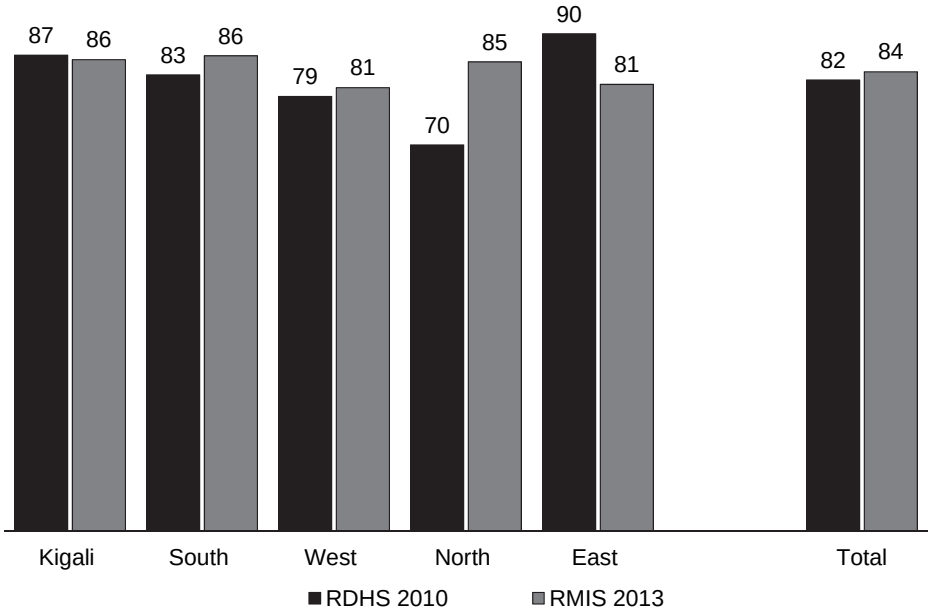
Percentage of households with at least 2, 3, and 4+ mosquito nets (treated or untreated), insecticide-treated net (ITN), and long-lasting insecticidal net (LLIN); average number of nets, ITNs, and LLINs per household, by background characteristics, Rwanda 2013

	Percentage of households with at least two mosquito nets			Percentage of households with at least three mosquito nets			Percentage of households with at least four mosquito nets			
Background Characteristic	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	Any mosquito net	Insecticide-treated mosquito net (ITN)[2]	Long-lasting insecticidal net (LLIN)	Number of households
Residence										
Urban	55.6	55.5	55.5	27.9	27.8	27.8	10.7	10.6	10.6	660
Rural	53.8	53.3	53.3	20.0	19.8	19.8	4.6	4.6	4.6	4,106
Region										
Kigali	53.1	52.8	52.8	28.0	27.7	27.7	11.5	11.4	11.4	514
South	57.0	56.8	56.8	20.7	20.7	20.7	5.7	5.7	5.7	1,170
West	50.8	50.2	50.2	17.2	17.0	17.0	3.7	3.7	3.7	1,078
North	56.0	56.0	56.0	24.1	24.1	24.1	4.8	4.8	4.8	756
East	53.3	52.4	52.3	20.1	19.7	19.7	4.8	4.7	4.7	1,248
Wealth quintile										
Lowest	41.0	40.4	40.4	11.1	10.7	10.7	2.0	2.0	2.0	1,037
Second	48.3	47.8	47.7	14.1	14.1	14.1	2.3	2.3	2.3	999
Middle	58.7	58.3	58.3	22.1	22.0	22.0	4.9	4.9	4.9	913
Fourth	65.1	64.9	64.9	27.1	27.1	27.1	6.8	6.8	6.8	891
Highest	59.7	59.1	59.1	32.9	32.5	32.5	12.2	12.1	12.1	927
Total	54.1	53.6	53.6	21.1	20.9	20.9	5.5	5.5	5.5	4,766

Table 3.2 shows the percentage of households that own multiple mosquito nets. More than half (54 percent) own at least two ITNs, one in five (21 percent) own three or more ITNs, and only 6 percent own four or more ITNs. The percentage of households owning at least three or at least four ITNs is higher in the urban areas than in the rural areas; and is higher in Kigali City than in the other provinces. The proportion of households owning multiple ITNs increases when the level of household wealth increases. These data are consistent and can be explained by the number of rooms found in the households; urban households are slightly more likely to have three or more sleeping rooms than rural households (35 and 32 percent, respectively). See Housing Characteristics.

Figure 3.1 compares ownership of at least one ITN among households, as measured in Rwanda DHS 2010 and Rwanda MIS 2013 surveys, by national and provincial levels. At the national level, ITN ownership has slightly increased within the past three years from 82 percent measured in 2010 to 84 percent measured in the recent RMIS survey. A decrease in ITN ownership of 9 percentage points occurred within the East province. On the other hand, the greatest increase occurred in the North province: 15 percentage points within the past two years (from 70 percent in RDHS 2010 to 85 percent in RMIS 2013).

Figure 3.1
Percentage of households that own at least one ITN, RDHS 2010 and RMIS 2013



3.1.2 Indoor Residual Spraying

Indoor residual spraying (IRS) is another vector control intervention used to control malaria transmission. IRS is the spraying of the interior walls and ceilings of a structure with long-lasting insecticide. It reduces the transmission of malaria by killing adult female mosquitoes when they rest on the walls of the structure after feeding. IRS in Rwanda is not a nationwide program; it focuses exclusively on one district of the South province and two districts of the Eastern province. To obtain information on the prevalence of IRS, all households interviewed in the 2013 RMIS were asked whether the interior walls of their dwelling had been sprayed to protect against mosquitoes during the 12 month period before the survey and, if so, who had sprayed the dwelling. The percentage of households with IRS in the past 12 months is presented in Table 3.3.

Table 3.3 Indoor residual spraying against mosquitoes

Percentage of households in which someone has come into the dwelling to spray the interior walls against mosquitoes (IRS) in the past 12 months, the percentage of households with at least one ITN and/or IRS in the past 12 months, and the percentage of households with at least one ITN for every two persons and/or IRS in the past 12 months, by background characteristics, Rwanda 2013

Background Characteristic	Percentage of households with IRS[1] in the past 12 months	Percentage of households with at least one ITN[2] and/or IRS in the past 12 months	Percentage of households with at least one ITN[2] for every two persons and/or IRS in the past 12 months	Number of households
Residence				
Urban	8.2	83.8	53.2	660
Rural	10.7	83.9	47.2	4,106
Region				
Kigali	5.3	84.3	53.3	514
South	15.9	87.1	51.4	1,170
West	0.0	80.1	33.8	1,078
North	0.0	85.3	47.4	756
East	22.3	83.3	55.3	1,248
Wealth quintile				
Lowest	7.9	77.6	39.6	1,037
Second	8.7	82.5	43.7	999
Middle	10.5	86.4	48.4	913
Fourth	15.3	89.1	53.9	891
Highest	9.7	85.3	56.0	927
Total	10.3	83.9	48.0	4,766

[1] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private, or nongovernmental organization.
[2] An insecticide-treated net (ITN) is a factory-treated net that does not require any further treatment (LLIN) or a net that has been soaked with insecticide within the past 12 months.

Table 3.3 shows that only 10 percent of all households in Rwanda were sprayed in the past 12 months. This low proportion is due to the fact that IRS concerns only three districts countrywide. By residence, rural households are more likely than urban households to have had IRS (11 percent compared with 8 percent). Among the regions, a higher proportion of households in the East province (22 percent) have been sprayed compared with households in the South province (16 percent) and Kigali City (5 percent). IRS is not implemented in the West and North provinces. While there is no apparent pattern by wealth quintile, households in the fourth quintile are the most likely to have been sprayed.

Most of the spraying in the past 12 months was done by a government worker (88 percent), followed by a private company (14 percent); 10 percent of the households receiving IRS were not be able to identify the source (data not shown).

Table 3.3 also shows a combined indicator of malaria protection at the household level, that is, which households are covered by either vector control intervention: IRS or use of an ITN. Overall, 84 percent of households are protected either by owning an ITN or having received IRS in the past 12 months; and only about half of households (48 percent) have an ITN for every two household members or have received IRS in the past 12 months. The urban-rural difference in the percentage of households with at least one ITN for every two household members or IRS in the past 12 months is evident (53 percent in urban versus 47 percent in rural) and may be explained by the number of rooms found in the households, which is higher in urban areas than rural areas. Households in the West province are less likely to have at least one ITN for every two household members and/or IRS in the past 12 months (34 percent) compared with other provinces. The proportion of households covered by this vector control intervention increases with wealth quintile, from 40 percent of the households in the lowest quintile to 56 percent of the households in the highest quintile.

3.2 ACCESS TO MOSQUITO NETS

The 2013 RMIS presents data on access to an ITN, measured by the proportion of the population that could sleep under an ITN if each ITN in the household were used by up to two people. Coupled with mosquito net usage, ITN access can provide useful information on the magnitude of the behavioral gap in ITN ownership and use, or, in other words, the proportion of the population with access to an ITN but not using it. If the difference between these indicators is substantial, the program may need to focus on behavior change and how to identify the main drivers/barriers to ITN use in order to design an appropriate intervention. This analysis helps ITN programs determine whether they need to achieve higher ITN coverage, promote ITN use, or both. Table 3.4 shows percent distribution of the *de facto* household population by number of ITNs the household owns, according to number of persons who stayed in the household the night before the survey.

Table 3.4 Access to an insecticide-treated net (ITN)

Percent distribution of the *de facto* household population by number of ITNs the household owns, according to number of persons who stayed in the household the night before the survey, Rwanda 2013

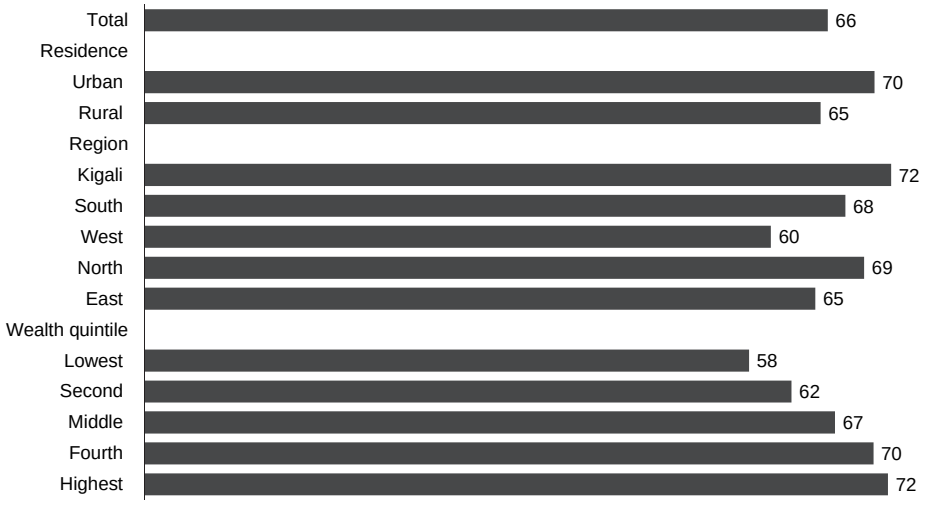
	Number of persons who stayed in the household the night before the survey								
Number of ITNs	1	2	3	4	5	6	7	8+	Total
0	45.3	28.6	16.9	14.8	11.2	10.5	8.0	8.7	13.4
1	43.9	49.7	36.4	26.0	21.1	20.0	16.4	13.5	24.3
2	8.2	18.3	35.7	40.8	41.2	36.2	33.1	29.9	35.1
3	1.9	2.8	9.7	14.5	20.5	23.9	32.7	26.6	19.5
4	0.6	0.6	1.0	3.3	5.7	8.9	8.7	12.8	6.1
5	0.0	0.0	0.3	0.4	0.2	0.0	0.3	3.6	0.7
6	0.0	0.0	0.0	0.0	0.1	0.0	0.3	3.2	0.5
7+	0.0	0.0	0.0	0.2	0.0	0.4	0.6	1.7	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number	370	1,189	2,771	3,395	4,032	3,329	2,488	2,698	20,272
Percent with access to an ITN[1]	54.7	71.4	70.9	72.2	67.9	64.1	61.5	55.2	65.9

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

As shown in Table 3.4, 13 percent of Rwandans slept in homes with no ITN the night before the survey and, therefore, were not able to use an ITN. Twenty-four percent stayed in households that own only one ITN, while 35 percent slept in households that own two ITNs. Only 20 percent of Rwandans slept in households that own three ITNs and 6 percent slept in households that own four ITNs. Very few individuals slept in homes with more than four ITNs.

Overall, 66 percent of the population could sleep under an ITN if each ITN in the household were to be used by up to two people. As expected, the proportion of persons with access to an ITN tends to decrease as household size increases. Access to an ITN is highest for households with two, three, or four persons staying in the household the night before the survey (71 percent – 72 percent). ITN access gradually decreases thereafter.

Figure 3.2
Percentage of the de facto population with access to an ITN in the household



RMIS 2013

Figure 3.2 shows the percentage of the population with access to an ITN in the household, by residence and wealth quintile. People living in urban areas are more likely to have access to an ITN than their rural counterparts (70 percent and 65 percent, respectively). Residents of the West province are less likely to have access to an ITN (60 percent) compared with those in Kigali City and other provinces (from 65 percent to 72 percent). Access to an ITN increases as the level of household wealth increases: from 58 percent for households in the lowest quintile to 72 percent for households in the highest quintile.

3.2.1 Use of Mosquito Nets by Household Population

Universal coverage of mosquito nets is necessary to accomplish significant reductions in malaria transmission. Moreover, the most vulnerable groups of population, such as children under age 5 and pregnant women should be prioritized. The 2013 RMIS asked about use of mosquito nets by household members during the night before the survey. These data are shown in Table 3.5.

The table shows that 62 percent of the household population slept under any net the night before the survey, and 61 percent slept under an ITN. Because practically all ITNs in Rwanda are LLINs, use of ITNs and LLINs is about the same. Sixty-five percent of Rwandans were covered by a vector control intervention the night before the survey; that is they either slept under an ITN or slept in a dwelling sprayed with IRS in the past 12 months.

ITN use among the general population is higher for children under age 5 (74 percent) and adults 35-39 (73 percent) compared with other age groups. Women and girls (63 percent) are more likely than men and boys (59 percent) to have slept under an ITN the previous night. Urban residents (65 percent) are more likely than rural residents (60 percent) to have slept under an ITN. By province, ITN use is the lowest among people living in the West province (52 percent). ITN use steadily increases as wealth also increases from the lowest quintile to the fourth quintile. For example, 55 percent of those in the lowest wealth quintile slept under an ITN the previous night compared with 66 percent of those in the fourth wealth quintile. ITN use in the fourth quintile and in the highest quintile is practically the same (66 percent and 65 percent).

Table 3.5 Use of mosquito nets by persons in the household

Percentage of the de facto household population who slept the night before the survey under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among the de facto household population in households with at least one ITN, the percentage who slept under an ITN the night before the survey, by background characteristics, Rwanda 2013

	Household population					Household population in households with at least one ITN[1]	
	Percentage who slept under any net last night	Percentage who slept under an ITN[1] last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN[1] last night or in a dwelling sprayed with IRS[2] in the past 12 months	Number	Percentage who slept under an ITN[1] last night	Number[3]
Age (in years)							
<5	75.0	74.1	74.1	77.2	3,107	79.4	2,898
5-14	50.5	50.1	50.1	54.7	5,578	57.5	4,855
15-34	60.3	59.5	59.5	63.0	6,941	70.0	5,895
35-39	73.8	73.1	73.0	75.9	2,430	82.4	2,156
50+	61.7	61.1	61.1	64.5	2,216	77.3	1,751
DK/Missing	0.0	0.0	0.0	62.8	2	0.0	2
Sex							
Male	59.9	59.2	59.2	63.2	9,546	68.4	8,253
Female	63.1	62.5	62.5	65.8	10,726	72.1	9,304
Residence							
Urban	65.9	64.9	64.9	67.0	2,786	73.6	2,458
Rural	60.9	60.3	60.3	64.2	17,486	69.8	15,098
Region							
Kigali	69.6	68.2	68.2	69.6	2,090	76.5	1,864
South	66.7	66.2	66.2	69.9	4,960	74.6	4,403
West	52.5	52.1	52.1	52.1	4,810	62.0	4,043
North	64.7	64.5	64.5	64.5	3,209	73.0	2,837
East	60.0	58.9	58.9	69.1	5,202	69.5	4,409
Wealth quintile							
Lowest	55.3	54.5	54.5	57.0	4,041	66.9	3,294
Second	57.3	57.0	57.0	60.9	4,020	68.1	3,367
Middle	62.8	62.5	62.5	65.4	4,070	71.5	3,561
Fourth	66.2	66.0	66.0	71.0	4,082	72.5	3,715
Highest	66.2	64.6	64.5	68.5	4,058	72.4	3,620
Total	61.6	60.9	60.9	64.6	20,272	70.4	17,556

[1] An insecticide-treated net (ITN) is a factory-treated net that does not require any further treatment (LLIN) or a net that has been soaked with insecticide within the past 12 months.
[2] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private or non-governmental organization.
[3] Including 2 cases for which age is “don’t know” or missing.

As expected, ITN use is higher among households that own an ITN. In households that own at least one ITN, 70 percent of the population slept under an ITN the night before the survey. In households with at least one ITN, women and girls are more likely than men and boys to sleep under an ITN (72 percent and 68 percent, respectively). There is also an urban-rural difference in the percentage of population who utilized an ITN the night before the survey (74 percent and 70 percent, respectively). Among households that own an ITN, West province residents are less likely than those living in other provinces to sleep under an ITN (62 percent compared with 70 percent to 77 percent in other provinces). People in the middle or higher wealth quintiles who slept in a household that owned an ITN are slightly more likely to have used an ITN the previous night than people in the lowest and in the second wealth quintiles.

Table 3.6 presents the percentage of existing ITNs in households that were used by at least one household member the night prior to the interview. Overall, only 72 percent of existing ITNs in households were used the night prior to the interview. The proportion of ITNs used by at least one household member the night prior to the interview is slightly higher in urban areas than in rural area (75 percent and 72 percent respectively). The use of existing ITNs is lowest in the West province (67 percent) and is highest in Kigali City (78 percent). The percentage of existing ITNs in households that were used increases consistently as level of household wealth increases; from 69 percent in the lowest quintile to 76 percent in the highest wealth quintile.

Table 3.6 Use of existing ITNs

Percentage of insecticide-treated nets (ITNs) that were used by anyone the night before the survey, by background characteristics, Rwanda 2013

	Percentage of existing ITNs[1] used last night	Number of ITNs[1]
Residence		
Urban	74.5	1,201
Rural	71.7	6,587
Region		
Kigali	78.1	932
South	74.0	1,974
West	66.5	1,637
North	74.7	1,288
East	70.5	1,957
Wealth quintile		
Lowest	69.3	1,342
Second	70.3	1,446
Middle	70.5	1,553
Fourth	73.4	1,669
Highest	76.1	1,778
Total	72.2	7,788

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

3.2.2 Use of Mosquito Nets by Children under Five

Children under age 5 are considered the most vulnerable to severe complications of malaria infection due to their lack of acquired immunity. Those living in areas of high malaria transmission naturally acquire immunity to the disease over time (Doolan et al., 2009). Acquired immunity does not prevent *P. falciparum* infection but rather protects against severe forms of malaria and fatality. During the first six months after birth, antibodies passed from the mother protect infants born in areas of endemic malaria. Over time, this passive immunity is gradually lost and children start to develop their own immunity to malaria. Development of immunity depends on exposure to malarial infection, and in high malaria-endemic areas, children are likely to have attained a high level of immunity before age 5. Such children may experience episodes of malaria illness but usually do not suffer from severe, life-threatening malaria.

Table 3.7 shows the use of mosquito nets by children under age 5. On average, 74 percent slept under an ITN the previous night. ITN use among younger children is slightly higher than that among the older children. For example, 75 percent of children less than one year old and 80 percent of children one year old have slept under an ITN the night before the survey compared with 70 percent of children age 4. ITN use does not vary by child's sex. Children in urban areas are more likely than children in rural areas to use ITNs (82 percent and 73 percent, respectively). Those living in Kigali City and South province and those in the highest wealth quintile are more likely than others to have slept under an ITN.

ITN use among children in households that have at least one ITN is slightly higher than among children in all households. In households with at least one ITN, 79 percent of children slept under an ITN the night before the survey, an improvement from 75 percent in 2010 RDHS.

Table 3.7 Use of mosquito nets by children

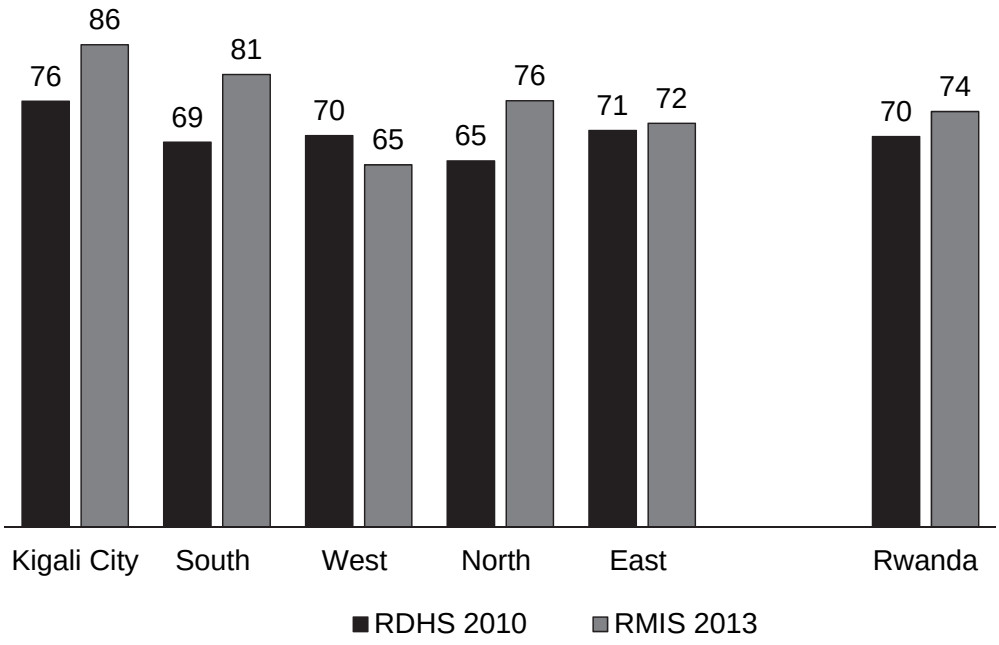
Percentage of children under age 5 who, the night before the survey, slept under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among children under age 5 in households with at least one ITN, the percentage who slept under an ITN the night before the survey, by background characteristics, Rwanda 2013

	Children under age 5 in all households					Children under age 5 in households with at least one ITN[1]	
Background Characteristic	Percentage who slept under any net last night	Percentage who slept under an ITN[1] last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN[1] last night or in a dwelling sprayed with IRS[2] in the past 12 months	Number of children	Percentage who slept under an ITN[1] last night	Number of children
Age (in years)							
<1	76.8	75.4	75.4	79.0	608	82.1	558
1	81.3	80.4	80.4	83.0	646	85.2	609
2	73.3	73.0	73.0	75.5	582	77.0	551
3	72.7	71.8	71.8	75.3	635	77.4	590
4	70.6	69.6	69.6	72.9	637	75.0	591
Sex							
Male	75.6	74.3	74.3	77.2	1,555	79.3	1,458
Female	74.3	73.8	73.8	77.2	1,552	79.5	1,440
Residence							
Urban	83.1	81.8	81.8	83.5	380	85.3	365
Rural	73.8	73.0	73.0	76.3	2,726	78.5	2,534
Region							
Kigali	87.8	86.0	86.0	86.6	271	90.5	257
South	81.4	80.7	80.7	83.2	768	83.8	739
West	64.9	64.6	64.6	64.6	776	70.2	714
North	76.5	76.0	76.0	76.0	424	81.4	396
East	73.5	72.0	72.0	80.8	867	78.9	791
Wealth quintile							
Lowest	72.2	70.9	70.9	72.9	707	77.6	647
Second	70.6	70.2	70.2	73.4	672	76.3	618
Middle	77.3	77.2	77.2	80.0	638	81.8	602
Fourth	76.8	76.4	76.4	81.6	577	80.0	551
Highest	79.5	76.9	76.9	79.6	513	82.1	480
Total	75.0	74.1	74.1	77.2	3,107	79.4	2,898

Note: Table is based on children who stayed in the household the night before the interview.
[1] An insecticide-treated net (ITN) is a factory-treated net that does not require any further treatment (LLIN) or a net that has been soaked with insecticide within the past 12 months.
[2] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private, or nongovernmental organization.

Figure 3.3 shows the use of mosquito nets by children under age 5 in the RDHS 2010 and RMIS 2013. On the national level, there has been a 4-percentage-point increase in ITN use among children in the past two years (70 and 74 percent). Nevertheless, this change varies by province. The proportion of children who slept under an ITN the previous night has decreased in the West province between 2010 and 2013, from 70 percent to 65 percent. ITN use has remained relatively stable in the East province (71 percent and 72 percent, respectively), and has substantially increased in Kigali City and in the South and North provinces.

Figure 3.3
Percentage of children under 5 who slept under an ITN the previous night, RDHS 2010 and RMIS 2013



3.2.3 Use of Mosquito Nets by Pregnant Women

Pregnancy suppresses immunity, and pregnant women are at increased risk for severe malaria compared with other adults. In addition, malaria in pregnant women is frequently associated with the development of anemia; it also interferes with the maternal-fetus oxygen exchange, leading to low birth weight in infants. To prevent complications from malaria in pregnancy such as anemia, low birth weight, and trans-placental parasitemia, the MOPDD has encouraged all pregnant women to sleep under an ITN since 2005.

Table 3.8 shows the use of mosquito nets by pregnant women according to background characteristics. Overall, three in four pregnant women in Rwanda (74 percent) slept under an ITN the previous night. ITN use among pregnant women is highest among those women living in urban areas (84 percent) and among those with secondary or higher education (81 percent).

Table 3.8 Use of mosquito nets by pregnant women

Percentages of pregnant women age 15-49 who, the night before the survey, slept under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among pregnant women age 15-49 in households with at least one ITN, the percentage who slept under an ITN the night before the survey, by background characteristics, Rwanda 2013

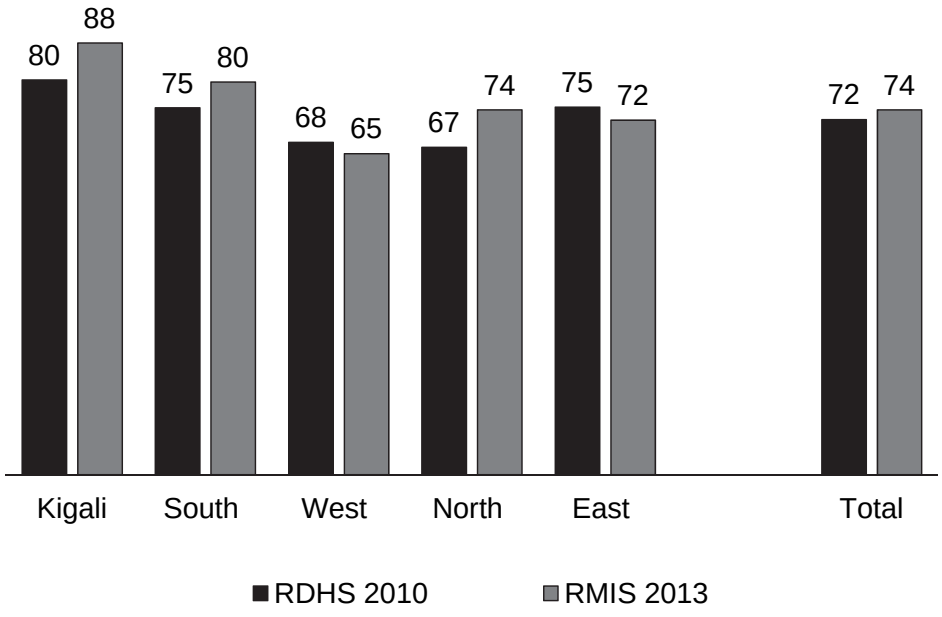
	Among pregnant women age 15-49 in all households					Among pregnant women age 15-49 in households with at least one ITN[1]	
Background Characteristic	Percentage who slept under any net last night	Percentage who slept under an ITN[1] last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN[1] last night or in a dwelling sprayed with IRS[2] in the past 12 months	Number of women	Percentage who slept under an ITN[1] last night	Number of women
Age							
15-19	(83.2)	(83.2)	(83.2)	(83.2)	37	(92.0)	33
20-24	70.2	67.0	67.0	69.2	93	84.4	73
25-29	80.9	80.9	80.9	82.8	103	88.5	94
30-34	69.8	69.8	69.8	69.8	65	84.9	54
35-39	(72.8)	(72.8)	(72.8)	(72.8)	33	(77.2)	31
40-44	*	*	*	*	10	*	9
45-49	*	*	*	*	1	*	1
Residence							
Urban	85.5	84.4	84.4	84.4	50	90.8	46
Rural	73.4	72.5	72.5	74.3	292	84.9	249
Region							
Kigali	89.3	87.8	87.8	87.8	38	92.8	36
South	79.9	79.9	79.9	81.1	79	88.0	72
West	65.3	65.3	65.3	65.3	85	78.5	71
North	(74.2)	(74.2)	(74.2)	(74.2)	44	(87.0)	38
East	74.7	72.1	72.1	76.6	94	86.6	79
Education							
No education	68.1	68.1	68.1	70.0	51	86.0	41
Primary	75.6	74.3	74.3	75.2	244	85.1	213
Secondary or higher	80.7	80.7	80.7	85.2	46	88.9	42
Wealth quintile							
Lowest	66.9	66.9	66.9	68.5	59	79.3	50
Second	68.3	68.3	68.3	72.8	68	84.7	55
Middle	74.5	74.5	74.5	74.5	78	86.0	68
Fourth	81.2	81.2	81.2	83.1	62	84.8	59
Highest	83.5	79.4	79.4	79.4	74	92.5	64
Total	75.1	74.2	74.2	75.8	341	85.8	295

Note: Table is based on women who stayed in the household the night before the interview. Figures in the parenthesis are based on 25-49 unweighted cases. An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.
[1] An insecticide-treated net (ITN) is a factory-treated net that does not require any further treatment (LLIN) or a net that has been soaked with insecticide within the past 12 months.
[2] Indoor residual spraying (IRS) is limited to spraying conducted by a government, private, or nongovernmental organization.

As expected, ITN use is considerably higher for women who live in households that own at least one ITN than for women in all households. In fact nearly 9 in 10 pregnant women (86 percent) who live in households with at least one ITN slept under an ITN the night before the survey compared with 74 percent of women in all households. Variations in ITN use by pregnant women in households with at least one ITN by background characteristics are similar to those found for all households.

Figure 3.4 shows trends in ITN use among pregnant women on national and regional levels. At the national level, there has been a slight increase in ITN use among pregnant women (72 percent measured in 2010 compared with 74 percent in 2013). Nevertheless, trends by province are inconsistent. The proportion of those women who slept under an ITN the previous night has decreased in the West and the East provinces between 2010 and 2013, from 68 percent to 65 percent and from 75 percent to 72 percent respectively. ITN use has increased in Kigali City and the South and North provinces.

Figure 3.4
Percentage of pregnant women who slept under an ITN the previous night, RDHS 2010 and RMIS 2013



3.3 PREFERENCE FOR COLOR OF MOSQUITO NET AND TIME TO WASH THE NET

The 2013 RMIS households were asked about their color preference for mosquito nets. Furthermore, households that have at least one mosquito net were asked at what time they prefer to wash the net. Table 3.9 shows color preference of mosquito nets among all the households, and Table 3.10 shows time preference for washing nets among households that have at least one mosquito net.

Table 3.9 shows that the majority of households interviewed (62 percent) prefer blue mosquito nets, and about 1 in 5 households (21 percent) interviewed prefer white mosquito nets. The next popular color for the mosquito net is green, preferred by 15 percent of the households. Only 1 percent of households interviewed prefer pink or any other color of net. Blue and green mosquito nets are more preferred by rural households, while white is the preferred color in urban areas. Preference for net color varies by province. Households in Kigali City are more likely to prefer white nets, while households in the other provinces prefer blue and green nets. Net color also has an association with the household's wealth. White nets are highly popular among households in the highest wealth quintile (51 percent) compared with other households (from 10 percent to 19 percent). Blue and green nets are less preferred by households in the highest wealth quintile compared with those in the other four quintiles.

Table 3.9 Preference for color of mosquito net

Percent distribution of households by preference for color of mosquito net, by background characteristics, Rwanda 2013

Background characteristic	White	Blue	Pink	Green	Any color	Other	Missing	Total	Number
Residence									
Urban	51.8	38.5	0.9	7.9	0.3	0.6	0.0	100.0	660
Rural	16.2	66.0	0.5	16.6	0.4	0.3	0.0	100.0	4,106
Region									
Kigali	56.1	35.0	0.7	7.5	0.4	0.3	0.0	100.0	514
South	14.9	71.3	0.6	12.4	0.6	0.2	0.0	100.0	1,170
West	16.0	64.4	0.3	18.4	0.4	0.4	0.0	100.0	1,078
North	17.9	59.5	0.4	21.2	0.3	0.6	0.1	100.0	756
East	19.0	64.7	0.7	15.2	0.1	0.3	0.0	100.0	1,248
Wealth quintile									
Lowest	9.7	69.8	0.5	19.0	0.6	0.2	0.1	100.0	1,037
Second	13.9	64.9	0.7	19.6	0.6	0.3	0.0	100.0	999
Middle	14.3	68.8	0.4	16.1	0.0	0.4	0.0	100.0	913
Fourth	18.5	65.2	0.3	15.3	0.2	0.5	0.0	100.0	891
Highest	51.2	41.4	1.0	6.1	0.2	0.2	0.0	100.0	927
Total	21.2	62.2	0.6	15.4	0.4	0.3	0.0	100.0	4,766

Table 3.10 shows that among households that own at least one mosquito net, 23 percent never wash the net, 61 percent wash the nets in the morning, and the rest wash the nets either in the afternoon (12 percent) or in the evening (5 percent). Urban households are more likely to wash the net than rural households. Households in the East province are more likely not to wash nets (29 percent) compared with other provinces (22 percent or less). The percentage of households that have never washed their net decreases as household wealth increases, from 29 percent for households in the lowest quintile to 18 percent for households in the highest quintile. Washing nets in the morning is more frequently reported by households in the urban areas (68 percent) and in Kigali City (74 percent) than households in rural areas or in other provinces.

Table 3.10 Washing mosquito net

Percent distribution of households that own at least one net by preferred time in the day that they usually wash the mosquito net, by background characteristics, Rwanda 2013

Background characteristic	Never wash	Morning	Afternoon	Evening	Total	Number of households
Residence						
Urban	15.5	68.3	10.0	6.1	100.0	559
Rural	23.9	59.8	11.7	4.6	100.0	3,420
Region						
Kigali	14.5	74.2	5.3	6.1	100.0	440
South	21.2	57.8	15.0	5.9	100.0	1,011
West	21.8	67.4	8.1	2.7	100.0	869
North	21.8	66.9	8.3	3.0	100.0	645
East	29.1	49.1	15.6	6.3	100.0	1,014
Wealth quintile						
Lowest	28.8	55.4	12.3	3.5	100.0	803
Second	24.8	59.5	11.7	4.0	100.0	809
Middle	21.4	61.5	12.9	4.2	100.0	780
Fourth	20.8	60.9	12.1	6.2	100.0	785
Highest	17.6	67.6	8.4	6.4	100.0	802
Total	22.7	61.0	11.5	4.9	100.0	3,979

MANAGEMENT OF FEVER IN CHILDREN 4

Key Findings

- Three of ten Rwandan children (29 percent) had a fever in the two weeks prior to the survey. Of these children, 68 percent sought advice or treatment and 30 percent had blood taken from a finger or heel for testing.
- Among children that had a fever, 11 percent took ACT, the recommended malaria treatment in Rwanda.
- An overwhelmingly large proportion of children under age 5 with fever who received antimalarial medicines for treatment were given ACT (92 percent), while 7 percent were given artemether alone, 1 percent received quinine, and 4 percent took other antimalarial medicines.

This chapter presents data on childhood fever management by the National Malaria Control Program. It addresses the prevalence, diagnosis, and treatment of fever in children.

4.1 Prevalence, Diagnosis, and Prompt Treatment of Children with Fever

Malaria case management, including the identification, diagnosis, and prompt treatment of all malaria cases with appropriate and effective antimalarial drugs, is one of the key strategic goals for malaria control in Rwanda. Fever is a major manifestation of malaria and other acute infections in children. Most malarial fevers occur at home, and prompt and effective treatment is critical to prevent morbidity and mortality. The 2013 RMIS asked mothers whether their children under age 5 had had a fever in the two weeks preceding the survey and, if so, whether any treatment was sought. Questions were also asked about blood testing, the types of drugs given to the child, and how soon and for how long the drugs were taken.

Table 4.1 shows the percentage of children under age 5 who had fever in the two weeks preceding the survey and, among those children under age 5 with fever, the percentage for whom advice or treatment was sought from a health facility, provider, or pharmacy; the percentage of such children who had a drop of blood taken from a finger- or heel-prick (presumably for a malaria test); the percentage who took ACT or other antimalarial drugs; and the percentage who took drugs on the same or next day.

Table 4.1 Prevalence, diagnosis, and prompt treatment of children with fever

Percentage of children under age 5 with fever in the two weeks preceding the survey; and among children under age 5 with fever, the percentage for whom advice or treatment was sought, the percentage who had blood taken from a finger or heel, the percentage who took any artemisinin-based combination therapy (ACT), the percentage who took ACT the same or next day following the onset of fever, the percentage who took antimalarial drugs, and the percentage who took the drugs the same or next day following the onset of fever, by background characteristics, Rwanda 2013

	Among children under age 5:		Among children under age 5 with fever:						
Background Characteristic	Percentage with fever in the two weeks preceding the survey	Number of children	Percentage for whom advice or treatment was sought	Percentage who had blood taken from a finger or heel for testing	Percentage who took any ACT	Percentage who took any ACT same or next day	Percentage who took antimalarial drugs	Percentage who took antimalarial drugs same or next day	Number of children
Age (in months)									
<12	32.8	613	70.2	25.8	5.9	2.3	6.7	2.3	201
12-23	35.8	639	76.0	36.8	12.6	9.9	14.2	9.9	229
24-35	29.5	572	61.3	30.7	12.6	10.3	14.1	11.2	169
36-47	26.8	633	64.7	30.4	12.2	7.3	12.8	7.3	169
48-59	20.2	618	65.9	25.6	12.6	4.3	12.6	4.3	125
Sex									
Male	29.6	1,527	64.5	29.7	9.6	6.2	11.4	6.6	452
Female	28.5	1,547	72.2	31.0	12.4	7.8	12.6	7.8	442
Residence									
Urban	29.3	390	77.2	35.8	6.3	5.0	9.0	6.3	114
Rural	29.0	2,684	67.1	29.6	11.7	7.3	12.4	7.3	779
Region									
Kigali	33.3	289	84.9	42.8	1.9	1.2	3.5	1.2	96
South	28.0	747	71.4	39.5	18.6	11.7	19.3	12.4	209
West	33.3	758	62.3	22.6	6.7	5.1	7.0	5.1	252
North	23.6	424	49.5	14.1	1.8	1.8	5.5	1.8	100
East	27.5	855	73.4	32.4	16.6	9.5	17.0	9.5	235
Mother's education									
No education	29.6	558	60.0	23.8	12.9	7.9	13.5	7.9	165
Primary	29.2	2,203	68.9	30.6	11.0	7.0	11.9	7.0	643
Secondary or higher	27.0	314	80.2	41.5	7.4	5.1	10.1	6.9	85
Wealth quintile									
Lowest	30.1	711	62.4	22.2	16.7	9.3	17.2	9.3	214
Second	26.8	665	66.9	27.9	10.8	8.1	12.4	8.1	178
Middle	31.0	620	61.5	32.1	10.0	7.1	10.9	7.1	192
Fourth	28.4	549	72.0	33.0	10.6	4.3	11.1	4.3	156
Highest	28.9	529	83.3	39.9	5.1	5.1	6.6	6.2	153
Total	29.1	3,074	68.4	30.4	11.0	7.0	12.0	7.2	893

Table 4.1 shows that 29 percent of children under age 5 had fever during the two weeks preceding the survey. Children under 24 months are more likely to suffer from fever than older children. The prevalence of fever is not affected by the type of residence or by the sex of the child, and does not vary greatly by province. There is no clear association between fever and wealth index quintile. Children of mothers with secondary education or higher are slightly less likely than other children to have a fever two weeks prior to the survey.

Among children with fever, two-thirds (68 percent) were taken to a health facility, provider, or pharmacy for advice or treatment. Treatment-seeking behavior is highest among children age 12-23 months; however, the relationship between fever and children's age does not follow a clear pattern. Girls or urban children are more likely than boys or rural children to have been taken to a health facility, provider, or pharmacy for advice or treatment, respectively. Among regions, the proportion of children who were taken for treatment is highest in Kigali City (85 percent) and lowest in the North province (50 percent). Care seeking for children with fever generally increases with the mother's education. For example, treatment for fever was sought for two-thirds (80 percent) of children whose mothers have at least a secondary education compared

with only 60 percent of children whose mothers have no education. Children living in the highest wealth quintile are most likely to be taken to a health facility, provider, or pharmacy for advice or treatment (83 percent) compared with other children, but there is no clear association between fever and wealth quintile.

In the 2013 RMIS, mothers were asked whether children under age 5 with fever had blood taken from a finger or heel for testing, presumably for diagnostic purposes. The survey question did not ask which test was conducted. Although the blood could have been taken for malaria testing, it could also have been taken for anemia or other tests. The mother may or may not have known the reason for which blood was taken from her child. Overall, 30 percent of children with fever had a heel or finger prick; this is a 50 percent increase compared with the percentage of children with blood reported as taken in the 2010 RDHS (21 percent). The increase is likely due to the new policy that calls for universal diagnosis of fever before malaria treatment is provided.

The percentage of children who had a finger or heel prick varies by subgroup of children and follows a pattern similar to that observed among differentials of children taken for advice or treatment; it is highest among children age 12-23 months, higher for children in urban areas than in rural areas, and highest for children in Kigali City compared with other provinces. The probability of a child having blood taken during fever increases with the level of the mother's education and with the household wealth index. For example, the proportion of children who had blood taken from a finger or heel for testing increases from 24 percent for children whose mothers have no education to 31 percent for children whose mothers have a primary education, to 42 percent for children whose mothers have secondary education or higher.

Table 4.1 also presents the percentage of children with fever that received prompt treatment. On average, 11 percent of children with fever took artemisinin-based combination therapies (ACTs), the recommended treatment for malaria in Rwanda. Only one percent of children used any other antimalarial drugs. In Rwanda, the most common ACT is artemether-lumefantrine, locally packed as Primo at the community level and dispensed by community health workers through the Integrated Community Case Management ICCM strategy. Of those children with fever, 7 percent took an ACT within 24 hours of onset of fever, or during the recommended timeframe. Children <12-35 months are less likely than others to have taken an ACT, and boys are less likely than girls to have taken an ACT. Children in the rural areas (12 percent) are more likely than children in the urban areas (6 percent) to have taken an ACT. By province, children living in the South province (19 percent) and East province (17 percent) are more likely to have taken an ACT compared with children in Kigali City (2 percent), North province (2 percent), or West province (7 percent). This difference is explained by malaria endemicity and burden, which is higher in East and South provinces compared with other provinces. The proportion of children that took an ACT has a negative relationship with the mother's education and the household wealth quintile.

Variation by background characteristics among the percentage of children that took an ACT the same or next day are similar to the differentials observed for children that took an ACT. The proportion of children who took an ACT within the same or next day after onset of fever is higher in rural areas than in the urban areas (5 percent in urban areas and 7 percent in rural areas). The percentage of children with fever treated with an ACT has a negative relationship with the mother's education; it is highest for children with an uneducated mother (8 percent) and decreases to 5 percent for children of mothers who have secondary education or higher.

4.2 SOURCES OF ADVICE OR TREATMENT FOR CHILDREN WITH FEVER

To assess the contribution of public and private medical service providers in the treatment of fever among children, women were asked where they obtained the advice or treatment for their children with fever.

Table 4.2 shows that 72 percent of children with fever (894 children) sought advice and treatment. Among those for whom advice and treatment was sought (639 children), it often came from the public sector (72 percent). Among those who received advice and treatment, one in two children (49 percent) obtained them from a health center and 21 percent from community health workers (another important source of advice and treatment for fever in public sector). Fifteen percent of children for whom advice or treatment for fever was sought went to the private medical sector, and another 15 percent went to the nonmedical sector (kiosks, traditional practitioner, friends, relatives, and other sources).

Table 4.2 Source of advice or treatment for children with fever

Percentage of children under age 5 with fever in the two weeks preceding the survey for whom advice or treatment was sought from specific sources; and among children under age 5 with fever in the two weeks preceding the survey for whom advice or treatment was sought, the percentage for whom advice or treatment was sought from specific sources, by background characteristics, Rwanda 2013

	Percentage for whom advice or treatment was sought from each source:	
Background Characteristic	Among children with fever	Among children with fever for whom advice or treatment was sought
Any public sector source	51.3	71.7
Referral hospital	0.2	0.3
District hospital	0.9	1.3
Health center	35.1	49.0
Health post	2.1	2.9
Community health worker	14.9	20.8
Any private sector source	10.4	14.6
Polyclinic	0.7	0.9
Clinic	1.2	1.7
Dispensary	1.8	2.6
Pharmacy	6.7	9.3
Other private medical	0.1	0.1
Any other source	10.7	15.0
Kiosk	0.8	1.1
Traditional practitioner	2.8	3.9
Friend/relative	3.7	5.1
Other	3.6	5.1
Total	71.6	100.0
Number of children	893	639

4.3 MALARIA CASE MANAGEMENT AMONG CHILDREN

Details on the types and timing of antimalarial drugs given to children to treat fever are presented in Table 4.3. When interpreting the results, 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.

As shown in Table 4.3, an overwhelmingly large proportion of children under age 5 with fever who took an antimalarial drug were given either ACT or Primo (92 percent), while 7 percent were given artemether, 1 percent were given quinine, and 4 percent of children with a fever took another antimalarial drug. Among children with fever who took an antimalarial drug, 60 percent took it in the same day or the next day after the fever.

Table 4.3 Type of antimalarial drugs used

Among children under age 5 with fever in the two weeks preceding the survey who took any antimalarial medication, the percentage who took specific antimalarial drugs, by background characteristics, Rwanda 2013

Background Characteristic	Percentage of children who took:						Percentage who took antimalarial drug same day or next day	Number of children with fever who took anti-malarial drug
	ACT[1]	Primo	ACT/Primo	Quinine	Artemether	Other antimalarial		
Age (in months)								
<12	*	*	*	*	*	*	*	13
12-23	(62.0)	(31.6)	(88.7)	(0.0)	(13.7)	(6.3)	(70.2)	32
24-35	*	*	*	*	*	*	*	24
36-47	*	*	*	*	*	*	*	22
48-59	*	*	*	*	*	*	*	16
Sex								
Male	(56.3)	(30.1)	(84.8)	(1.6)	(9.0)	(8.7)	(57.8)	51
Female	69.3	32.0	98.5	0.0	4.3	0.0	61.9	56
Residence								
Urban	*	*	*	*	*	*	*	10
Rural	64.4	30.7	94.2	0.8	4.9	2.2	58.8	97
Region								
Kigali	*	*	*	*	*	*	*	3
South	(63.5)	(38.6)	(96.1)	(2.0)	(3.9)	(3.9)	(64.3)	40
West	*	*	*	*	*	*	*	18
North	*	*	*	*	*	*	*	6
East	(69.2	(28.2)	(97.5)	(0.0)	(2.5)	(3.2)	(55.9)	40
Mother's education								
No education	*	*	*	*	*	*	*	22
Primary	64.1	28.8	93.0	0.0	4.9	3.8	59.4	76
Secondary or higher	*	*	*	*	*	*	*	9
Wealth quintile								
Lowest	(70.3)	(29.2)	(97.2)	(2.2)	(2.8)	(0.0)	(54.4)	37
Second	*	*	*	*	*	*	*	22
Middle	*	*	*	*	*	*	*	21
Fourth	*	*	*	*	*	*	*	17
Highest	*	*	*	*	*	*	*	10
Total	63.0	31.1	91.9	0.8	6.6	4.2	59.9	107

Note: Figures in the parenthesis are based on 25-49 unweighted cases. An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.
[1] ACT = Artemisinin-based combination therapy.

MALARIA KNOWLEDGE 5

Key Findings

- All women in Rwanda have heard about malaria.
- Nearly all women (95 percent) are aware that mosquito bites cause malaria.
- Two in three women (66 percent) know that sleeping under a mosquito net protects against malaria.
- Three in four Rwandan women reported having seen or heard messages about malaria in the last six months before the survey.
- Nearly all women reported that malaria treatment can be received from the public sector.
- The most commonly cited source of information about malaria is the radio (79 percent), followed by community health workers (46 percent).

One of the objectives of the 2013 RMIS was to assess general knowledge about malaria. All women who were interviewed as a part of the survey were asked if they had ever heard of malaria and, if they responded yes, they were asked a series of questions about their knowledge of signs and symptoms, causes, and preventive measures.

5.1 KNOWLEDGE OF MALARIA

Nearly all women in Rwanda have heard of malaria. Table 5.1 presents, by background characteristics, the percentages of women who have general knowledge of malaria symptoms, causes, and prevention methods.

When asked to name the main symptoms of malaria, nearly nine in ten Rwandan women (88 percent) mention fever. Variations in knowledge of fever as a symptom across subgroups of women are small. Women in the youngest age cohort (15-19) are the least likely to report fever as a symptom of malaria compared with women in the other age groups. Urban women, women with a high level of education, and women in the highest wealth quintile are more likely than other women to recognize fever as a malaria symptom. Among provinces, those women living in the North province are least likely to recognize fever as a symptom, and those living in East province are most likely.

Table 5.1 General knowledge of malaria

Among women age 15-49, the percentage who can recognize fever as a sign of malaria, the percentage who report mosquito bites as a cause of malaria, and the percentage who report that sleeping under a mosquito net can protect against malaria, by background characteristics, Rwanda 2013

Background characteristic	Percentage who recognize fever as a symptom of malaria	Percentage who report mosquito bites as a cause of malaria	Percentage who report sleeping under a mosquito net to protect against malaria	Number of women
Age				
15-19	82.1	94.7	63.0	1,094
20-24	88.7	94.6	64.8	971
25-29	90.2	95.7	65.6	910
30-34	90.6	94.8	68.3	776
35-39	90.1	93.6	66.2	545
40-44	88.9	93.6	68.4	452
45-49	88.1	92.5	71.1	387
Residence				
Urban	89.8	97.4	68.0	1,049
Rural	87.5	93.8	65.5	4,086
Region				
Kigali	89.9	97.6	64.8	900
South	88.6	94.2	64.6	1,214
West	85.8	88.8	65.6	1,131
North	83.3	95.7	63.9	792
East	91.3	97.4	70.6	1,098
Education				
No education	81.9	86.4	70.9	700
Primary	88.4	94.9	67.1	3,374
Secondary or higher	90.7	98.8	60.0	984
Wealth quintile				
Lowest	84.4	90.5	66.8	959
Second	87.1	92.3	64.2	928
Middle	89.7	95.0	65.5	957
Fourth	87.9	96.2	71.3	967
Highest	90.0	97.4	63.2	1,324
Total	88.0	94.5	66.0	5,135

Note: The total percentage could exceed 100 percent because of multiple responses.

Awareness of mosquitoes as a vector for malaria transmission is key to the design of prevention programs. Overall, knowledge that a mosquito bite causes malaria is nearly universal among Rwandan women (95 percent). Because of its high prevalence, the differences in this indicator by background characteristics are small. Urban women, women with the highest level of education, and women in the highest wealth quintile are more likely than other women to be aware that mosquito bites transmit the parasite. By province, women living in the West are the least likely to know of this malaria vector. Variation in knowledge by age is insignificant.

Use of a mosquito net prevents malaria. Women in the survey were asked how to protect themselves from getting malaria. At the national level, two in three women (66 percent) say that the use of mosquito nets can prevent infection. Urban women are more likely than rural women to mention that sleeping under a mosquito net protects against malaria. However, women with no education are more likely than women with primary, secondary, or higher education to report that sleeping under a mosquito net protects against malaria (71 percent, 67 percent, and 60 percent respectively). Women in the oldest age group (45-49) are most likely to know this prevention method. There is no clear relationship between this indicator and household wealth.

5.2 KNOWLEDGE ON THE PLACE OF TREATMENT

When asked where someone can receive treatment if she or he is infected, practically all women mention at least one public health facility or provider, 15 percent mention a community health worker, and 2 percent mention an outreach service. About 18 percent of the respondents mention at least one private health facility.

Women in both the youngest and oldest age cohorts are the least likely to have cited community health workers as a source of malaria treatment compared with women in the other age groups. The urban-rural difference is insignificant. Women with the lowest level of education and women in the lowest wealth quintile are less likely than other women to have mentioned a community health worker. By province, women living in the East province (24 percent), South province (18 percent), and Kigali City (13 percent) are more likely to have mentioned community health workers than women living in North province (9 percent) and West province (9 percent).

Table 5.2 Knowledge on the place of treatment for malaria

Percentage of women age 15-49 who reported that malaria treatment can be received from a specific provider, by background characteristics, Rwanda 2013

Background characteristic	Outreach	Public sector community health worker	Other public sector	Private sector	Other source	Both public and private sectors	Number of women
Age							
15-19	2.6	13.8	99.3	15.5	1.3	15.4	1,094
20-24	2.7	13.2	99.5	19.4	1.0	19.1	971
25-29	1.6	16.2	99.9	20.9	0.8	20.9	910
30-34	2.6	17.0	99.4	17.7	0.8	17.3	776
35-39	1.5	15.8	99.8	16.1	1.1	16.1	545
40-44	1.5	14.2	100.0	13.7	2.4	13.7	452
45-49	1.8	13.4	99.7	16.0	1.3	15.8	387
Residence							
Urban	3.8	13.6	99.0	28.8	1.0	28.1	1,049
Rural	1.7	15.1	99.7	14.6	1.2	14.5	4,086
Region							
Kigali	2.6	12.8	99.2	31.6	0.8	30.9	900
South	1.1	18.1	99.6	18.0	0.4	17.9	1,214
West	1.9	8.7	99.4	11.2	1.7	11.1	1,131
North	6.2	8.6	99.9	9.7	1.3	9.7	792
East	0.4	23.6	99.9	17.4	1.6	17.4	1,098
Education							
No education	2.4	11.4	99.7	10.4	1.9	10.3	700
Primary	2.1	14.9	99.6	15.9	1.1	15.8	3,374
Secondary or higher	1.7	18.1	99.5	25.5	0.8	25.2	984
Wealth quintile							
Lowest	2.2	11.4	99.7	10.2	1.8	10.1	959
Second	1.4	13.6	99.6	13.6	1.1	13.6	928
Middle	1.9	14.8	99.8	16.8	1.1	16.8	957
Fourth	2.8	17.9	99.7	15.0	1.1	14.9	967
Highest	2.4	15.9	99.3	27.7	0.8	27.3	1,324
Total	2.2	14.8	99.6	17.5	1.1	17.3	5,135

Urban women, women with a higher education level, and women in the highest wealth quintile are more likely to report that malaria can be treated at a private health facility than other women. By province, women living in Kigali City (32 percent) are more likely to have mentioned a private health facility as a source of treatment than women living in other provinces (from 10 percent to 18 percent).

5.3 EXPOSURE TO MALARIA MESSAGES

The MAL & OPD Division has developed an information, education, and communication strategy to better communicate malaria messages to the general population. Key messages include the importance of sleeping under ITNs and seeking prompt treatment for fever. In the 2013 RMIS, women were asked if they had seen or heard a message about malaria in the six months preceding the survey. If they answered yes, the women were asked the source of any messages they had received.

Table 5.3 shows the percentages, by background characteristics, of women who saw a message about malaria in the six months before the survey. About three in five Rwandan women (59 percent) reported seeing or hearing one. Exposure of women in urban areas and in rural areas was similar. A higher proportion of women living in East province (67 percent) reported a malaria message in the prior six months than did women from other regions. Exposure among women increases consistently as both education and wealth increase. For example, 45 percent of women with no education saw or heard a malaria message in the six months before the survey compared with 59 percent of women with primary education and 69 percent of women with secondary education or higher. Similarly, women in the highest wealth quintile are more likely than those in the lowest quintile to have seen or heard a malaria message (68 percent and 50 percent, respectively).

Table 5.3 Media exposure to malaria messages

Percentage of women age 15-49 who have seen or heard a message about malaria in the past 6 months, and among them, the percentage who have heard or seen specific sources of media, by background characteristics, Rwanda 2013

Background characteristic	Percentage who have seen or heard a message about malaria	All women	Among women who have seen or heard messages about malaria, the percentage by specific sources:						
			Radio	Television	Poster/ Billboard	Community health worker	Community event	Other	Number of women
Age									
15-19	54.3	1,072	81.1	13.2	31.5	35.1	12.5	29.4	582
20-24	58.3	973	79.0	11.9	27.8	39.4	19.8	28.8	567
25-29	62.7	897	77.6	11.6	28.6	50.6	25.1	23.4	562
30-34	57.6	791	78.9	8.1	22.9	45.2	25.5	26.2	456
35-39	62.5	542	75.8	8.5	24.9	56.9	29.5	27.5	339
40-44	60.8	467	78.3	6.7	21.8	55.4	30.3	31.0	284
45-49	60.9	391	76.5	3.7	13.9	54.6	29.0	26.6	238
Residence									
Urban	59.4	794	79.5	39.9	40.2	31.7	15.2	24.8	472
Rural	58.9	4,341	78.3	4.5	23.3	48.8	24.5	27.9	2,557
Province									
Kigali	59.7	629	79.1	46.3	43.1	32.3	16.1	20.9	376
South	60.8	1,195	78.9	3.4	27.9	55.0	31.5	27.7	726
West	52.0	1,175	71.5	3.2	15.4	46.1	21.9	25.0	611
North	53.7	813	84.9	3.2	23.9	44.3	20.7	20.2	437
East	66.5	1,323	79.7	8.1	25.4	45.8	20.9	35.2	879
Education									
No education	44.5	708	70.1	1.7	5.7	49.6	24.8	27.7	315
Primary	59.1	3,443	77.8	5.3	22.4	47.7	24.1	26.8	2,035
Secondary	68.9	984	84.7	28.0	46.1	39.9	19.0	29.2	678
Wealth quintile									
Lowest	49.7	961	68.4	1.0	15.6	54.2	29.5	32.2	477
Second	51.3	971	75.2	0.8	17.9	49.1	23.0	22.6	498
Middle	60.1	1,007	79.0	2.2	18.5	48.2	21.9	28.0	605
Fourth	63.4	1,029	81.1	2.3	25.1	46.0	23.8	27.5	653
Highest	68.1	1,168	84.2	33.5	43.5	38.1	19.4	27.0	796
Total	59.0	5,135	78.5	10.0	25.9	46.2	23.0	27.4	3,029

Table 5.3 also shows the various sources of the malaria messages. Nearly 4 in 5 women (79 percent) reported hearing messages on the radio, 10 percent saw them on the television, and 46 percent heard messages from a community health worker. About one in four women (26 percent) saw messages on a poster/billboard, and 23 percent saw or heard messages at a community event.

Women living in urban areas or in Kigali City, women with secondary education or higher, and women in the highest wealth quintile are more likely to report a poster/billboard as the source of a malaria message compared with other women. By age cohort, women in the youngest cohort are most likely to cite a poster/billboard as a malaria message source. The distribution of women who cited radio or television as a source of messages is more or less similar to those who cite a poster/billboard as sources. However, the proportion of women who report the radio as the source of malaria messages is slightly higher in North province than in other provinces.

In contrast, women in the youngest age cohort are less likely to have seen or heard malaria messages from a community health worker or at a community event than other age cohorts. The proportion of women reporting community health workers and community events as sources of malaria messages is lower in urban areas and in Kigali City than in rural areas and in other provinces. Also, the proportion reporting community health workers and community events as sources is lower among women with secondary education or higher and among women in the highest wealth quintile compared with other women.

REFERENCES

Bradley, A. K, B. M. Greenwood, A. M. Greenwood, et al., 1986. "Bed-nets (Mosquito-nets) and Morbidity from Malaria." *Lancet* ii (8500): 204-7.

Doolan, D. L., C. Dobaño, and J. K. Baird. 2009. "Acquired Immunity to Malaria." *Clinical Microbiology Review* 22(1): 13–36.

Gwatkin, D., S. Rutstein, K. Johnson, R. Pande, and A. Wagstaff, (2000). *Socioeconomic Differences in Health, Nutrition, and Population in Bangladesh.* Washington. DC*:* World Bank.

Hossain, M. I., and C. F. Curtis. 1989. "Permethrin-impregnated Bednets: Behavioural and Killing Effects on Mosquitoes." *Medical and Veterinary Entomology* 4(1):367-76.

Lengeler C. 2004. "Insecticide-treated Bed nets and Curtains for Preventing Malaria." *Cochrane Database of Systematic Reviews*: Issue number 2.

Lindsay, S. W., and M. E. Gibson. 1988. "Bednets Revisited—Old Idea, New Angle." *Parasitology Today* (10):270-2.

Lines J. D., J. Myamba, and C. F. Curtis. 1987. "Experimental Hut Trial of Permethrin-impregnated Mosquito Nets and Eave Curtains against Malaria Mosquitoes in Tanzania." *Medical and Veterinary Entomology* (1):37-51.

Ministry of Health (MOH) [Rwanda], National Institute of Statistics of Rwanda (NISR), and ICF Macro. 2009. *Rwanda Interim Demographic and Health Survey 2007-08.* Calverton, Maryland, U.S.A.: MOH, NISR, and ICF Macro.

Ministry of Lands, Environment, Forests, Water and Natural Resources (MINITERE) and The Geographic Information Systems & Remote Sensing Research and Training Center of the National University of Rwanda (CGIS – NUR). 2007. *Final Report on the Mapping of Rwandese Forests, Volume 1*. Kigali, Rwanda: MINITERE and CGIS – NUR.

National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International. 2012. *Rwanda Demographic and Health Survey 2010*. Calverton, Maryland, USA: NISR, MOH, and ICF International.

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

WHO/Global Malaria Program, 2007. Insecticide Treated Mosquito Net: A WHO Position Statement. Geneva: WHO.

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.

SAMPLE DESIGN APPENDIX A

A.1 INTRODUCTION

The Rwanda Malaria Indicator Survey (2013 RMIS) is the first survey of its kind in Rwanda. It selects a nationally representative sample of 4,770 households from 159 sample clusters. The survey is designed to provide information on the following key malaria control indictors: (1) the proportion of households having at least one mosquito net and at least one insecticide-treated net (ITN); (2) the proportion of children under age 5 who slept under a mosquito net and under an ITN the night before the survey; (3) and the proportion of pregnant women who slept under a mosquito net and under an ITN the night before the survey.

The survey produces representative estimates for the main MIS indictors for the country as a whole, for urban and rural areas separately, and for each of the five provinces. For some indicators, representative results may be available for all thirty districts as well.

A.2 SAMPLING FRAME

The sampling frame used for RMIS 2013 was the preparatory frame for the Rwanda Population and Housing Census, which was conducted in 2012 (RPHC 2012) by the National Institute of Statistics of Rwanda (NISR). The sampling frame is a complete list of natural villages throughout the country. Although it is best to work with a frame consisting of Enumeration Areas (EAs), because the natural villages are variable in size, such a frame was not available at the time of the survey. The sampling frame for the 2002 Rwanda Population and Housing Census (RPHC 2002) was too old; especially after the reform of administrative units conducted in 2006 in the country. The old EA maps are no longer available, and therefore the old EAs are no longer identifiable. On the other hand, the new census frame for 2012 (RPHC 2012) had not been released yet. At the time of the survey design, the only adequate sampling frame available was the preparatory frame consisting of a list of 14,837 natural villages. The frame file contained the administrative belongings for each village and for the members of the village population. The village population came from the national ID card project effected in 2007-2008, which may suffer under coverage compared with the population projection in 2009 by NISR (no province projection available).

Rwanda's administrative units were redrawn in 2006, reducing the number of provinces from 11 (in 2002) to 5. Rwanda is divided into provinces; each province is sub-divided into a number of districts, each district into sectors, each sector into cells, and each cell into villages. There are five provinces, for a total of 30 districts and 417 sectors. Table A.1 below shows the distribution by number of villages, population, and population share, both by province and by districts within each province. Table A.2 below shows the average village size and the population distribution by district. The average village size is 610 residents, which is equivalent to 133 households. The sizes of the districts, which are quite homogeneous, vary by 2.7% to 4.4%. There is no urban-rural specification in the sampling frame because the urban-rural definition had not been released by the Department of Local Government (DLG) after the re-forming of administrative units.

Table A.1 Distribution of village and population by province and by district within province

Province	District	Number of villages	Population	Population share
	Bugesera	585	294,013	0.144
	Gatsibo	594	350,403	0.172
	Kayonza	418	255,119	0.125
East	Kirehe	613	278,708	0.137
	Ngoma	473	277,129	0.136
	Nyagatare	630	326,588	0.160
	Rwamagana	472	256,147	0.126
East Total		**3,785**	**2,038,107**	**0.225**
	Gasabo	494	398,282	0.446
Kigali City	Kicukiro	327	246,664	0.277
	Nyarugenge	356	247,090	0.277
Kigali City Total		**1,177**	**892,036**	**0.098**
	Burera	567	320,123	0.199
	Gakenke	617	334,236	0.207
North	Gicumbi	629	360,237	0.224
	Musanze	434	331,254	0.206
	Rulindo	494	264,981	0.164
North Total		**2,741**	**1,610,831**	**0.178**
	Gisagara	524	278,367	0.123
	Huye	516	288,203	0.127
	Kamonyi	319	287,881	0.127
	Muhanga	331	299,658	0.132
South	Nyamagabe	536	311,808	0.138
	Nyanza	421	262,713	0.116
	Nyaruguru	332	256,855	0.113
	Ruhango	533	280,625	0.124
South Total		**3,512**	**2,266,110**	**0.250**
	Karongi	538	293,816	0.131
	Ngororero	419	311,834	0.139
	Nyabihu	473	298,163	0.133
West	Nyamasheke	586	344,222	0.153
	Rubavu	525	349,224	0.155
	Rusizi	596	356,823	0.159
	Rutsiro	485	296,004	0.132
West Total		**3,622**	**2,250,086**	**0.248**
Rwanda		**14,837**	**9,057,170**	**1.000**

*Source: 2012 population census preparatory frame, Rwanda

Table A.2 Average village size and population distribution by district

Province	District	Average village size	Population distribution
	Bugesera	502	0.032
	Gatsibo	589	0.039
	Kayonza	610	0.028
East	Kirehe	454	0.031
	Ngoma	585	0.031
	Nyagatare	518	0.036
	Rwamagana	542	0.028
	Gasabo	806	0.044
Kigali City	Kicukiro	754	0.027
	Nyarugenge	694	0.027
	Burera	564	0.035
	Gakenke	541	0.037
North	Gicumbi	572	0.040
	Musanze	763	0.037
	Rulindo	536	0.029
	Gisagara	531	0.031
	Huye	558	0.032
	Kamonyi	902	0.032
South	Muhanga	905	0.033
	Nyamagabe	581	0.034
	Nyanza	624	0.029
	Nyaruguru	773	0.028
	Ruhango	526	0.031
	Karongi	546	0.032
	Ngororero	744	0.034
	Nyabihu	630	0.033
West	Nyamasheke	587	0.038
	Rubavu	665	0.039
	Rusizi	598	0.039
	Rutsiro	610	0.033
Rwanda		**610**	**1.000**

*Source: 2012 population census preparatory frame, Rwanda

A.3 SAMPLING PROCEDURE AND SAMPLE ALLOCATION

The sample for RMIS 2013 is a stratified sample selected in two stages from the sampling frame. Stratification was achieved by separating each province into districts; each district forms a sampling stratum. In total, 30 sampling strata were created. Samples were selected independently in each sampling stratum, by a two-stage selection process. In the first stage, 159 villages were selected with a stratified probability proportional to size selection, according to the sample allocation given in Table A.3. After the first stage of selection, and before the main survey, a household listing operation was carried out in all of the selected villages.

The household listing operation consisted of visiting each of the 159 selected villages, to draw a location map and a detailed sketch map, and to record on the household listing forms all residential households in the village, including the address and the name of each household head. The resulting list of households served as the sampling frame for the selection of households in the second stage. Some of the selected villages were large. To minimize the task of household listing, the selected villages with an estimated number of households greater than 300 were segmented. Only one segment was selected for the survey, with probability proportional to segment size. The methodology and the detailed household listing procedure were addressed in the household listing manual.

At the second stage, 30 households were selected from the new household listing for each selected village. Household selection was performed in a central office before the main survey. The survey interviewers were asked to interview only the pre-selected households. To prevent bias, no replacements and no changes in the pre-selected households were allowed in the implementing stages.

Table A.3 below shows the sample allocation of clusters and households by district and by province. Because of the budget and implementing constraints, the sample allocation was an equal size allocation at district level: 5 clusters and 150 households per district. An exception was made for the districts in Kigali, where 8 clusters and 240 households were allocated to each district because of the small number of districts. Table A.4 shows the expected numbers of children under age 5 and currently pregnant women age 15-49 covered by the RMIS sample by province. Table A.5 below shows the expected survey precision for ITN use by currently pregnant women age 15-49 at the provincial and national levels. For the use of ITNs among pregnant women, we expected good precision at the provincial level end excellent precision at the national level. The calculations were based on the survey results of the 2010 Rwanda DHS.

Table A.3 Sample allocation of clusters and households by province and by district (RMIS 2013)

Province	District	Number of villages	Number of households	Expected # of HH/province
	Bugesera	5	150	
	Gatsibo	5	150	
	Kayonza	5	150	
East	Kirehe	5	150	1,050
	Ngoma	5	150	
	Nyagatare	5	150	
	Rwamagana	5	150	
	Gasabo	8	240	
Kigali	Kicukiro	8	240	720
	Nyarugenge	8	240	
	Burera	5	150	
	Gakenke	5	150	
North	Gicumbi	5	150	750
	Musanze	5	150	
	Rulindo	5	150	
	Gisagara	5	150	
	Huye	5	150	
	Kamonyi	5	150	
South	Muhanga	5	150	1,200
	Nyamagabe	5	150	
	Nyanza	5	150	
	Nyaruguru	5	150	
	Ruhango	5	150	
	Karongi	5	150	
	Ngororero	5	150	
	Nyabihu	5	150	
West	Nyamasheke	5	150	1,050
	Rubavu	5	150	
	Rusizi	5	150	
	Rutsiro	5	150	
Rwanda		**159**	**4,770**	**4,770**

Table A.4 Expected numbers of children under 5 and currently pregnant women 15-49 covered by province (RMIS 2013)

Province	Expected number of individuals covered	
	Children under 5	Pregnant women 15-49
East	715	79
Kigali	486	54
North	510	56
South	813	90
West	708	78
Rwanda	**3,232**	**357**

Table A.5 Expected survey precision for use of ITN by pregnant women by province

Province	Use of ITN by pregnant women 15-49			
	R	R-2SE	R+2SE	CV
East	74.8	63.6	86.0	0.08
Kigali	80.3	67.8	92.8	0.08
North	66.6	52.1	81.1	0.11
South	74.1	63.5	84.7	0.07
West	67.6	55.4	79.8	0.09
Rwanda	**72.2**	**66.7**	**77.7**	**0.04**

A.4 SAMPLING WEIGHT FOR HOUSEHOLD AND INDIVIDUAL SURVEY

Because of the non-proportional allocation of the sample to the different reporting domains, sampling weights will be required for any analysis using RMIS 2013 data to ensure the sample is representative. Because the RMIS 2013 sample was a two-stage stratified cluster sample, sampling weights were calculated based on sampling probabilities that were calculated separately for each sampling stage and for each cluster. We use the following notations:

P_{1hi}: sampling probability of the ith cluster in stratum h
P_{2hi}: sampling probability within the ith cluster for households
P_{hi}: overall sampling probability of any households of the ith cluster in stratum h

Let a_h be the number of clusters selected in stratum h for RMIS 2013, M_{hi} the number of households according to the sampling frame in the ith cluster, and $\sum M_{hi}$ the total number of structures in the stratum h. The probability of selecting the ith cluster in stratum h for RMIS 2013 was calculated as follows:

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

Let L_{hi} and g_{hi} (g_{hi}=30 for all h and i for RMIS 2013) be the number of households listed and selected in the ith cluster in stratum h. The probability for selecting a household in the ith cluster was calculated as follows:

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

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

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

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

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

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

A.5 SAMPLE IMPLEMENTATION

Table A.6 Sample implementation: Women

Percent distribution of households and eligible women by results of the household and individual interviews, and household, eligible women, and overall women response rates, according to urban-rural residence and region (unweighted), Rwanda 2013

	Residence		Region					
Result	Urban	Rural	Kigali	South	West	North	East	Total
Selected households								
Completed (C)	99.5	99.9	99.6	99.9	100.0	99.7	100.0	99.9
Household present but no competent respondent at home (HP)	0.2	0.0	0.1	0.0	0.0	0.3	0.0	0.1
Household absent (HA)	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Dwelling vacant/address not a dwelling (DV)	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of sampled households	841	3,931	721	1,200	1,051	750	1,050	4,772
Household response rate (HRR)[1]	99.8	100.0	99.9	100.0	100.0	99.7	100.0	99.9
Eligible women								
Completed (EWC)	99.3	99.5	99.2	99.3	99.6	99.9	99.3	99.4
Not at home (EWNH)	0.4	0.1	0.4	0.2	0.1	0.0	0.1	0.2
Incapacitated (EWI)	0.2	0.4	0.3	0.2	0.4	0.1	0.5	0.3
Other (EWO)	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of women	1,056	4,108	907	1,222	1,136	793	1,106	5,164
Eligible women response rate (EWRR)[2]	99.3	99.5	99.2	99.3	99.6	99.9	99.3	99.4
Overall women response rate (ORR)[3]	99.1	99.4	99.1	99.3	99.6	99.6	99.3	99.4

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

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

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

$$OWRR = HRR * EWRR/100$$

ESTIMATES OF SAMPLING ERRORS APPENDIX B

The estimates from a sample survey are affected by two types of errors: (1) nonsampling errors, and (2) 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 2013 Rwanda Malaria Indicator Survey (2013 RMIS) 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 2013 RMIS is only one of many samples that could have been selected from the same population, using the same design and identical size. Each of these samples would yield results that differ somewhat from the results of the actual sample selected. Sampling error is 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 or 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 2013 RMIS sample is the result of a multi-stage stratified design, and, consequently, it was necessary to use more complex formulas. The computer software used to calculate sampling errors for the 2013 RMIS is an SAS program. This program used the Taylor linearization method for variance estimation for survey estimates that are means or proportions.

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

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

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 hth stratum,
y_{hi} is the sum of the weighted values of variable y in the ith cluster in the hth stratum,
x_{hi} is the sum of the weighted number of cases in the ith cluster in the hth stratum, and
f_h is the sampling fraction of PSU in the hth stratum which is small and ignored

In addition to the standard error, the program computes the design effect (DEFT) for each estimate, 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 is due to the use of a more complex and less statistically efficient design, such as multistage and cluster selection. The program also computes the relative standard error and the confidence limits for the estimates.

Sampling errors for the 2013 RMIS are calculated for selected variables considered to be of primary interest for households, for children under 5, and for pregnant women, respectively. The results are presented in this appendix for the country as a whole; for urban and rural areas separately; for Kigali City, and for each of the four 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.4 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 *Average number of mosquito nets per household*) can be interpreted as follows: the overall average from the total sample is 1.657, and its standard error is 0.028. Therefore, to obtain the 95 percent confidence limits, one adds and subtracts twice the standard error to the sample estimate, i.e., 1.657±2×0.028. There is a high probability (95 percent) that the *true* average number of mosquito nets per household is between 1.602 and 1.712.

For the total sample, the value of the design effect (DEFT), averaged over all variables, is 1.373, which means that, due to multistage and clustering of the sample, the average standard error is increased by a factor of 1.373 over that in an equivalent simple random sample.

Table B.1 List of indicators for sampling errors, Rwanda 2013

Variable	Estimate	Base population
HOUSEHOLDS		
Proportion of households with at least one mosquito net	Proportion	All households
Average number of mosquito nets per household	Mean	All households
Proportion of households with at least one insecticide treated mosquito net (ITN)	Proportion	All households
Average number of ITN per household	Mean	All households
Proportion of households with at least one ITN	Proportion	All households
Average number of ITNs per household	Mean	All households
Proportion of households that had the interior sprayed against mosquitoes	Proportion	All households
CHILDREN UNDER FIVE		
Slept under a mosquito net the night before the survey	Proportion	All children under 5 years of age
Slept under a treated mosquito net the night before the survey	Proportion	All children under 5 years of age
Slept under an ITN the night before the survey	Proportion	All children under 5 years of age
Slept under an ITN in a sprayed household	Proportion	All children under 5 years of age
Had a fever in the last two weeks	Proportion	All children under 5 years of age
Treated with antimalarial drugs	Proportion	All children under 5 years of age with fever
PREGNANT WOMEN		
Slept under a mosquito net the night before the survey	Proportion	All pregnant women age 15-49
Slept under a treated mosquito net the night before the survey	Proportion	All pregnant women age 15-49
Slept under an ITN the night before the survey	Proportion	All pregnant women age 15-49
Slept under an ITN in a sprayed household	Proportion	All pregnant women age 15-49

Table B.2 Sampling errors: Total sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.835	0.007	4,766	4,766	1.290	0.008	0.821	0.849
Average number of mosquito nets per household	1.657	0.028	4,766	4,766	1.665	0.017	1.602	1.712
Proportion of households having at least one treated mosquito net	0.826	0.007	4,766	4,766	1.285	0.009	0.812	0.840
Average number of insecticide treated mosquito nets (ITNs) per household	1.634	0.028	4,766	4,766	1.668	0.017	1.578	1.689
Proportion of households with at least one ITN	0.826	0.007	4,766	4,766	1.289	0.009	0.812	0.841
Average number of ITN per household	1.634	0.028	4,766	4,766	1.669	0.017	1.579	1.689
Proportion of households that had the interior sprayed against mosquitoes	0.103	0.006	4,766	4,766	1.361	0.058	0.091	0.115
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.750	0.015	3,087	3,107	1.612	0.020	0.720	0.779
Slept under an insecticide treated mosquito net the night before the survey	0.741	0.015	3,087	3,107	1.650	0.021	0.710	0.771
Slept under an ITN the night before the survey	0.741	0.015	3,087	3,107	1.650	0.021	0.710	0.771
Slept under an ITN in a sprayed household	0.772	0.013	3,087	3,107	1.469	0.017	0.746	0.798
Had a fever in the last two weeks	0.291	0.010	3,018	3,074	1.189	0.035	0.270	0.311
Treated with antimalarial drugs	0.120	0.014	876	893	1.263	0.117	0.092	0.148
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.751	0.026	339	341	1.115	0.035	0.699	0.803
Slept under an insecticide treated mosquito net the night before the survey	0.742	0.025	339	341	1.056	0.034	0.692	0.792
Slept under an ITN the night before the survey	0.742	0.025	339	341	1.056	0.034	0.692	0.792
Slept under an ITN in a sprayed household	0.758	0.024	339	341	1.046	0.032	0.709	0.806

Table B.3 Sampling errors: Urban sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.860	0.008	1,196	980	0.819	0.010	0.844	0.877
Average number of mosquito nets per household	1.803	0.067	1,196	980	1.812	0.037	1.668	1.937
Proportion of households having at least one treated mosquito net	0.847	0.008	1,196	980	0.811	0.010	0.830	0.864
Average number of insecticide treated mosquito nets (ITNs) per household	1.764	0.069	1,196	980	1.856	0.039	1.626	1.902
Proportion of households with at least one ITN	0.847	0.008	1,196	980	0.811	0.010	0.830	0.864
Average number of ITN per household	1.764	0.069	1,196	980	1.854	0.039	1.627	1.902
Proportion of households that had the interior sprayed against mosquitoes	0.067	0.014	1,196	980	1.976	0.214	0.038	0.096
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.821	0.020	713	587	1.163	0.024	0.781	0.860
Slept under an insecticide treated mosquito net the night before the survey	0.802	0.020	713	587	1.126	0.025	0.762	0.842
Slept under an ITN the night before the survey	0.802	0.020	713	587	1.126	0.025	0.762	0.842
Slept under an ITN in a sprayed household	0.812	0.020	713	587	1.159	0.025	0.771	0.852
Had a fever in the last two weeks	0.326	0.015	729	606	0.823	0.046	0.296	0.356
Treated with antimalarial drugs	0.077	0.016	237	198	0.920	0.202	0.046	0.109
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.857	0.036	90	73	0.956	0.041	0.786	0.928
Slept under an insecticide treated mosquito net the night before the survey	0.849	0.037	90	73	0.971	0.043	0.775	0.923
Slept under an ITN the night before the survey	0.849	0.037	90	73	0.971	0.043	0.775	0.923
Slept under an ITN in a sprayed household	0.849	0.037	90	73	0.971	0.043	0.775	0.923

Table B.4 Sampling errors: Rural sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.828	0.008	3,570	3,786	1.288	0.010	0.812	0.844
Average number of mosquito nets per household	1.619	0.028	3,570	3,786	1.526	0.017	1.563	1.676
Proportion of households having at least one treated mosquito net	0.821	0.008	3,570	3,786	1.302	0.010	0.804	0.837
Average number of insecticide treated mosquito nets (ITNs) per household	1.600	0.028	3,570	3,786	1.531	0.018	1.543	1.657
Proportion of households with at least one ITN	0.821	0.008	3,570	3,786	1.309	0.010	0.804	0.838
Average number of ITN per household	1.600	0.028	3,570	3,786	1.533	0.018	1.544	1.657
Proportion of households that had the interior sprayed against mosquitoes	0.112	0.007	3,570	3,786	1.309	0.062	0.099	0.126
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.733	0.017	2,374	2,520	1.628	0.024	0.698	0.768
Slept under an insecticide treated mosquito net the night before the survey	0.726	0.018	2,374	2,520	1.669	0.025	0.690	0.762
Slept under an ITN the night before the survey	0.726	0.018	2,374	2,520	1.669	0.025	0.690	0.762
Slept under an ITN in a sprayed household	0.762	0.015	2,374	2,520	1.484	0.020	0.732	0.793
Had a fever in the last two weeks	0.282	0.012	2,289	2,468	1.216	0.042	0.258	0.305
Treated with antimalarial drugs	0.132	0.018	639	695	1.293	0.133	0.097	0.167
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.723	0.032	249	268	1.131	0.044	0.659	0.786
Slept under an insecticide treated mosquito net the night before the survey	0.714	0.030	249	268	1.053	0.042	0.654	0.773
Slept under an ITN the night before the survey	0.714	0.030	249	268	1.053	0.042	0.654	0.773
Slept under an ITN in a sprayed household	0.733	0.029	249	268	1.047	0.040	0.674	0.791

Table B.5 Sampling errors: Kigali sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.857	0.015	718	514	1.118	0.017	0.827	0.886
Average number of mosquito nets per household	1.857	0.122	718	514	2.317	0.066	1.613	2.101
Proportion of households having at least one treated mosquito net	0.838	0.014	718	514	1.041	0.017	0.809	0.866
Average number of insecticide treated mosquito nets (ITNs) per household	1.813	0.125	718	514	2.360	0.069	1.563	2.063
Proportion of households with at least one ITN	0.838	0.014	718	514	1.041	0.017	0.809	0.866
Average number of ITN per household	1.814	0.125	718	514	2.356	0.069	1.564	2.063
Proportion of households that had the interior sprayed against mosquitoes	0.053	0.016	718	514	1.929	0.305	0.021	0.085
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.878	0.023	391	271	1.256	0.026	0.831	0.924
Slept under an insecticide treated mosquito net the night before the survey	0.860	0.024	391	271	1.211	0.028	0.812	0.908
Slept under an ITN the night before the survey	0.860	0.024	391	271	1.211	0.028	0.812	0.908
Slept under an ITN in a sprayed household	0.866	0.024	391	271	1.247	0.028	0.817	0.914
Had a fever in the last two weeks	0.333	0.030	410	289	1.233	0.090	0.273	0.393
Treated with antimalarial drugs	0.035	0.013	133	96	0.840	0.379	0.008	0.061
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.893	0.035	54	38	0.833	0.040	0.822	0.964
Slept under an insecticide treated mosquito net the night before the survey	0.878	0.040	54	38	0.901	0.046	0.797	0.959
Slept under an ITN the night before the survey	0.878	0.040	54	38	0.901	0.046	0.797	0.959
Slept under an ITN in a sprayed household	0.878	0.040	54	38	0.901	0.046	0.797	0.959

Table B.6 Sampling errors: South sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.864	0.012	1,199	1,170	1.237	0.014	0.839	0.888
Average number of mosquito nets per household	1.703	0.052	1,199	1,170	1.684	0.031	1.598	1.808
Proportion of households having at least one treated mosquito net	0.859	0.012	1,199	1,170	1.200	0.014	0.834	0.883
Average number of insecticide treated mosquito nets (ITNs) per household	1.688	0.052	1,199	1,170	1.676	0.031	1.583	1.792
Proportion of households with at least one ITN	0.859	0.012	1,199	1,170	1.200	0.014	0.834	0.883
Average number of ITN per household	1.688	0.052	1,199	1,170	1.676	0.031	1.583	1.792
Proportion of households that had the interior sprayed against mosquitoes	0.159	0.012	1,199	1,170	1.092	0.073	0.136	0.182
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.814	0.021	791	768	1.282	0.026	0.773	0.856
Slept under an insecticide treated mosquito net the night before the survey	0.807	0.021	791	768	1.266	0.026	0.765	0.849
Slept under an ITN the night before the survey	0.807	0.021	791	768	1.266	0.026	0.765	0.849
Slept under an ITN in a sprayed household	0.832	0.020	791	768	1.295	0.024	0.791	0.872
Had a fever in the last two weeks	0.280	0.023	758	747	1.353	0.083	0.234	0.326
Treated with antimalarial drugs	0.193	0.035	211	209	1.248	0.182	0.123	0.264
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.799	0.037	82	79	0.835	0.046	0.725	0.874
Slept under an insecticide treated mosquito net the night before the survey	0.799	0.037	82	79	0.835	0.046	0.725	0.874
Slept under an ITN the night before the survey	0.799	0.037	82	79	0.835	0.046	0.725	0.874
Slept under an ITN in a sprayed household	0.811	0.037	82	79	0.852	0.046	0.737	0.886

Table B.7 Sampling errors: West sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.806	0.015	1,051	1,078	1.267	0.019	0.775	0.837
Average number of mosquito nets per household	1.534	0.052	1,051	1,078	1.535	0.034	1.430	1.638
Proportion of households having at least one treated mosquito net	0.801	0.015	1,051	1,078	1.210	0.019	0.771	0.831
Average number of insecticide treated mosquito nets (ITNs) per household	1.519	0.050	1,051	1,078	1.479	0.033	1.419	1.619
Proportion of households with at least one ITN	0.801	0.015	1,051	1,078	1.210	0.019	0.771	0.831
Average number of ITN per household	1.519	0.050	1,051	1,078	1.479	0.033	1.419	1.619
Proportion of households that had the interior sprayed against mosquitoes	0.000	0.000	1,051	1,078	na	na	0.000	0.000
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.649	0.029	744	776	1.434	0.045	0.590	0.708
Slept under an insecticide treated mosquito net the night before the survey	0.646	0.030	744	776	1.438	0.046	0.587	0.705
Slept under an ITN the night before the survey	0.646	0.030	744	776	1.438	0.046	0.587	0.705
Slept under an ITN in a sprayed household	0.646	0.030	744	776	1.438	0.046	0.587	0.705
Had a fever in the last two weeks	0.333	0.021	717	758	1.197	0.064	0.290	0.376
Treated with antimalarial drugs	0.070	0.017	235	252	1.024	0.238	0.037	0.104
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.653	0.056	82	85	1.074	0.086	0.541	0.765
Slept under an insecticide treated mosquito net the night before the survey	0.653	0.056	82	85	1.074	0.086	0.541	0.765
Slept under an ITN the night before the survey	0.653	0.056	82	85	1.074	0.086	0.541	0.765
Slept under an ITN in a sprayed household	0.653	0.056	82	85	1.074	0.086	0.541	0.765

Table B.8 Sampling errors: North sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R-2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.853	0.014	748	756	1.114	0.017	0.824	0.882
Average number of mosquito nets per household	1.706	0.051	748	756	1.265	0.030	1.605	1.808
Proportion of households having at least one treated mosquito net	0.853	0.014	748	756	1.114	0.017	0.824	0.882
Average number of insecticide treated mosquito nets (ITNs) per household	1.703	0.051	748	756	1.279	0.030	1.600	1.805
Proportion of households with at least one ITN	0.853	0.014	748	756	1.114	0.017	0.824	0.882
Average number of ITN per household	1.703	0.051	748	756	1.279	0.030	1.600	1.805
Proportion of households that had the interior sprayed against mosquitoes	0.000	0.000	748	756	na	na	0.000	0.000
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.765	0.048	424	424	1.949	0.063	0.669	0.861
Slept under an insecticide treated mosquito net the night before the survey	0.760	0.049	424	424	1.971	0.064	0.662	0.858
Slept under an ITN the night before the survey	0.760	0.049	424	424	1.971	0.064	0.662	0.858
Slept under an ITN in a sprayed household	0.760	0.049	424	424	1.971	0.064	0.662	0.858
Had a fever in the last two weeks	0.236	0.024	419	424	1.122	0.103	0.187	0.284
Treated with antimalarial drugs	0.055	0.028	103	100	1.200	0.505	0.000	0.111
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.742	0.073	44	44	1.108	0.099	0.596	0.888
Slept under an insecticide treated mosquito net the night before the survey	0.742	0.073	44	44	1.108	0.099	0.596	0.888
Slept under an ITN the night before the survey	0.742	0.073	44	44	1.108	0.099	0.596	0.888
Slept under an ITN in a sprayed household	0.742	0.073	44	44	1.108	0.099	0.596	0.888

Table B.9 Sampling errors: East sample, Rwanda 2013

Variable	Value (R)	Standard error (SE)	Un-weighted cases (N)	Weighted cases (WN)	Design effect (DEFT)	Relative error (SE/R)	Confidence limit R-2SE	Confidence limit R+2SE
HOUSEHOLDS								
Proportion of households having at least one mosquito net	0.812	0.016	1,050	1,248	1.359	0.020	0.779	0.845
Average number of mosquito nets per household	1.608	0.052	1,050	1,248	1.464	0.032	1.504	1.711
Proportion of households having at least one treated mosquito net	0.797	0.017	1,050	1,248	1.395	0.022	0.762	0.831
Average number of insecticide treated mosquito nets (ITNs) per household	1.567	0.052	1,050	1,248	1.476	0.033	1.463	1.671
Proportion of households with at least one ITN	0.798	0.017	1,050	1,248	1.409	0.022	0.763	0.832
Average number of ITN per household	1.568	0.052	1,050	1,248	1.482	0.033	1.463	1.673
Proportion of households that had the interior sprayed against mosquitoes	0.223	0.019	1,050	1,248	1.452	0.084	0.185	0.260
CHILDREN UNDER FIVE								
Slept under a mosquito net the night before the survey	0.735	0.034	737	867	1.758	0.046	0.667	0.803
Slept under an insecticide treated mosquito net the night before the survey	0.720	0.036	737	867	1.834	0.050	0.647	0.792
Slept under an ITN the night before the survey	0.720	0.036	737	867	1.834	0.050	0.647	0.792
Slept under an ITN in a sprayed household	0.808	0.023	737	867	1.324	0.028	0.763	0.853
Had a fever in the last two weeks	0.275	0.017	714	855	0.948	0.060	0.242	0.308
Treated with antimalarial drugs	0.170	0.035	194	235	1.275	0.203	0.101	0.239
PREGNANT WOMEN								
Slept under a mosquito net the night before the survey	0.747	0.062	77	94	1.273	0.083	0.623	0.871
Slept under an insecticide treated mosquito net the night before the survey	0.721	0.055	77	94	1.090	0.076	0.611	0.831
Slept under an ITN the night before the survey	0.721	0.055	77	94	1.090	0.076	0.611	0.831
Slept under an ITN in a sprayed household	0.766	0.052	77	94	1.084	0.067	0.663	0.869

SAMPLE IMPLEMENTATION APPENDIX C

Table C.1 Household age distribution

Single-year age distribution of the de facto household population by sex (weighted), Rwanda 2013

	Women		Men	
Age	Number	Percent	Number	Percent
0	311	2.9	290	3.0
1	315	2.9	342	3.6
2	292	2.7	284	3.0
3	321	3.0	318	3.3
4	311	2.9	315	3.3
5	341	3.2	292	3.1
6	224	2.1	245	2.6
7	330	3.1	364	3.8
8	284	2.6	271	2.8
9	271	2.5	275	2.9
10	326	3.0	327	3.4
11	236	2.2	226	2.4
12	321	3.0	292	3.1
13	346	3.2	271	2.8
14	119	1.1	224	2.3
15	250	2.3	196	2.1
16	259	2.4	228	2.4
17	204	1.9	201	2.1
18	199	1.9	192	2.0
19	153	1.4	166	1.7
20	178	1.7	193	2.0
21	232	2.2	162	1.7
22	179	1.7	135	1.4
23	197	1.8	157	1.6
24	179	1.7	131	1.4
25	200	1.9	200	2.1
26	155	1.4	132	1.4
27	164	1.5	165	1.7
28	197	1.8	159	1.7
29	174	1.6	134	1.4
30	189	1.8	188	2.0
31	165	1.5	135	1.4
32	161	1.5	161	1.7
33	121	1.1	114	1.2
34	148	1.4	92	1.0
35	132	1.2	100	1.0
36	97	0.9	88	0.9
37	103	1.0	69	0.7
38	107	1.0	87	0.9
39	90	0.8	74	0.8
40	117	1.1	104	1.1
41	96	0.9	53	0.6
42	86	0.8	72	0.8
43	100	0.9	61	0.6
44	68	0.6	44	0.5
45	94	0.9	88	0.9
46	57	0.5	45	0.5
47	65	0.6	57	0.6
48	80	0.7	55	0.6
49	89	0.8	47	0.5
50	40	0.4	75	0.8
51	92	0.9	53	0.6
52	80	0.7	40	0.4
53	77	0.7	65	0.7
54	81	0.8	66	0.7
55	77	0.7	49	0.5
56	64	0.6	38	0.4
57	37	0.3	47	0.5
58	38	0.4	43	0.5
59	36	0.3	23	0.2
60	70	0.6	48	0.5
61	32	0.3	37	0.4
62	44	0.4	28	0.3
63	37	0.3	33	0.3
64	39	0.4	16	0.2
65	44	0.4	18	0.2
66	31	0.3	14	0.1
67	38	0.4	22	0.2
68	31	0.3	26	0.3
69	17	0.2	18	0.2
70+	289	2.7	164	1.7
Don't know/missing	2	0.0	0	0.0
Total	10,726	100.0	9,546	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 percent distribution and percentage of eligible women who were interviewed (weighted), by five-year age groups, Rwanda 2013

Age group	Household population of women age 10-54	Interviewed women age 15-49		Percentage of eligible women interviewed
		Number	Percentage	
10-14	1,348	-	-	-
15-19	1,064	1,056	20.9	99.2
20-24	966	957	18.9	99.1
25-29	889	888	17.6	99.9
30-34	784	781	15.4	99.6
35-39	530	526	10.4	99.3
40-44	466	465	9.2	99.6
45-49	385	384	7.6	99.8
50-54	369	-	-	-
15-49	5,083	5,056	100.0	99.5

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

Table C.3 Completeness of reporting

Percentage of observations missing information for selected demographic and health questions (weighted), Rwanda 2013

Subject	Percentage with information missing	Number of cases
Month Only (Births in the 5 years preceding the survey)	0.00	3,171
Month and Year (Births in the 5 years preceding the survey)	0.00	3,171
Respondent's education (All women age 15-49)	0.24	5,135

[1] Both year and age missing.

SURVEY PERSONNEL APPENDIX D

STEERING COMMITTEE

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Agnes Binagwaho

Secretary

Corine Karema

Members

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Vincent Mutabazi
Ngabo Fidele
Caty Mugeni
Daniel Ngamije
Jeremie Zoungrana
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BéathaAkayezu
Monique Nyiramana
Clotilde Muhimpundu
Olive Nyirabagoyi
Redempta Umutanguha

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Marie Grace Kamayugi
Veneranda Mukatwagiramungu
Jeanne Mukasoni
Marie Josee Bananeza
Francine Mujawamaruya
Dorothée Mukandekezi
Jeannine Kayitesi
Jeanne Francoise Mukabarezi
Joseph Minani
Consolée Mukasine
Jacqueline Nibamureke
Marie Aimée Kayiganwa
Vestune Uwamahoro
Jeanne Claudine Uwera
Ethienne Kwizera
Genevieve Mukunduhirwe
Jean Chrysostome Nzabihimana
Pelagie Niwemfura
Pilar Kandamage
Vestine Umwali
Solange Baribeza
Serge Habumuremyi
Claudine Munganyiki
Julienne Mukakunzi
Luc Michel Muramira
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Petronille Mukarugina
Sylvie Ingabire
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Audrey Shenett
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QUESTIONNAIRES APPENDIX E

24 September 2012

MALARIA INDICATOR SURVEY
HOUSEHOLD QUESTIONNAIRE

REPUBLIC OF RWANDA
MALARIA & OTHER PARASITIC DISEASES DIVISION

IDENTIFICATION (1)

PLACE NAME _____

NAME OF HOUSEHOLD HEAD _____

CLUSTER NUMBER . . . . . [ ][ ][ ]

HOUSEHOLD NUMBER . . . . . [ ][ ]

INTERVIEWER VISITS

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

*RESULT CODES:

1 COMPLETED
2 NO HOUSEHOLD MEMBER AT HOME OR NO COMPETENT RESPONDENT AT 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 ELIGIBLE WOMEN [ ][ ]

LINE NO. OF RESPONDENT TO HOUSEHOLD QUESTIONNAIRE [ ][ ]

SUPERVISOR	OFFICE EDITOR	KEYED BY
NAME _____ [ ][ ][ ]	[ ][ ]	[ ][ ]

HH-1

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INTRODUCTION AND CONSENT

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

GIVE CARD WITH CONTACT INFORMATION

Do you have any questions?
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

HH-3

HOUSEHOLD SCHEDULE

							IF 15 YEARS OR OLDER	
LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE IN YEAR	MARITAL STATUS	ELIGIBILITY
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES AND RECORDING THE RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THAT THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-7 FOR EACH PERSON.	What is the relationship of (NAME) to the head of the household? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?	What is (NAME'S) current marital status? 1=MARRIED OR LIVING TOGETHER 2=DIVORCED SEPARATED 3=WIDOWED 4=NEVER-MARRIED AND NEVER LIVED TOGETHER	CIRCLE LINE NUMBER OF ALL WOMEN AGE 15-49 YEARS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7A)	(8)
01			M F 1 2	Y N 1 2	Y N 1 2	IN YEAR		01
02			1 2	1 2	1 2			02
03			1 2	1 2	1 2			03
04			1 2	1 2	1 2			04
05			1 2	1 2	1 2			05
06			1 2	1 2	1 2			06
07			1 2	1 2	1 2			07
08			1 2	1 2	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/STEP CHILD
13 = NOT RELATED
98 = DON'T KNOW

HH ENG 4

							IF 15 YEARS OR OLDER	
LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE IN YEAR	MARITAL STATUS	ELIGIBILITY
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES AND RECORDING THE RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THAT THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-7 FOR EACH PERSON.	What is the relationship of (NAME) to the head of the household? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?	What is (NAME'S) current marital status? 1=MARRIED OR LIVING TOGETHER 2=DIVORCED SEPARATED 3=WIDOWED 4=NEVER-MARRIED AND NEVER LIVED TOGETHER	CIRCLE LINE NUMBER OF ALL WOMEN AGE 15-49 YEARS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7A)	(8)
09			M F 1 2	Y N 1 2	Y N 1 2	IN YEAR		09
10			1 2	1 2	1 2			10
11			1 2	1 2	1 2			11
12			1 2	1 2	1 2			12
13			1 2	1 2	1 2			13
14			1 2	1 2	1 2			14
15			1 2	1 2	1 2			15
16			1 2	1 2	1 2			16

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 are not listed? YES → ADD TO TABLE NO

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

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/STEP CHILD
13 = NOT RELATED
98 = DON'T KNOW

HH ENG 5

HOUSEHOLD CHARACTERISTICS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101	What is the main source of drinking water for members of your household?	PIPED WATER PIPED INTO DWELLING . . . . . 11 PIPED TO YARD/PLOT . . . . . 12 PUBLIC TAP/STANDPIPE . . . . . 13 TUBE WELL OR BOREHOLE . . . . . 21 DUG WELL 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/DAM/ LAKE/POND/STREAM/CANAL/ IRRIGATION CHANNEL) . . . . . 81 BOTTLED WATER . . . . . 91 OTHER _____ 96 (SPECIFY)	104 104
102	Where is that water source located?	IN OWN DWELLING . . . . . 1 IN OWN YARD/PLOT . . . . . 2 ELSEWHERE 3	104
103	How long does it take to go there, get water, and come back?	MINUTES . . . . . [ ][ ][ ] DON'T KNOW 998	
104	What kind of toilet facility do members of your household usually use? **(2)**	FLUSH OR POUR FLUSH TOILET FLUSH TO PIPED SEWER SYSTEM . . . . . 11 FLUSH TO SEPTIC TANK . . . . . 12 FLUSH TO PIT LATRINE . . . . . 13 FLUSH TO SOMEWHERE ELSE . . . . . 14 FLUSH, DON'T KNOW WHERE . . . . . 15 PIT LATRINE VENTILATED IMPROVED PIT LATRINE . . . . . 21 PIT LATRINE WITH SLAB . . . . . 22 PIT LATRINE WITHOUT SLAB/ OPEN PIT . . . . . 23 COMPOSTING TOILET . . . . . 31 BUCKET TOILET . . . . . 41 HANGING TOILET/HANGING LATRINE . . . . . 51 NO FACILITY/BUSH/FIELD . . . . . 61 OTHER _____ 96 (SPECIFY)	107
105	Do you share this toilet facility with other households?	YES . . . . . 1 NO 2	107
106	How many households use this toilet facility?	NO. OF HOUSEHOLDS IF LESS THAN 10 . . . . . [0][ ] 10 OR MORE HOUSEHOLDS . . . . . 95 DON'T KNOW 98	

HH-6

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES			SKIP
107	Does your household have:		YES	NO	
	Electricity?	ELECTRICITY	1	2	
	A radio?	RADIO	1	2	
	A television?	TELEVISION	1	2	
	A mobile telephone?	MOBILE TELEPHONE	1	2	
	A non-mobile telephone?	NON-MOBILE TELEPHONE	1	2	
	A refrigerator?	REFRIGERATOR	1	2	
	A computer?	COMPUTER	1	2	
108	What type of fuel does your household mainly use for cooking?	ELECTRICITY ..... 01 LPG ..... 02 NATURAL GAS ..... 03 BIOGAS ..... 04 KEROSENE ..... 05 COAL, LIGNITE ..... 06 CHARCOAL ..... 07 WOOD ..... 08 STRAW/SHRUBS/GRASS ..... 09 AGRICULTURAL CROP ..... 10 ANIMAL DUNG ..... 11 NO FOOD COOKED IN HOUSEHOLD ..... 95 OTHER _____ 96 (SPECIFY)			
109	MAIN MATERIAL OF THE FLOOR. RECORD OBSERVATION.	NATURAL FLOOR EARTH/SAND ..... 11 DUNG ..... 12 RUDIMENTARY FLOOR WOOD PLANKS ..... 21 PALM/BAMBOO ..... 22 FINISHED FLOOR PARQUET OR POLISHED WOOD ..... 31 VINYL OR ASPHALT STRIPS ..... 32 CERAMIC TILES ..... 33 CEMENT ..... 34 CARPET ..... 35 OTHER _____ 96 (SPECIFY)			
110	MAIN MATERIAL OF THE ROOF. RECORD OBSERVATION.	NATURAL ROOFING NO ROOF ..... 11 THATCH/PALM LEAF ..... 12 SOD ..... 13 RUDIMENTARY ROOFING RUSTIC MAT ..... 21 PALM/BAMBOO ..... 22 WOOD PLANKS ..... 23 CARDBOARD ..... 24 FINISHED ROOFING METAL ..... 31 WOOD ..... 32 CALAMINE/CEMENT FIBER ..... 33 CERAMIC TILES ..... 34 CEMENT ..... 35 ROOFING SHINGLES ..... 36 OTHER _____ 96 (SPECIFY)			

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
111	MAIN MATERIAL OF THE EXTERIOR WALLS. RECORD OBSERVATION.	NATURAL WALLS NO WALLS . . . . . 11 CANE/PALM/TRUNKS . . . . . 12 DIRT . . . . . 13 RUDIMENTARY WALLS BAMBOO WITH MUD . . . . . 21 STONE WITH MUD . . . . . 22 UNCOVERED ADOBE . . . . . 23 PLYWOOD . . . . . 24 CARDBOARD . . . . . 25 REUSED WOOD . . . . . 26 FINISHED WALLS CEMENT . . . . . 31 STONE WITH LIME/CEMENT . . . . . 32 BRICKS . . . . . 33 CEMENT BLOCKS . . . . . 34 COVERED ADOBE . . . . . 35 WOOD PLANKS/SHINGLES . . . . . 36 OTHER _____ 96 (SPECIFY)	
112	How many rooms in this household are used for sleeping?	ROOMS . . . . . [ ][ ]	
113	Does any member of this household own: A watch? A bicycle? A motorcycle or motor scooter? An animal-drawn cart? A car or truck? A boat with a motor? A boat without a motor?	YES NO WATCH . . . . . 1 2 BICYCLE . . . . . 1 2 MOTORCYCLE/SCOOTER . . . 1 2 ANIMAL-DRAWN CART . . . . . 1 2 CAR/TRUCK . . . . . 1 2 BOAT WITH MOTOR . . . . . 1 2 BOAT WITHOUT MOTOR . . . 1 2	
114	Does any member of this household own any agricultural land?	YES . . . . . 1 NO 2	→ 116
115	How many hectares of agricultural land do members of this household own? IF 95 OR MORE, CIRCLE '950'.	HECTARES . . . . . [ ][ ] . [ ] 95 OR MORE HECTARES . . . . . 950 DON'T KNOW 998	
116	Does this household own any livestock, herds, other farm animals, or poultry?	YES . . . . . 1 NO 2	→ 118
117	How many of the following animals does this household own? IF NONE, ENTER '00'. IF 95 OR MORE, ENTER '95'. IF UNKNOWN, ENTER '98'. Local cows? Milk cows? Bulls? Goats? Sheep? Chickens? Pigs? Rabbits? Horses, donkeys, or mules?	LOCAL COWS . . . . . [ ][ ] MILK COWS . . . . . [ ][ ] BULLS . . . . . [ ][ ] GOATS . . . . . [ ][ ] SHEEP . . . . . [ ][ ] CHICKENS . . . . . [ ][ ] PIGS . . . . . [ ][ ] RABBITS . . . . . [ ][ ] HORSES/DONKEYS/MULES [ ][ ]	

HH-8

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
118	Does any member of this household have a bank account?	YES . . . . . 1 NO 2	
119	At any time in the past 12 months, has anyone come into your dwelling to spray the interior walls against mosquitoes?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 121
120	Who sprayed the dwelling?	GOVERNMENT WORKER/PROGRAM . . . . . A PRIVATE COMPANY . . . . . B NONGOVERNMENTAL ORGANIZATION (NGO) . . . . . C OTHER _____ (SPECIFY) X DON'T KNOW . . . . . Z	
121	Does your household have any mosquito nets that can be used while sleeping?	YES . . . . . 1 NO 2	→ 133
122	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS . . . . . [ ]	

		NET #1	NET #2	NET #3
123	ASK THE RESPONDENT TO SHOW YOU ALL THE NETS IN THE HOUSEHOLD IF MORE THAN 3 NETS, USE ADDITIONAL QUESTIONNAIRE(S).	OBSERVED . . . . . 1 NOT OBSERVED . . . 2	OBSERVED . . . . . 1 NOT OBSERVED . . . 2	OBSERVED . . . . . 1 NOT OBSERVED . . . 2
124	How many months ago did your household get the mosquito net? IF LESS THAN ONE MONTH AGO, RECORD '00'.	MONTHS AGO . . . [ ][ ] MORE THAN 36 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . [ ][ ] MORE THAN 36 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . [ ][ ] MORE THAN 36 MONTHS AGO . . . 95 NOT SURE 98
124A	How did you obtain the net?	DURING IMMUNIZATION OF CHILDREN . . . 11 DURING IMMUNIZATION CAMPAIGN 12 DURING ANC VISIT 13 FROM A COMMUNITY HEALTH WORKER . . . . . 14 FROM PHARMACY 15 FROM SHOP . . . . . 16 OTHER _____ 96 SPECIFY	DURING IMMUNIZATION OF CHILDREN . . . 11 DURING IMMUNIZATION CAMPAIGN 12 DURING ANC VISIT 13 FROM A COMMUNITY HEALTH WORKER . . . . . 14 FROM PHARMACY 15 FROM SHOP . . . . . 16 OTHER _____ 96 SPECIFY	DURING IMMUNIZATION OF CHILDREN . . . 11 DURING IMMUNIZATION CAMPAIGN 12 DURING ANC VISIT 13 FROM A COMMUNITY HEALTH WORKER . . . . . 14 FROM PHARMACY 15 FROM SHOP . . . . . 16 OTHER _____ 96 SPECIFY
125	OBSERVE OR ASK THE BRAND/ TYPE OF MOSQUITO NET. IF BRAND IS UNKNOWN AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS	LONG-LASTING INSECTICIDE-TREATED NET (LLIN) PERMANET/MAMA NET/TUZANET OLYSET/NET PROTECT . . . 11 OTHER LLIN DK BRAND . . . 16 (SKIP TO 128) OTHER BRAND . . . 96 DK BRAND 98	LONG-LASTING INSECTICIDE-TREATED NET (LLIN) PERMANET/MAMA NET/TUZANET OLYSET/NET PROTECT . . . 11 OTHER LLIN DK BRAND . . . 16 (SKIP TO 128) OTHER BRAND . . . 96 DK BRAND 98	LONG-LASTING INSECTICIDE-TREATED NET (LLIN) PERMANET/MAMA NET/TUZANET OLYSET/NET PROTECT . . . 11 OTHER LLIN DK BRAND . . . 16 (SKIP TO 128) OTHER BRAND . . . 96 DK BRAND 98
126	Since you got the net, was it ever soaked or dipped in a liquid to kill or repel mosquitoes?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 128) NOT SURE 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 128) NOT SURE 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 128) NOT SURE 8
127	How many months ago was the net last soaked or dipped? IF LESS THAN ONE MONTH AGO, RECORD '00'.	MONTHS AGO . . . [ ][ ] MORE THAN 24 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . [ ][ ] MORE THAN 24 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . [ ][ ] MORE THAN 24 MONTHS AGO . . . 95 NOT SURE 98
128	**OBSERVE CONDITION OF MOSQUITO NET:** DOES IT HAVE HOLES THAT ARE EQUAL TO OR LARGER THAN THE TIP OF YOUR THUMB?	YES . . . . . 1 NO 2	YES . . . . . 1 NO 2	YES . . . . . 1 NO 2
128A	OBSERVE OR ASK THE SHAPE OF THE MOSQUITO NET.	CONICAL . . . . . 1 RECTANGLE 2	CONICAL . . . . . 1 RECTANGLE 2	CONICAL . . . . . 1 RECTANGLE 2

HH-10

		NET #1	NET #2	NET #3
128B	How many times did you wash this mosquito net since you have it?	TIMES WASHED . . . [ ][ ] MORE THAN 95 TIMES . . . . . 95 NOT SURE 98	TIMES WASHED . . . [ ][ ] MORE THAN 95 TIMES . . . . . 95 NOT SURE 98	TIMES WASHED . . . [ ][ ] MORE THAN 95 TIMES . . . . . 95 NOT SURE 98
128C	Did anyone sleep under this mosquito net last night?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 130) ←┤ NOT SURE 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 130) ←┤ NOT SURE 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 130) ←┤ NOT SURE 8
129	Who slept under this mosquito net last night? RECORD THE PERSON'S NAME AND LINE NUMBER FROM THE HOUSEHOLD SCHEDULE.	NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]
		NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]
		NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]
		NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]	NAME_____ LINE NO. . . . . [ ][ ]
130		GO BACK TO 123 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 131.	GO BACK TO 123 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 131.	GO TO 123 IN FIRST COLUMN OF A NEW QUESTIONNAIRE; OR, IF NO MORE NETS, GO TO 131.

131	When do you usually wash your net(s)?	NEVER WASH . . . . . 1 USUALLY WASH IN THE MORNING . . . . . 2 IN THE AFTERNOON . . . . . 3 IN THE EVENING 4	→ 133
132	Why do you wash your net(s)?	BECAUSE THE NET IS DIRTY . . . . . 1 BECAUSE THE NET SMELLS BAD . . . . . 2 OTHER REASON _____ 6 SPECIFY	
133	Which color of the net do you prefer?	WHITE . . . . . 1 BLUE . . . . . 2 PINK . . . . . 3 GREEN . . . . . 4 OTHER _____ 6 SPECIFY	

HH-11

24 September 2012

MALARIA INDICATOR SURVEY
WOMAN'S QUESTIONNAIRE

REPUBLIC OF RWANDA
MALARIA & OTHER PARASITIC DISEASES DIVISION

IDENTIFICATION (1)

PLACE NAME _____

NAME OF HOUSEHOLD HEAD _____

CLUSTER NUMBER . . . . . [ ][ ][ ]

HOUSEHOLD NUMBER . . . . . [ ][ ]

NAME AND LINE NUMBER OF WOMAN _____ [ ][ ]

INTERVIEWER VISITS

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

*RESULT CODES:

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

SUPERVISOR	OFFICE EDITOR	KEYED BY
NAME _____ [ ][ ][ ]	[ ][ ]	[ ][ ]

(1) This section should be adapted for country-specific survey design.

W-1

SECTION 1. RESPONDENT'S BACKGROUND

INTRODUCTION AND CONSENT

INFORMED CONSENT

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

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

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101	RECORD THE TIME.	HOUR . . . . . [ ][ ] MINUTES . . . . . [ ][ ]	
102	In what month and year were you born?	MONTH . . . . . [ ][ ] DON'T KNOW MONTH . . . . . 98 YEAR . . . . . [ ][ ][ ][ ] DON'T KNOW YEAR 9998	
103	How old were you at your last birthday? COMPARE AND CORRECT 102 AND/OR 103 IF INCONSISTENT.	AGE IN COMPLETED YEARS [ ][ ]	
104	Have you ever attended school?	YES . . . . . 1 NO 2	→ 108
105	What is the highest level of school you attended: primary, secondary, or higher?	PRIMARY . . . . . 1 POST-PRIMARY/VOCATIONAL . . . . . 2 SECONDARY . . . . . 3 TERTIARY . . . . . 4 PRE-PRIMARY 6	
106	What is the highest (grade/form/year) you completed at that level? IF COMPLETED LESS THAN ONE YEAR AT THAT LEVEL, RECORD '00'.	GRADE/FORM/YEAR . . . . . [ ][ ]	
107	CHECK 105: PRIMARY [ ] ↓ POST-PRIMARY/ VOCATIONAL SECONDARY OR HIGHER [ ] →		109

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
108	Now I would like you to read this sentence to me. SHOW CARD 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	
109	What is your religion?	CATHOLIC . . . . . 1 PROTESTANT . . . . . 2 ADVENTIST . . . . . 3 MUSLIM . . . . . 4 TRADITIONAL . . . . . 5 OTHER _____ 6 SPECIFY NO RELIGION 7	
109A	Have you ever heard any illness called malaria?	YES . . . . . 1 NO 2	 → 201
109B	Can you tell me the main sign or symptom of malaria? MULTIPLE RESPONSES POSSIBLE PROBE ONCE (ANYTHING ELSE?)	FEVER . . . . . A FEELING COLD . . . . . B HEADACHE . . . . . C NAUSEA AND VOMITING . . . . . D DIARRHEA . . . . . E DIZZINESS . . . . . F LOSS OF APPETITE . . . . . G BODY ACHE OR JOINT PAIN . . . . . H PALE EYES . . . . . I SALTY TASTING PALMS . . . . . J BODY WEAKNESS . . . . . K REFUSING TO EAT OR DRINK . . . . . L OTHER _____ X SPECIFY	
109C	In your opinion, what causes malaria? MULTIPLE RESPONSES POSSIBLE PROBE ONCE (ANYTHING ELSE?)	MOSQUITO BITES . . . . . A EATING IMMATURE SUGACANE . . . B EATING DIRTY FOOD . . . . . C DRINKING DIRTY WATER . . . . . D GETTING SOAKED WITH RAIN . . . . . E COLD OR CHANGING WEATHER . . . F WITCHCRAFT . . . . . G OTHER _____ X SPECIFY DON'T KNOW . . . . . Z	
109D	How can someone protect themselves against malaria? MULTIPLE RESPONSES POSSIBLE PROBE ONCE (ANYTHING ELSE?)	SLEEP UNDER A MOSQUITO NET . . . A SLEEP UNDER A INSECTICIDE TREATED MOSQUITO NET . . . . . B USE MOSQUITO REPELLANT . . . . . C AVOID MOSQUITO BITES . . . . . D TAKE PREVENTIVE MEDICATION . . . E SPRAY HOUSE WITH INSECTICIDE . F USE MOSQUITO COILS . . . . . G CUT THE GRASS AROUND THE HOUSE . . . . . H FILL IN PUDDLES (STAGNANT WATER) . . . . . I KEEP HOUSE SURROUNDINGS CLEAN . . . . . J BURN LEAVES . . . . . K DON'T DRINK DIRTY WATER . . . . . L DON'T EAT BAD FOOD . . . . . M PUT MOSQUITO SCREENS ON THE WINDOWS . . . . . N DON'T GET SOAKED WITH RAIN . . . O OTHER _____ X SPECIFY DON'T KNOW . . . . . Z	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
109E	Where can someone receive treatment for malaria? MULTIPLE RESPONSES POSSIBLE PROBE ONCE (ANYTHING ELSE?)	PUBLIC/AGREE SECTOR REF. HOSPITAL . . . . . A DIST. HOSPITAL . . . . . B HEALTH CENTER . . . . . C HEALTH POST . . . . . D OUTREACH . . . . . E COMMUNITY HEALTH WORKER . . . F OTHER PUBLIC FACILITY . . . . . G _____ (SPECIFY) PRIVATE MED. SECTOR POLYCLINIC . . . . . H CLINIC . . . . . I DISPENSARY . . . . . J PHARMACY . . . . . K OTHER PRIVATE MEDICAL FACILITY . . . . . L _____ (SPECIFY) OTHER SOURCE KIOSK . . . . . M TRADITIONAL PRACTITIONER . . . N CHURCH . . . . . O FRIEND/RELATIVE . . . . . P OTHER _____ (SPECIFY) X DON'T KNOW . . . . . Z	
111	In the past six months, have you seen or heard any messages about malaria?	YES . . . . . 1 NO 2	→ 201
112	Have you seen or heard these messages: On the radio? On the television? On a poster or billboard? From a community health worker? At a community event? Anywhere else?	YES / NO RADIO . . . . . 1 / 2 TELEVISION . . . . . 1 / 2 POSTER OR BILLBOARD 1 / 2 COMMUNITY HEALTH WORKER . . . . . 1 / 2 COMMUNITY EVENT . . . 1 / 2 ANYWHERE ELSE . . . . . 1 / 2	

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 given birth?	YES . . . . . 1 NO 2	→ 206
202	Do you have any sons or daughters to whom you have given birth who are now living with you?	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 sons or daughters to whom you have given birth 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 given birth to a boy or girl who was born alive but 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 BIRTHS . . . . . [ ][ ]	
209	CHECK 208: Just to make sure that I have this right: you have had in TOTAL _____ births during your life. Is that correct? YES [ ] ↓ NO [ ] → PROBE AND CORRECT 201-208 AS NECESSARY.		
210	Now I'd like to ask you about your more recent births. How many births have you had in the last 6 years? IF NONE, CIRCLE '00.'	TOTAL IN THE LAST 6 YEARS . . . . . [ ][ ] NONE 00	→ 224

211 Now I would like to record the names of all your births **in the last six years**, whether still alive or not, starting with the most recent one you had.
RECORD NAMES OF ALL THE BIRTHS IN THE LAST 6 YEARS IN 212. RECORD TWINS AND TRIPLETS ON SEPARATE ROWS.

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

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
221	Have you had any live births since the birth of (NAME OF MOST RECENT BIRTH)? IF YES, RECORD BIRTH(S) IN TABLE.	YES . . . . . 1 NO 2	
222	COMPARE 210 WITH NUMBER OF BIRTHS IN HISTORY ABOVE AND MARK: NUMBERS ARE SAME ☐ ↓ NUMBERS ARE DIFFERENT ☐ → (PROBE AND RECONCILE.)		
223	CHECK 215: ENTER THE NUMBER OF BIRTHS IN 2007 OR LATER.	NUMBER OF BIRTHS . . . . . ☐ NONE 0	
224	Are you pregnant now?	YES . . . . . 1 NO . . . . . 2 UNSURE 8	→ 226
225	How many months pregnant are you? RECORD NUMBER OF COMPLETED MONTHS.	MONTHS . . . . . ☐☐	
226	CHECK 223: ONE OR MORE BIRTHS IN 2007 OR LATER ☐ ↓ NO BIRTHS IN 2007 OR LATER ☐ → 426 Q. 223 IS BLANK ☐ → 426		

SECTION 3. PREGNANCY AND INTERMITTENT PREVENTATIVE TREATMENT

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
301	CHECK 212 AND 216: ENTER IN THE TABLE THE NAME AND SURVIVAL STATUS OF THE MOST RECENT BIRTH. Now I would like to ask some questions about your last pregnancy that resulted in a live birth.		
301A	FROM 212 AND 216, LINE 01:	MOST RECENT BIRTH NAME _____ LIVING ☐ DEAD ☐	
302	When you were pregnant with (NAME), did you see anyone for antenatal care for this pregnancy?	YES . . . . . 1 NO 2	→ 304
303	Whom did you see? Anyone else? PROBE TO IDENTIFY EACH TYPE OF PERSON AND RECORD ALL MENTIONED.	HEALTH PERSONNEL DOCTOR . . . . . A NURSE/MEDICAL ASSIST. . . . . B MIDWIFE . . . . . C OTHER PERSON TRADITIONAL BIRTHATTENDANT D COMMUNITY HEALTH WORKER E COMMUNITY HEALTH MOTHER AND CHILD . . . . . F OTHER _____ X (SPECIFY)	
304	CHECK 215 AND 216: ONE OR MORE LIVING CHILDREN BORN IN 2007 OR LATER ☐ → GO TO 401 NO LIVING CHILDREN BORN IN 2007 OR LATER ☐		→ 426

SECTION 4. FEVER IN CHILDREN

401	CHECK 212 AND 216: ENTER IN THE TABLE THE BIRTH HISTORY NUMBER, NAME, AND SURVIVAL STATUS OF EACH BIRTH IN 2007 OR LATER. ASK THE QUESTIONS ABOUT ALL OF THESE BIRTHS. BEGIN WITH THE MOST RECENT BIRTH. (IF THERE ARE MORE THAN 3 BIRTHS, USE AN ADDITIONAL QUESTIONNAIRE). Now I would like to ask some questions about the health of your children born since January 2007. (We will talk about each separately.)			
402	BIRTH HISTORY NUMBER FROM 212 IN BIRTH HISTORY	MOST RECENT BIRTH BIRTH HISTORY NUMBER [ ][ ]	SECOND MOST RECENT BIRTH BIRTH HISTORY NUMBER [ ][ ]	THIRD MOST RECENT BIRTH BIRTH HISTORY NUMBER [ ][ ]
403	FROM 212 AND 216	NAME _____ LIVING ☐ DEAD ☐ (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 426)	NAME _____ LIVING ☐ DEAD ☐ (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 426)	NAME _____ LIVING ☐ DEAD ☐ (GO TO 403 IN MOST RECENT COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 426)
404	Has (NAME) been ill with a fever at any time in the last 2 weeks?	YES . . . . . 1 NO . . . . . 2 (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 426) DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 426) DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 (GO TO 403 IN MOST RECENT COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 426) DON'T KNOW 8
405	At any time during the illness, did (NAME) have blood taken from his/her finger or heel for testing?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8
406	Did you seek advice or treatment for the illness from any source?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 410)	YES . . . . . 1 NO . . . . . 2 (SKIP TO 410)	YES . . . . . 1 NO . . . . . 2 (SKIP TO 410)
407	Where did you seek advice or treatment? Anywhere else? PROBE TO IDENTIFY EACH TYPE OF SOURCE. IF UNABLE TO DETERMINE IF PUBLIC OR PRIVATE SECTOR, WRITE THE NAME OF THE PLACE. _____ (NAME OF PLACE(S))	PUBLIC/AGREE SECTOR REF. HOSPITAL . A DIST. HOSPITAL . B HEALTH CENTER C HEALTH POST . . . D OUTREACH . . . E COMMUNITY HEALTH WORKER . . . F OTHER PUBLIC FACILITY _____ G (SPECIFY) PRIVATE MED. SECTOR POLYCLINIC . . . H CLINIC . . . . . I DISPENSARY J PHARMACY K OTHER PRIVATE MED. FACILITY _____ L (SPECIFY) OTHER SOURCE KIOSK . . . . . M TRADITIONAL PRACTITIONER N CHURCH . . . . . O FRIEND/RELATIVE P OTHER _____ X (SPECIFY)	PUBLIC/AGREE SECTOR REF. HOSPITAL . A DIST. HOSPITAL . B HEALTH CENTER C HEALTH POST . . . D OUTREACH . . . E COMMUNITY HEALTH WORKER . . . F OTHER PUBLIC FACILITY _____ G (SPECIFY) PRIVATE MED. SECTOR POLYCLINIC . . . H CLINIC . . . . . I DISPENSARY J PHARMACY K OTHER PRIVATE MED. FACILITY _____ L (SPECIFY) OTHER SOURCE KIOSK . . . . . M TRADITIONAL PRACTITIONER N CHURCH . . . . . O FRIEND/RELATIVE P OTHER _____ X (SPECIFY)	PUBLIC/AGREE SECTOR REF. HOSPITAL . A DIST. HOSPITAL . B HEALTH CENTER C HEALTH POST . . . D OUTREACH . . . E COMMUNITY HEALTH WORKER . . . F OTHER PUBLIC FACILITY _____ G (SPECIFY) PRIVATE MED. SECTOR POLYCLINIC . . . H CLINIC . . . . . I DISPENSARY J PHARMACY K OTHER PRIVATE MED. FACILITY _____ L (SPECIFY) OTHER SOURCE KIOSK . . . . . M TRADITIONAL PRACTITIONER N CHURCH . . . . . O FRIEND/RELATIVE P OTHER _____ X (SPECIFY)

NO.	QUESTIONS AND FILTERS	MOST RECENT BIRTH NAME _____	SECOND MOST RECENT BIRTH NAME _____	THIRD MOST RECENT 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 seek advice or treatment? USE LETTER CODE FROM 407.	FIRST PLACE . . . ☐	FIRST PLACE . . . ☐	FIRST PLACE . . . ☐
410	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 426) DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426) DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 (GO TO 403 IN MOST RECENT COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 426) DON'T KNOW 8
411	What drugs did (NAME) take? **(3)** Any other drugs? RECORD ALL MENTIONED.	ANTIMALARIAL DRUGS COARTEM . . . A PRIMO . . . B QUININE . . . . . C OTHER ANTI-MALARIAL _____ . . . D (SPECIFY) ANTIBIOTIC DRUGS PILL/SYRUP . . . G INJECTION . . . H OTHER DRUGS ASPIRIN . . . . . I ACETA-MINOPHEN . . . J IBUPROFEN . . . K OTHER _____ X (SPECIFY) DON'T KNOW . . . . . Z	ANTIMALARIAL DRUGS COARTEM . . . A PRIMO . . . B QUININE . . . . . C OTHER ANTI-MALARIAL _____ . . . D (SPECIFY) ANTIBIOTIC DRUGS PILL/SYRUP . . . G INJECTION . . . H OTHER DRUGS ASPIRIN . . . . . I ACETA-MINOPHEN . . . J IBUPROFEN . . . K OTHER _____ X (SPECIFY) DON'T KNOW . . . . . Z	ANTIMALARIAL DRUGS COARTEM . . . A PRIMO . . . B QUININE . . . . . C OTHER ANTI-MALARIAL _____ . . . D (SPECIFY) ANTIBIOTIC DRUGS PILL/SYRUP . . . G INJECTION . . . H OTHER DRUGS ASPIRIN . . . . . I ACETA-MINOPHEN . . . J IBUPROFEN . . . K OTHER _____ X (SPECIFY) DON'T KNOW . . . . . Z
412	CHECK 411: ANY CODE A-D CIRCLED?	YES ☐ / NO ☐ (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426)	YES ☐ / NO ☐ (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426)	YES ☐ / NO ☐ (GO TO 403 IN MOST RECENT COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 426)

NO.	QUESTIONS AND FILTERS	MOST RECENT BIRTH NAME _____	SECOND MOST RECENT BIRTH NAME _____	THIRD MOST RECENT BIRTH NAME _____
413	CHECK 411: COARTEM ('A') GIVEN	CODE 'A' CIRCLED ☐ CODE 'A' NOT CIRCLED ☐ (SKIP TO 415)	CODE 'A' CIRCLED ☐ CODE 'A' NOT CIRCLED ☐ (SKIP TO 415)	CODE 'A' CIRCLED ☐ CODE 'A' NOT CIRCLED ☐ (SKIP TO 415)
414	How long after the fever started did (NAME) first take (COARTEM)?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
415	CHECK 411: PRIMO ('B') GIVEN	CODE 'B' CIRCLED ☐ CODE 'B' NOT CIRCLED ☐ (SKIP TO 417)	CODE 'B' CIRCLED ☐ CODE 'B' NOT CIRCLED ☐ (SKIP TO 417)	CODE 'B' CIRCLED ☐ CODE 'B' NOT CIRCLED ☐ (SKIP TO 417)
416	How long after the fever started did (NAME) first take PRIMO?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
417	CHECK 411: QUININE ('C') GIVEN	CODE 'C' CIRCLED ☐ CODE 'C' NOT CIRCLED ☐ (SKIP TO 423)	CODE 'C' CIRCLED ☐ CODE 'C' NOT CIRCLED ☐ (SKIP TO 423)	CODE 'C' CIRCLED ☐ CODE 'C' NOT CIRCLED ☐ (SKIP TO 423)
418	How long after the fever started did (NAME) first take QUININE?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8

NO.	QUESTIONS AND FILTERS	MOST RECENT BIRTH NAME _____	SECOND MOST RECENT BIRTH NAME _____	THIRD MOST RECENT BIRTH NAME _____
423	CHECK 411: OTHER ANTIMALARIAL ('D') GIVEN	CODE 'D' CIRCLED ☐ CODE 'D' NOT CIRCLED ☐ (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426)	CODE 'D' CIRCLED ☐ CODE 'D' NOT CIRCLED ☐ (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426)	CODE 'D' CIRCLED ☐ CODE 'D' NOT CIRCLED ☐ (GO TO 403 IN MOST RECENT COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 426)
424	How long after the fever started did (NAME) first take (OTHER ANTIMALARIAL)?	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . . 0 NEXT DAY . . . . . 1 TWO DAYS AFTER FEVER . . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . . 3 DON'T KNOW . . . 8
425		GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426.	GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 426.	GO TO 403 IN MOST RECENT COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 426.
426	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: _____

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