Ethiopia National Malaria Indicator Survey

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This report summarizes the findings of the 2007 Ethiopia National Malaria Indicator Survey carried out from October through December 2007. The survey was implemented by the Malaria and Other Vector-Borne Diseases Prevention and Control team of the Federal Ministry of Health Ethiopia, the Central Statistics Agency, the World Health Organization, the United States Agency for International Development and the US Centers for Disease Control and Prevention (US President's Malaria Initiative), The Carter Center, the United Nations Children's Fund of Ethiopia, the Center for National Health Development in Ethiopia, the Malaria Consortium and the Malaria Control and Evaluation Partnership in Africa, a program at PATH.

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Acronyms and Terms

ACT	Artemisinin-based combination therapy
ANC	Antenatal clinic
CDC	US Centers for Disease Control and Prevention
CNHDE	Center for National Health Development in Ethiopia
CSA	Central Statistical Agency
DHS	Demographic and health surveys
DPPA	Disaster Prevention and Preparedness Agency
EA	Enumeration area
FMoH	Federal Ministry of Health
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoE	Government of Ethiopia
GPS	Global positioning system
HAPCO	HIV/AIDS Prevention and Control Office
IEC	Information education communication
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
KAP	Knowledge, attitudes, and practices
LLIN	Long-lasting insecticidal net
M&E	Monitoring and evaluation
MACEPA	Malaria Control and Evaluation Partnership in Africa
MERG	Monitoring and Evaluation Reference Group
MIS	Malaria indicator survey
NGO	Nongovernmental organization
NMPCU	National Malaria Prevention Control Unit
NMSP	National Malaria Strategic Plan
PATH	Program for Appropriate Technology in Health
PDA	Personal digital assistant

PMI	US President's Malaria Initiative
RHB	Regional Health Bureau
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SNNPR	Southern Nations, Nationalities, and People's Region
SOP	Standard operating procedures
SP	Sulfadoxine-pyrimethamine
TCC–Ethiopia	The Carter Center–Ethiopia
TCC–Atlanta	The Carter Center–Atlanta
TOT	Training of trainers
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

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Preface

It is not unusual to determine what direction to take by looking at where we are and where we have been. However, we can't navigate wildly, and careful planning, monitoring, and evaluation processes are more important than ever to maximize the benefits of the limited resources we have. Accordingly, the Federal Ministry of Health, together with its partners, decided to conduct malaria indicator surveys and publish reports every two years, starting in 2007. This is meant to assist policymakers, health care providers, and partners to have a source of important knowledge that can be used to inform decisions and form the basis for action and benchmarks for assessing progress in the areas of malaria prevention and control.

Malaria should no longer be a major threat to the development endeavors of Ethiopia. The Federal Ministry of Health, in collaboration with its partners, is determined to wage an all-out battle against malaria in line with the targets set by the Health Sector Development Programme III and the National Malaria Strategic Plan 2006–2010. We are on the offensive by embarking on an aggressive scale-up of antimalaria interventions including prompt and effective diagnosis and treatment, universal coverage with long-lasting insecticidal nets (LLINs), and indoor residual spraying in target areas where malaria takes its greatest toll. We have set for ourselves high coverage targets of these interventions. By scaling up for impact, we are confident that we can achieve our strategic goals of significantly reducing malaria-associated illness and eliminating malaria-related deaths, as well as reducing the prevalence rates of malaria parasitemia to a level where it is no longer a serious public health threat. Clear understanding of our progress toward these goals demands strong monitoring and evaluation tools; without the malaria indicator survey as one monitoring and evaluation tool, we can only surmise our progress. Accordingly, a strong health management information system is in place to monitor the malaria situation longitudinally, while a series of malaria indicator surveys will capture valuable community-based information which is beyond the reach of the routine health institution data. In addition, Ethiopia is striving to satisfy its human resource need in monitoring and evaluation through local training of public health personnel in this field at the postgraduate level.

The Ethiopia 2007 National Malaria Indicator Survey represents the first nationally representative assessment of the coverage of the key antimalaria interventions in combination with the measures of malaria-related burden using malaria parasite and anemia prevalence testing among children less than five years of age as well as adults. Comparison of the Demographic and Health Survey 2005 with this survey depicted a great leap forward in controlling malaria in Ethiopia. Of note is the fact that among 21 sub-Saharan African countries, Ethiopia has boosted its rank in insecticide-treated net coverage from near the bottom to near the top, only behind Togo and Sierra Leone, within the last three years. With well-planned procurement, replacement, and distribution efforts, coupled with a strong information, education, and communication/behavior change communication strategy we expect to have nearly perfect coverage and higher utilization rates of LLINs over the next two years. The survey indicates that we need to work hard to better educate people, improve geographic targeting of vector control activities, and boost the use of diagnostic tools (microscopy and rapid diagnostic tests) to maximize the efficient use of resources.

This report includes the malaria situation and coverage of interventions in areas beyond the traditionally known limit of malaria transmission in Ethiopia, i.e., below 2,000 meters altitude. Although patches of this area are affected by rare epidemics triggered by unusual extreme weather events occurring every 2 to 7 years, these areas were not part of our aggressive campaign for universal coverage of the key antimalaria interventions. These areas are covered under the epidemic prevention, preparedness, and response program where interventions are applied based on information collected by the early warning and detection system. Inclusion of these areas in this survey might have underestimated the national coverage figures for LLINs and other control and prevention efforts to some extent. This is also a good opportunity to

stress the need for an updated malaria risk map that should clearly define geographic limits and population targets for our antimalaria interventions. I believe this is the next priority for our malaria control program and its partners.

Finally, I would like to humbly request all partners to make maximum and wise use of this valuable information in the course of their projects so as to address the weaknesses and challenges depicted in this report. I would also like to thank again all the partners acknowledged in this report without whose active involvement this could not have been achieved. I sincerely hope and believe that they will keep up this momentum in the years to come.

Tedros Adhanom Ghebreyesus (PhD)
Minister of Health

Executive Summary

Sixty-eight percent of Ethiopia's population is at risk of malaria, representing approximately 52 million people in 2007. Malaria is seasonal in most parts of Ethiopia, with unstable malaria transmission, rendering the country prone to epidemics. The transmission patterns and intensity vary greatly due to the large diversity in altitude, rainfall, and population movement; areas below 2,000 meters are considered to be malarious (or potentially malarious). Large scale-up of malaria control interventions, especially distribution of long-lasting insecticidal nets (LLINs) and nationwide deployment of artemether-lumefantrine, began in 2005.

Ethiopia's 2007 National Malaria Indicator Survey (2007 MIS) is a large, nationally representative survey of coverage of key malaria interventions, treatment-seeking behavior, malaria prevalence in all age groups, anemia prevalence in children under age five years, malaria knowledge among women, and indicators of socioeconomic status. The survey was conducted by the Federal Ministry of Health in collaboration with the Central Statistics Agency, the Malaria Control and Evaluation Partnership in Africa (a program at PATH), The Carter Center, the President's Malaria Initiative (US Centers for Disease Control and Prevention/United States Agency for International Development), the World Health Organization, the United Nations Children's Fund, the Center for National Health Development in Ethiopia, and the Malaria Consortium.

The survey was based on a two-stage cluster sample of 7,621 households surveyed in 319 valid census enumeration areas (EAs), randomly selected in three malarious strata from all regions and urban areas of the country. The strata were 1) all areas <1,500m in altitude; 2) urban areas ≥1,500 to ≤2,500m; 3) rural areas ≥1,500 to ≤2,500m. The total number of persons residing in the sampled households was 32,380, including 16.7% children under age 5 years and 1.8% self-reported pregnant women. To meet the needs of partner organizations, oversampling was done in two regions (Amhara and Oromiya). The survey was conducted during October, November, and December 2007 (malaria transmission season) by 25 teams, using standard questionnaires programmed into personal digital assistants (PDAs).

In each selected EA, all households were mapped and 25 households were randomly selected by the PDA program. Interviews regarding household characteristics and nets were done in all 25 households of the cluster. Blood samples were taken from all children under age five years (with parents' consent) in every household, and from persons of all ages in eight randomly selected households per cluster. Interviews regarding reproductive history, fever treatment, and malaria knowledge were conducted with 6,607 women of child-bearing age. Malaria parasite testing was done using ParaScreen® rapid diagnostic tests (RDTs) to facilitate case management during the survey, and both thick and thin smear blood slides were taken to assess malaria infection rates. Hemoglobin testing for anemia was done using Hemocue Hb 201 analyzers for children under age five years. Results are based on a total of 7,621 household questionnaires, 6,657 women's questionnaires, 10,578 blood slides examined, and 4,846 anemia tests.

Since some parts of Ethiopia are malaria-free, only those areas below 2,000 meters (m) of altitude are targeted to receive interventions such as LLINs. Areas are targeted for key antimalaria interventions at different levels of the health system, especially by

local health authorities and zonal/regional health bureaus, based on criteria such as altitude, morbidity data, and history of epidemics. Indoor residual spraying (IRS) is conducted only in selected villages within the malarious areas.

Data are reported for all households surveyed in clusters below 2,500m in altitude and also separately for clusters situated below 2,000m. The MIS results indicate that in areas below 2,000m, 65.6% of households own at least one insecticide-treated net (ITN) and 65.3% of households own at least one LLIN. Nationally, 55.7% of the households own at least one net of any kind, 53.8% own at least one ITN, and 53.1% own at least one LLIN. Among children under age five years, 43.8% reported sleeping under a net the previous night in households below 2,000m, and 34.7% nationally. Among pregnant women living in households below 2,000m, 44.8% reported sleeping under a net the previous night, 36.7% nationally. In households owning at least one ITN, 60.1% of children under age five years and 65.7% of pregnant women slept under a new the previous night. IRS had been conducted in 20.0% of households below 2,000m in the 12 months preceding the survey, and 14.2% of households nationally.

Overall, 22.3% of children under age five years reported a fever in the two weeks preceding the survey. Of these, 15.4% sought medical attention within 24 hours of onset of fever, 9.5% took an antimalarial drug, and 3.9% took the drug the same day of fever onset. Among those who were treated with an antimalarial drug, 41.3% took an antimalarial within 24 hours of onset of fever, and 42.6% were treated with an ACT. Among the febrile children who were treated with an antimalarial the same day of fever onset, 6.7% sought their treatment from a health extension worker, 27.6% from another level of government health facility, 36.4% from private health providers, 12.8% used home treatment, and 1.5% sought treatment from shops.

By microscopy, parasite prevalence in all ages was 0.7%, with 76% of infections being *P. falciparum* and 24% *P. vivax*. Severe anemia (HB<8 g/dl) was found in 5.5% of children under age five years and peaked in children ages two to three years at 8.5%.

Chapter 1: Introduction

1. Background

Malaria transmission intensity, along with its temporal and spatial distribution in Ethiopia, is mainly determined by the diverse eco-climatic conditions. Climatic factors such as temperature, rainfall, and humidity show high variability mainly as a function of altitude and are the most important variables that influence malaria transmission.[1] Based on this altitudinal variation and associated climatic characteristics, areas of the country are categorized into climatic zones, namely, the cold zone locally known as "Dega"; the hot zone, "Kolla"; and areas of average climatic conditions, known as "Weyna Dega."

The cold zone, which covers areas higher than 2,500 meters (m) above sea level, has a mean annual temperature of 10–15°C. This highland area is considered free of local malaria transmission. The midland area, ranging in altitude from 1,500–2,500m with a mean annual temperature between 15–20°C, has diverse malaria transmission patterns. In the hot lowland zone, located in areas below 1,500m above sea level, where the mean annual temperature varies from 20–25°C, malaria transmission is endemic, and its intensity and duration are mainly dictated by the amount and duration of rainfall.[2] In the midland zone, where temperature is a determining factor, malaria transmission often occurs in areas below 2,000m, while areas between 2,000 and 2,500m may become affected during epidemics.[3,4]

Mean annual precipitation, in general, ranges from 800 to 2,200 millimeters (mm) in the highlands (>1,500m) and varies from less than 200 to 800mm in the lowlands (<1,500m). Rainfall decreases northwards and eastwards from the high rainfall pocket area in the southwest and seasonality is not uniform. The western half of the country has two distinct seasons (wet from June–September and dry from November–February), with the rainfall peak occurring in July and August. The central and most of the eastern part of the country have two rainy periods and one dry period. The south and southeastern parts of Ethiopia have two distinct dry periods (December–February and July–August) and two rain seasons (March–June and September–November). The major malaria transmission season is from September to December, following the main rainy season from June to September and a shorter transmission season from April to May following the short rainy season from December to February.[4]

Due to the unstable and seasonal pattern of malaria transmission, the protective immunity of the population is generally low, and all age groups are at risk of infection and disease. Although there are no nationally representative figures on malaria parasite prevalence prior to this study, some small-scale studies have documented malaria parasite prevalence between 10.4–13.5% in Gambella[5] and 7.6–14.1% in Tigray[6] in all age groups. A large household survey conducted by The Carter Center (TCC) in three regions in late 2006–early 2007 reported a prevalence of 4.1% (4.6% in Amhara, 0.9% in Oromiya, and 5.4% in Southern Nations, Nationalities, and People's Region [SNNPR]),[7] with 57% of infections attributable to *P. falciparum* and observed no statistical difference in infection rates by age group of the sampled population.

The unstable nature of malaria transmission is characterized by frequent focal and cyclical epidemics of irregular interval ranging from 5–8 years. In the Ethiopian

highlands, several large-scale epidemics have been documented since 1958. In that year, an estimated 150,000 people died during a widespread epidemic of malaria in the highlands.[8] Several epidemics have been reported since then. Abnormal transmission of unusual proportions affected the highlands and highland-fringe areas in 1988 and 1991–92, which was associated with abnormally increased minimum temperature.[9] In 1998, widespread epidemics occurred in the highlands, and, in the most recent epidemic in 2003, more than 2 million clinical malaria cases and 3,000 deaths were reported from 3,368 villages in 211 districts.[3]

In 2005–2006, the annual health and health-related indicators of the Federal Ministry of Health (FMoH) reported malaria as a leading cause of morbidity and mortality in the nation.[10] The annual average number of malaria cases based on clinical diagnosis (typically without laboratory confirmation) reported by health facilities over the 2001–2005 period was 9.4 million (range 8.4–11.5). National estimates of the actual number of cases at the population level (again, based on clinical diagnosis) are estimated to be higher (on the order of 10–12 million with 60–70% and 30–40% of the cases due to *P. falciparum* and *P. vivax*, respectively.[11]

The national malaria control and prevention program

Interventions against malaria in Ethiopia first started in the late 1950s in response to the 1958 epidemic. The service was organized by what was then called the Malaria Eradication Service, a pilot project established for 15 years. The Malaria Eradication Service provided malaria diagnosis and treatment with chloroquine and spraying of houses with DDT. With the change of approach from malaria eradication to control in 1972, the malaria control program in Ethiopia was re-organized as a vertical program operating across the country through 17 zonal and 70 sector offices. Laboratory diagnosis and treatment services and seasonal spraying operations were provided through the sector offices.

In 1993, the vertical Malaria Control Program was reorganized in line with the government's plan to democratize and decentralize the health services. In the decentralized system, planning and implementation of malaria prevention and control activities belong to the RHBs, while the federal level is mandated to handle policy and guideline development and capacity building. During the eradication and vertical program era, malaria control personnel were trained in the Malaria Reference Training Center in Nazareth/Adama. Separate basic training for malaria control personnel is not currently provided, and training on basic malariology has little emphasis in the training curricula of health professionals. The newly engaged cadre of health extension workers does receive training on malaria as part of their training on the main 16 health packages that are part of their curriculum.

Following the launch of the Roll Back Malaria (RBM) Partnership in 1998, Ethiopia convened a national consensus-building workshop in March 2000 and started a coordinated action against malaria with its local and international partners. The RBM partners developed a five-year National Strategic Plan for Malaria Prevention and Control (2001–2005) and conducted an RBM baseline survey in 14 districts in 2001 to document baseline information prior to the launch of large-scale interventions.

Scaling up the control program

Major scale-up in malaria prevention and control interventions was implemented in 2003, when the country received support from the Global Fund to Fight AIDS,

Tuberculosis and Malaria (GFATM) for its Round 2 malaria proposal. The implementation of the GFATM-supported activities took some time due to a major change in the country's malaria diagnosis and treatment guidelines, introducing the artemisinin-based combination therapy (ACT) drug artemether-lumefantrine in July 2004. At the same time the FMoH decided to introduce long-lasting insecticidal nets (LLINs) as a method of malaria prevention and control, the global supply of which was not adequate to meet the global demand at that time. This meant that the full effects of the scale up in Ethiopia would not be fully realized until the supply increased.

A major scale-up of malaria prevention and control activities with wide distribution of rapid diagnostic tests (RDTs), ACTs, LLINs and indoor residual spraying (IRS) was started in the third quarter of 2005. These interventions were targeted to suit local epidemiological situations with case management being made available in all malarious areas, while LLINs are primarily targeted for areas below the altitude of 2,000m and IRS targets epidemic-prone areas up to 2,500m of altitude.

In 2005, the FMoH of Ethiopia identified four major areas of intervention for malaria control. The 2006-2010 National Strategic Plan defines the following targets:[11]

- **Early diagnosis and treatment**: provide 100% access to effective and affordable malaria diagnosis and treatment.
- **Selective vector control**: obtain and maintain 100% coverage of all households in malarious areas with an average of two ITNs per household; increase IRS coverage to 60% in epidemic-prone areas.
- **Epidemic prevention and control**: early detection and 80% containment of malaria epidemics within two weeks of onset and strengthening of malaria surveillance in malaria-free areas to institute timely preventive measures.
- **Information education communication (IEC)**: provide 100% of households with targeted IEC on all key malaria messages to increase use of interventions.

In the period between 2004 and 2007, the FMoH, with support from GFATM Rounds 2 and 5, TCC, the United Nations Children's Fund (UNICEF), the United States Agency for International Development (USAID), the World Health Organization (WHO), and other partners procured and distributed a total of 12.5 million RDTs, 15.4 million treatment courses of artemether-lumefantrine, and 17.2 million LLINs. The number of structures targeted for IRS also increased to 4.2 million between 2004 and 2005 as compared to the 3.4 million unit structures targeted between 2001 and 2003.

The second Demographic and Health Survey (DHS),[4] which assessed coverage, treatment status and use of mosquito nets, and prompt access to antimalarial treatment, was conducted in 2005. This survey provided estimates of coverage of these interventions prior to the onset of major scale–up efforts.

Due to the lack of comprehensive representative sampling at the national level and the lack of current data on the status of coverage of essential interventions, assessing program progress has been challenging. In an effort to solve this problem and to ensure timely assessment in program achievements, the 2007 MIS was conducted in Ethiopia from October through December (during malaria transmission season) in 8,165 households within 341 clusters. 544 households in 22 clusters exceeded the altitudinal limit of the survey and were excluded from the analysis, leaving 7,621 households within 319 clusters, for which the results are presented in this report.

The 2007 MIS used methodology recommended by the RBM Monitoring and Evaluation Reference Group (MERG) for national Ministries of Health to collect key and timely national-level information on malaria control. The tools and methodologies used are compatible with existing DHS and multiple indicator cluster surveys. The RBM MERG recommends that MISs take place within 6 weeks of the end of the rainy season. The MIS assesses anemia and parasitemia as an indicator of the burden of malaria, especially among children where attributable impact can be measured as a result of scaling up malaria interventions.

2. Objectives

Ethiopia's nationally representative household survey, following the RBM MERG-recommended MIS guidelines, was conducted to evaluate the progress of the national malaria control program and has the following objectives:

- To measure the coverage of malaria control services including insecticide-treated nets (ITNs), IRS, and antimalarial medicines used for treatment of febrile children, including:
  - Household ownership of nets, treated nets, and LLINs.
  - Use of ITNs among target populations (and especially the most vulnerable, children under age five years and pregnant women).
  - Household application of insecticide.
  - Provision and promptness of antimalarial drugs for febrile episodes.
- To measure the prevalence of fever, malaria parasitemia, and anemia (HB <8g/dl) among children under age five years, and malaria parasitemia among populations of all ages at the household level.

Implementing standardized, representative household survey methods at the national level in Ethiopia will also serve to strengthen the capacity of the National Malaria Control Program and local agencies involved and facilitate future surveys of this type.

3. Sample design

A stratified two-stage cluster sample design was implemented in order to identify sample households. The purpose of stratification was to improve the efficiency (increase the precision) of national estimates and to produce separate estimates of a given precision for the domains. Census EAs were the primary sampling units (PSUs). Households within selected EAs were second-stage sampling units. The sample was designed to generate nationally representative data, but also to accommodate specific partner needs, providing regional data for the Oromiya Regional State (requested by PMI) and zonal data for the Amhara Regional State (requested by TCC).

All enumeration areas in the country in kebeles (villages) with a mean altitude below 2,500m were stratified into <1,500m and ≥1,500m ≤2,500m altitude categories. Each of the altitude-based strata was again further stratified by urban/rural, region state, and zone strata. Domains of estimations for the survey were:

- National (country): Urban for altitude range of ≥1,500m ≤2,500m.
- National (country): Rural for altitude range of ≥1,500m ≤2,500m.
- National (country): For altitude range of <1,500m.
- Zone for Amhara (except Bahir Dar and Argoba special zones).
- Regional State for Oromiya.

Sampling frame

Three sources of information were used in constructing the sampling frame and selecting MIS EAs:

- The list of EAs along with their corresponding population size, obtained from the third round (2007) Population and Housing Census Cartographic Map Work obtained from the Government of Ethiopia's (GoE) Central Statistical Agency (CSA).
- The list of kebeles along with their corresponding altitude, obtained from the GoE's Disaster Prevention and Preparedness Agency (DPPA).
- Altitudinal values obtained from WHO were used to identify the altitudes of unmatched EAs.

Sample size determination and allocation

The sample size was determined using 95% confidence limits, 80% power, a design effect of 1.25 (established based on a similar survey), and 20% adjustment for non-response (from household refusals or abandoned households). In addition, the sample size assumes that 82% of households have children under age six years. Based on the above inputs and assumptions, a minimum sample of 5,650 households was calculated to be necessary to obtain both robust national level information for altitude below 1,500m and urban- and rural-level information for altitudes from 1,500m to 2,500m.

To satisfy the specific programmatic needs of US President's Malaria Initiative (PMI) and TCC, an additional 2,875 households were surveyed. Consequently, 8,525 households throughout the country were needed to achieve reliable precision for all the survey domains mentioned in the above subsection. In particular, 12 EAs and 300 households per zone and a total of 121 EAs and 3,025 households throughout Amhara were estimated to provide the desired precision for zonal estimates. Ninety-three EAs and 2,325 households were, on the other hand, determined to provide reliable regional estimates for Oromiya.

To keep the design effect as low as possible while maximizing the feasibility of the survey, balance had to be struck between the number of households per cluster (trying to minimize this to reduce the design effect) and the number of EAs (trying to minimize this to reduce the cost, transportation, and workload of the survey teams. Taking both the cost required and the precision to be gained into account, surveying 25 sample households per EA was decided to be optimum; five additional households were selected to compensate for not-at-home or absent households. The overall distribution of sample clusters (EAs) and households by stratum is provided in Appendix A. The sampling weights and estimation procedures of totals and ratios are provided in Appendix B.

Survey organization and management

The decision to delegate TCC–Ethiopia to lead the management of the survey, the establishment of a technical working group, and frequent consultative meetings during the planning phase was instrumental in establishing common ground and accommodating the interests of various partners. The decision also was critical to the successful completion of the survey, despite the very short preparatory period. Details of the survey organization are explained and the contributor institutions/individuals to the training program are stated in Appendix C. Survey budget information is in Appendix D.

4. Questionnaires

The design of Ethiopia's 2007 MIS questionnaire was based on the model developed by the RBM MERG which includes a household and a women's questionnaire (see Annex 1). These questionnaires are structured, pre-coded, closed- and open-ended questions adapted by the US Centers for Disease Control and Prevention (CDC)–Atlanta for paper-free data collection using personal digital assistants (PDAs). The original English-version questionnaires were translated into the national language (Amharic) and two additional major languages (Oromifa and Tigrigna) for reference purposes.

The household questionnaire was administered to the head of the household and covered household socio-economic characteristics and malaria-specific issues such as:

- Household characteristics including number of sleeping rooms and places.
- Status of IRS, including whether insecticide had been applied to household structures and whether re-plastering of interior walls of dwellings had taken place.
- Household ownership and utilization of nets, source of origin, and treatment status of nets.

The household questionnaire was used to identify and filter children under age six years for specimen collection and women ages 15–49 years who were eligible to answer the individual women's questionnaire. The women's questionnaire included background characteristics; reproduction, birth history, and current pregnancy status; knowledge, attitudes and practices on malaria preventive and curative aspects; and fever prevalence among children under age five years and treatment-seeking behavior. Blood samples were taken from all children under age five years and from all members of every fourth household. The diagnostic tests included a malaria RDT (ParaScreen®) to facilitate timely management of parasitemic persons, blood slides for microscopic examination, and hemoglobin testing.

5. Personal digital assistants

PDAs were used for the second-stage random sampling and for recording questionnaires and malaria RDT/anemia results. A total of 113 PDAs, including two for supervision, (on average 4.5 PDAs per team) were used in the survey. Two PDA models were used, Hewlett Packard IPAQ HX249X (79%) and Dell Axim–51 (21%). The questionnaires, as well as the household listing, sampling, and navigation programs were integrated and installed in the Windows Mobile 5.0 operating system using Visual Basic developed by the CDC. This integrated program enabled surveyors to conduct the second-stage sampling (household listing within an EA and random selection of 25 households) and navigate to selected households to complete interviewing and specimen collection and testing.

Geographic positioning system (GPS)

Each PDA was equipped with a BC 337 WAAS GPS receiver (Compact–Flash GPS) used to list and map all households within an EA for the second-stage sampling, as well as to navigate surveyors back to selected households.

6. Training and pre-testing activities

Overall, 115 interviewers (all from RHBs), 25 field team leaders (all from RHBs) and 11 supervisors (from TCC, FMoH, UNICEF, WHO, and the Malaria Control and Evaluation

Partnership in Africa [MACEPA], a program at PATH) participated in the training. All interviewers, field team leaders and supervisors were trained during a 10-day workshop on the rationale and methodology of the survey and the PDA/GPS-based data collection technique. Training included an introduction to PDAs and the questionnaire as well as a number of theoretical and practical sessions on questionnaire administration (e.g., role playing in different local languages including English), GPS data collection and geo-referencing of households, laboratory procedures (e.g. blood sampling, preparing microscopic slides, processing samples for RDT, and Hb testing), hazardous waste disposal, and mock interviews. Prior to fieldwork, the questionnaires were pre-tested and adjusted in 10 (5 urban and 5 rural) EAs close to the training center.

7. Community sensitization

Community sensitization activities were implemented by UNICEF-Ethiopia and included formal letters, radio spots, posters, and leaflets. These approaches included information regarding the purpose of the MIS, the procedures, and expectations from local authorities and communities, as well as the importance of household participation. Furthermore, a series of television and radio spots was aired in the national language and in the two other major languages. The spots were aired three times a week, starting one week before the survey for a total period of five weeks.

8. Survey organization, field work, and supportive supervision

Surveyors were organized in 25 teams (50 functional sub-teams). Each team carried a range of supplies and materials, including PDAs with their accessories, uniforms, reagents and instruments for sample collection, smear preparation, testing and staining, antimalarial and antihelminthic drugs, iron syrup or tablets, sensitization letters, posters, leaflets, and camping equipment.

Survey organization

A typical survey team consisted of 6 people (two sub-teams of 2 people each, a team leader and a driver). Some teams (i.e., those assigned to the most remote areas of the country) had 1 extra laboratory technician.

A total of 25 supervisors, 100 surveyors, and 25 drivers were deployed to their respective survey areas. Data were collected in 341 EAs: 91 districts, 71 zones, 9 regions, 1 city council, and 1 city administration. Interviews and tests (anemia, RDTs and blood films) were conducted by all the 25 teams.

Questionnaire administration, specimen collection, and testing

The specimen processing was organized in such a way that all of the 3 tests (anemia test, malaria RDTs, and blood films for microscopic examination of malaria parasites based on WHO guidelines[1]) were performed simultaneously from one surveyed individual's single finger prick. Results are based on a total of 10,637 malaria RDT tests, 10,578 blood slides examined, and 4,846 anemia tests.

Results from the anemia testing and RDTs (processed and interpreted as per manufacturer's instructions) were readily available during the survey, and this opportunity was exploited to strengthen the surveillance system of the health sector at

least during the major malaria transmission season (the survey period) by reporting potential hot spots where malaria cases were clustered.

Treatment

For children diagnosed with anemia (hemoglobin 5–8g/dl), results were shared with the parent/guardian, and the children were given artemether-lumefantrine (CoArtem®) if older than age four months as per the national protocol, albendazole if under age 24 months per IMCI's National Protocol, and a two-week supply of supplemental iron. All infants under 4 months and children with hemoglobin <5g/dl were referred to the nearest health facility for further evaluation and treatment. The treatment algorithm is presented in Appendix E.

Subjects with a positive RDT for *P. falciparum*/PAN, if not pregnant, received immediate treatment for malaria using artemether-lumefantrine (CoArtem®), as per the national protocol and pregnant positives were treated with quinine tablets. Those individuals who were positive for PAN only were treated using chloroquine (as per national protocol). Subjects who were found to be seriously ill, as determined by the survey nurses, were advised to immediately visit the nearest possible health facility.

Slide examination

All microscopic slides were stained with Giemsa in the field and were read by 8 first-level reader microscopists after the field work was completed (per WHO guidelines).[12]

A crosscheck reading of all positives and 10% of negatives from each cluster was conducted to estimate the quality of the first reading. Slides with discordant results were reread by a third microscopist.

Supportive supervision

Teams were visited by supervisors in the field at least twice during the survey period. The objective of the supervisory visits was to improve the quality and quantity of data collected by surveyors. Supervisory visits included the following: inspection of teams' PDA records and questionnaires; random inspection of some households by navigating to and visiting surveyed households; assessment from the households of the records obtained from the survey; completion of a supervisory checklist by direct and indirect observation; and observing a team's overall harmony and performance as well as providing feedback and sharing the experience of other teams supervised. Institutions and individuals involved in the supervision are listed in Appendix C. Major lessons learned from the supervision are outlined in Chapter 6.

9. Survey stratification terminology and definitions

Table 1 presents the stratification terms and definitions as they relate to the survey results.

Table 1. Survey stratification terms and definitions (Ethiopia 2007)

Stratification	Definition
National	All enumeration areas (EAs) surveyed (national level information for altitude below 1,500m and urban- and rural-level information for altitudes from 1,500m to 2,500m.)
Malarious vs. nonmalarious	Areas below 2,000m altitude are considered malarious.
Program target areas	Top priority areas, usually areas below the altitude of 2,000m, although in some regions or districts, this can also include some areas above 2,000m. In Amhara, Oromiya, and SNNPR, the definition was based on the stratification of kebeles (villages) in the UNICEF micro-plan. In Tigray, the definition is based on altitude and history of malaria.
Regional level	The sample size is only sufficient in Amhara and Oromiya regions for regional comparisons, as oversampling was done in these two regions to provide regional data. Estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Chapter 2: Characteristics of households and women respondents

1. Household characteristics

For the purpose of this survey, a household was defined as a person or group of persons, related or not, living together in the same dwelling unit, under one household head, sharing a common source of food. The household questionnaire collected basic demographic and socio-economic characteristics for each person who spent the night preceding the survey in the sampled household, including usual residents and visitors, as well as information on their household characteristics.

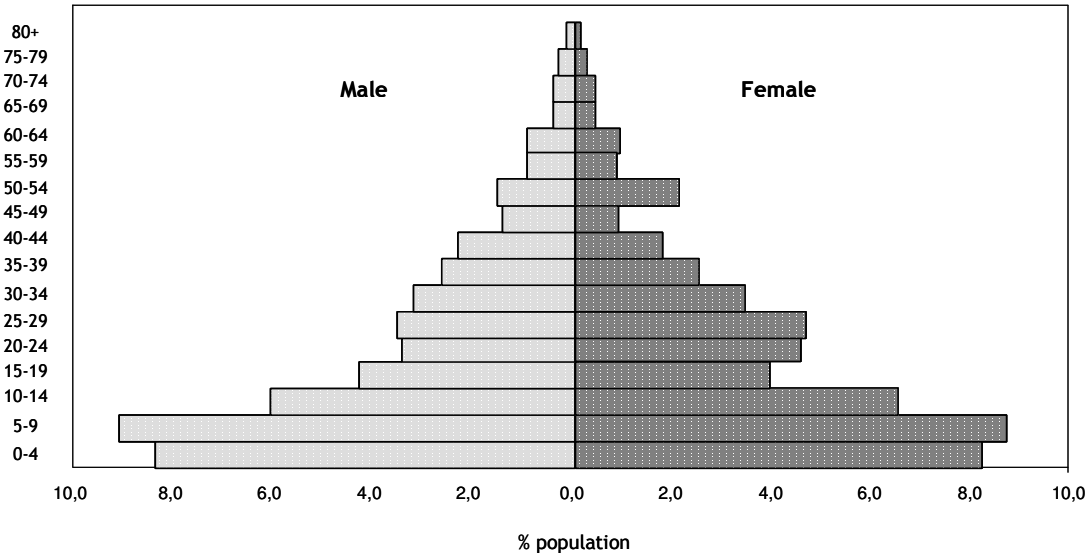
Table 2 shows that there are approximately as many men as women in the sampled population (49.9% vs. 50.1%, respectively).

Table 2. Percent distribution of the household population by five-year age groups, according to gender and residence (Ethiopia 2007)

	Rural			Urban			Total		
Ages	*Male*	*Female*	*Total*	*Male*	*Female*	*Total*	*Male*	*Female*	*Total*
0-4	9.0	8.6	17.6	5.5	5.8	11.4	8.5	8.2	16.7
5-9	9.6	9.0	18.6	6.5	7.0	13.5	9.2	8.7	17.8
10-14	6.3	6.4	12.6	5.4	7.3	12.7	6.1	6.5	12.6
15-19	4.2	3.4	7.7	5.1	6.6	11.7	4.4	3.9	8.3
20-24	3.3	4.2	7.5	4.3	6.6	10.9	3.5	4.6	8.0
25-29	3.4	4.6	8.0	4.4	5.0	9.4	3.6	4.6	8.2
30-34	3.2	3.4	6.6	3.5	3.6	7.1	3.3	3.4	6.7
35-39	2.6	2.3	4.9	3.0	3.5	6.5	2.7	2.5	5.2
40-44	2.4	1.7	4.1	2.5	1.9	4.3	2.4	1.8	4.1
45-49	1.4	0.9	2.2	2.0	1.0	3.0	1.5	0.9	2.3
50-54	1.6	2.2	3.9	1.2	1.3	2.5	1.6	2.1	3.7
55-59	1.0	0.8	1.8	0.9	1.1	2.0	1.0	0.8	1.8
60-64	1.0	0.9	1.9	0.8	1.0	1.8	1.0	0.9	1.9
65-69	0.5	0.4	0.8	0.5	0.8	1.2	0.5	0.4	0.9
70-74	0.5	0.4	0.9	0.3	0.6	1.0	0.5	0.4	0.9
75-79	0.4	0.2	0.6	0.2	0.3	0.5	0.3	0.2	0.6
80+	0.2	0.1	0.3	0.2	0.2	0.4	0.2	0.1	0.3
Total	13,587	13,365	26,952	2,612	2,816	5,428	16,199	16,181	32,380
Percent	50.5	49.5	100.0	46.5	53.5	100.0	49.9	50.1	100.0

The data show that the sampled Ethiopian population is young, as the population under age 15 years represents over 46% of the population. Only 3% of the population is aged 65 years and older. **Figure 1** data are characteristic of populations with strong fecundity and high mortality, i.e., with a wide basis that rapidly shrinks with age. The figure also shows gaps between men and women at different ages: for instance, there are more men than women at ages 15–19 years and 40–49 years. Conversely, there are more women ages 20–29 years and 50–54 years than there are men.

Figure 1. Age pyramid of MIS-sampled population (Ethiopia 2007)



The household questionnaire provided information on the composition of households, such as the sex of the household head and the number of people making up the household. **Table 3** shows that there are some differences in the structure of households between rural and urban settings. Rural households were larger (mean household size 4.68 persons, n=6,154 households) than urban households (mean 3.86 persons, n=1,467 households) and were more likely to be headed by men than women. Nearly 13% of urban households were comprised of only one individual, as opposed to less than 6% in rural settings.

Table 3. Percent distribution by sex of household head and household size, according to residence (Ethiopia 2007)

Characteristic	Residence		
	Rural	Urban	Total
Sex of household head			
Male	4,917	1,015	5,932
%	81.1	68.0	78.8
Female	1,237	452	1,689
%	18.9	32.0	21.2
Total	100.0	100.0	100
Total number of households	6,154	1,467	7,621
Number of usual members			
1	361	184	545
%	5.4	12.8	6.7
2	834	277	1,111
%	12.7	19.1	13.8
3	1,000	259	1,259
%	16.0	16.6	16.1
4	1,112	256	1,368
%	18.5	19.5	18.6

(continued)

Table 3. Percent distribution by sex of household head and household size, according to residence (Ethiopia 2007)

Characteristic	Residence		
	Rural	Urban	Total
5	1,023	188	1,211
%	15.9	12.0	15.2
6	752	137	889
%	12.1	9.1	11.6
7	512	68	580
%	8.3	4.6	7.7
8	304	50	354
%	5.7	3.0	5.3
9+	256	48	304
%	5.4	3.3	5.0
Total	100.0	100.0	100.0
Total number of households	6,154	1,467	7,621

Table 4 shows that three quarters of urban households reported having electricity, compared to 2.5% of rural households; over three quarters of rural households have no windows. Nationally, the most common sources of drinking water were surface water (28.5%) and unprotected springs (19.3%). In rural areas, the most common sources of drinking water were surface water (34.0%) and unprotected spring water (23.2%), while urban households mostly reported using public taps or standpipes (32.4%) or water piped into the dwelling (30.5%). The majority of households reported having no sanitation facilities (49.1%) or using open pits (27.2%). Only 12.2% of the population has access to facilities with a flushing system. The vast majority of both urban and rural households surveyed had earth or sand floors (78.3%), bamboo or mud walls (68.6%), and thatched roofs (52.7%).

Table 4. Percent distribution of households by household characteristic, according to residence (Ethiopia 2007)

Household characteristic	Residence		
	Rural	Urban	Total
Electricity			
Yes	1.5	76.8	14.7
No	98.5	23.2	85.3
Window			
Yes	20.2	63.6	27.9
No	79.8	36.4	72.1
Source of drinking water			
Piped into dwelling	2.2	30.5	7.1
Piped into yard/plot	1.9	20.4	5.2
Public tap/standpipe	10.3	32.4	14.2
Tube well or borehole	0.8	3.1	1.2
Protected well	3.7	5.8	4.1
Unprotected well	17.4	2.4	14.7

(continued)

Table 4. Percent distribution of households by household characteristic, according to residence (Ethiopia 2007)

Household characteristic	Residence		
	Rural	Urban	Total
Protected spring	5.4	1.5	4.8
Unprotected spring	23.2	0.7	19.3
Rainwater	0.6	0.0	0.5
Tanker truck	0.2	0.1	0.2
Cart with small tank	0.0	0.2	0.03
Surface water	34.0	2.9	28.5
Bottled water	0.0	0.0	0.0
Other	0.2	0.0	0.2
Sanitation facilities			
Flush to pipe sewer	0.0	1.4	0.2
Flush to septic tank	0.1	1.7	0.3
Flush to pit latrine	3.9	10.0	4.9
Flush to somewhere else	6.7	2.3	5.9
Flush, don't know where	1.0	0.2	0.8
Ventilated improved pit latrine (VIP)	0.3	5.4	1.2
Pit latrine with slab	4.1	32.5	9.0
Pit latrine without slab/open pit	26.6	29.7	27.2
Composting toilet	0.2	0.2	0.2
Bucket toilet	0.0	0.0	0.0
Hanging toilet/hanging latrine	0.1	0.3	0.1
No facility/bush/field	56.2	15.3	49.1
Other	0.9	1.0	0.9
Floor type			
Earth/sand	81.7	62.6	78.3
Dung	14.3	5.3	12.8
Wood planks	2.4	0.7	2.1
Palm/bamboo	0.8	0.6	0.7
Parquet or polished wood	0.1	0.5	0.1
Vinyl or asphalt strips	0.0	0.5	0.1
Ceramic tiles	0.2	2.7	0.6
Cement	0.2	24.9	4.5
Carpet	0.0	1.5	0.3
Other	0.3	0.6	0.4
Wall type			
No walls	2.1	0.6	1.8
Cane/trucks/bamboo/reed	3.7	1.0	3.2
Bamboo/ wood with mud	69.8	63.1	68.6
Stone with mud	6.0	9.0	6.5
Uncovered adobe	0.2	0.2	0.2
Plywood	8.7	5.1	8.1
Carton	1.0	0.0	0.8
Cement	0.2	8.7	1.7

(continued)

Table 4. Percent distribution of households by household characteristic, according to residence (Ethiopia 2007)

Household characteristic	Residence		
	Rural	Urban	Total
Stone with lime/cement	0.1	6.2	1.1
Bricks	0.0	0.6	0.1
Cement blocks	0.0	3.9	0.7
Covered adobe	0.1	0.0	0.1
Wood planks/shingles	7.3	1.3	6.2
Other	0.9	0.5	0.8
Roof type			
Thatch/leaf	62.8	5.2	52.7
Sticks and mud	3.5	2.3	3.3
Rustic mat/ plastic sheet	2.6	4.0	2.8
Reed/ bamboo	1.3	0.4	1.1
Wood planks	1.4	2.6	1.6
Corrugated iron	19.0	75.9	29.0
Wood	5.9	3.8	5.5
Calamine/cement fiber	0.0	0.4	0.1
Cement/ concrete	0.0	0.7	0.1
Roofing shingles	0.4	1.5	0.6
Other	3.1	3.2	3.1
Total	100.0	100.0	100.0
Total number of households	6,154	1,467	7,621

Table 5 shows that one third (33.7%) of all households possess a radio. Over 25% of urban households report having a phone, compared with 0.2% of rural households.

Table 5. Percent of households possessing various durable consumer goods (Ethiopia 2007)

Household characteristic	Residence		
	Rural	Urban	Total
Radio	25.4	73.0	33.7
Television	0.2	33.8	6.2
Telephone	0.2	25.8	4.6
Cell phone	0.0	0.0	0.0
Refrigerator	0.0	10.2	1.8
Bicycle	0.6	9.8	2.3
Motorcycle	0.1	0.6	0.2
Car	0.1	2.9	0.6
Boat	0.0	0.0	0.0
Donkey	0.0	0.0	0.0
Total number of households	6,154	1,467	7,621

2. Characteristics of women respondents

Eligible women ages 15–49 years were interviewed using the women's questionnaire. **Table 6** shows that nearly two thirds (59.8%) of women were ages 15–29 years, and the vast majority of them lived in rural areas (80.7%). Nearly three quarters of women reported no education (72.9%). The women surveyed were mainly Orthodox (41.3%) or Muslim (32.6), and most women belonged to either the Oromo (37.4%) or the Amhara (26.6%) ethnic groups.

Table 6. Percent distribution of women ages 15–49 years by background characteristics (Ethiopia 2007)

Background characteristic	Percent	Number
Ages		
15-19	17.0	1,135
20-24	21.1	1,416
25-29	21.7	1,413
30-34	16.2	1,091
35-39	11.6	776
40-44	8.2	545
45-49	4.1	281
Total	100.0	6,657
Residence		
Rural	80.7	5,292
Urban	19.3	1,365
Total	100.0	6,657
Region		
Addis Ababa	1.5	48
Afar	2.8	105
Amhara	22.7	2,258
Benishangul-Gumuz	2.6	404
Dire Dawa	1.1	64
Gambella	1.4	273
Harari	0.4	42
Oromiya	38.8	1,977
SNNPR	20.1	868
Somali	2.5	291
Tigray	6.1	327
Total	100.0	6,657
Education		
None	72.9	4,908
Primary	17.3	1,126
Secondary	7.7	511
Higher	2.1	112
Total	100.0	6,657

(continued)

Table 6. Percent distribution of women ages 15–49 years by background characteristics (Ethiopia 2007)

Background characteristic	Percent	Number
Religion		
Orthodox	41.3	2,995
Roman Catholic	0.7	56
Protestant/Other Christian	21.3	1,043
Muslim	32.6	2,265
Traditional	1.8	157
Other	2.2	141
Total	100.0	6,657
Ethnic group		
Afar	2.0	80
Agew	0.3	146
Amhara	26.6	2,205
Annuak	0.5	55
Awi	0.8	128
Berta	1.3	136
Dawuro	0.8	51
Gamo	0.7	76
Gedeo	1.3	54
Gofa	1.1	22
Gumuz	1.0	100
Guragie	0.6	22
Hadiya	1.4	30
Harari	0.1	11
Kambata	0.5	59
Keffa	1.1	73
Nuwer	0.2	90
Oromo	37.4	2,022
Sidamo	2.9	70
Shinasha	0.1	22
Silti	1.1	31
Somali	2.8	304
Tigraway	6.1	343
Welaita	2.9	141
Other	6.4	386
Total	100.0	6,657

Chapter 3: Coverage of key malaria interventions

1. Ownership of mosquito nets, ever-treated nets, ITNs, and LLINs

Table 7a shows that in malarious areas (defined as EAs or households below 2,000m), 68.9% of households owned at least one net of any kind and 65.6% owned at least one ITN. Also in those areas, 38.3% of households reported owning more than one net. At the national level, 55.7% of households surveyed currently own a mosquito net of any kind and 53.8% own one that has been treated with insecticide at one point in time (an "ever-treated" net). 53.3% of households report owning an ITN, and 29.7% report owning more than one ITN. The average number of ITNs per household was 1.1 in malarious areas and 0.9 overall.

At the national level, compared to urban households, rural households reported greater ownership of at least one net—any net (41.1% vs 58.8%, respectively); this difference was also true for ownership of at least one ITN (39.5% and 56.2%, respectively).

Net ownership was similar across wealth quintiles except that the highest wealth quintile group (predominantly urban) had lower net ownership. Nationwide, 60.2% of the poorest households own at least one net compared to 45.0% of wealthiest households. The trend is similar for ITN ownership, with 57.0% of the poorest households owning at least one ITN compared to 43.4% of the wealthiest households. Approximately one third of rural and poorest households own more than one ITN (31.4% and 30.2%, respectively).

Table 7a. Percentage of households with at least one and more than one mosquito net (treated or untreated), ever-treated net, and insecticide-treated net (ITN), and average number of nets of each type per household, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of households that have at least one net	Percentage of households that have more than one net	Average number of nets per household	Percentage of households that have at least one ever-treated net	Percentage of households that have more than one ever-treated net	Average number of ever-treated nets per household	Percentage of households that have at least one ITN	Percentage of households than have more than one ITN	Average number of ITNs per household	Number of households
Residence										
Rural	58.8	32.4	1.0	56.7	31.6	1.0	56.2	31.4	1.0	6,154
Urban	41.1	22.3	0.7	39.7	21.6	0.7	39.5	21.4	0.7	1,467
Region										
Addis Ababa	2.4	0.0	0.0	2.4	0.0	0.0	2.4	0.0	0.0	50
Afar	88.3	52.8	1.6	88.3	52.8	1.6	88.3	52.8	1.6	122
Amahara	75.2	45.1	1.3	72.6	44.1	1.3	72.5	43.8	1.3	2,609
Benishangul-Gumuz	73.0	43.9	1.3	73.0	43.9	1.3	73.0	43.9	1.3	449
Dire Dawa	56.4	35.9	1.0	54.8	34.3	1.0	54.8	34.3	1.0	75
Gambella	83.1	59.6	1.8	82.7	59.6	1.8	82.7	59.6	1.8	292
Harari	58.7	40.0	1.0	58.7	40.0	1.0	58.7	40.0	1.0	50
Oromiya	45.6	23.2	0.8	42.5	22.0	0.7	41.4	21.6	0.7	2,321
SNNPR	50.7	23.0	0.8	50.7	22.9	0.8	50.7	22.9	0.8	980
Somali	39.0	28.0	0.8	38.9	27.7	0.8	38.9	27.7	0.8	296
Tigray	53.7	34.3	1.0	53.1	33.7	1.0	52.5	33.1	0.9	377
Wealth index										
Poorest	60.2	30.8	1.0	57.1	30.3	0.9	57.0	30.2	0.9	1,553
Second	57.2	31.4	1.0	54.8	30.1	0.9	53.7	29.6	0.9	1,580
Third	56.3	33.7	1.0	54.8	32.4	1.0	54.2	32.2	1.0	1,396
Fourth	60.0	33.7	1.1	59.3	33.1	1.1	58.9	33.0	1.1	1,486
Richest	45.0	24.3	0.8	43.5	24.0	0.8	43.4	23.7	0.8	1,606

(continued)

Table 7a. Percentage of households with at least one and more than one mosquito net (treated or untreated), ever-treated net, and insecticide-treated net (ITN), and average number of nets of each type per household, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of households that have at least one net	Percentage of households that have more than one net	Average number of nets per household	Percentage of households that have at least one ever-treated net	Percentage of households that have more than one ever-treated net	Average number of ever-treated nets per household	Percentage of households that have at least one ITN	Percentage of households than have more than one ITN	Average number of ITNs per household	Number of households
Elevation [E]										
E<2,000m (malarious)	68.9	38.3	1.2	66.2	37.1	1.2	65.6	36.8	1.1	4,745
E>2,000m (nonmalarious)	28.4	15.1	0.5	28.2	14.9	0.5	28.1	14.9	0.4	2,538
Program target area										
Yes	72.5	42.8	1.3	70.0	41.4	1.3	69.4	41.1	1.2	4, 111
No	41.3	20.3	0.7	40.0	20.0	0.6	39.6	19.9	0.6	3, 510
Total	55.7	30.7	0.9	53.8	29.8	0.9	53.3	29.7	0.9	
Total number of households	4,408	2,464		4,315	2,416		4,263	2,395		7,621

An ever-treated net is 1) a factory-treated net that does not require any re-treatment, 2) any factory treated net or 3) a net that has been soaked/treated. An ITN is 1) a factory-treated net that does not require any re-treatment, 2) a pre-treated net that was obtained less than 12 months ago, or 3) a net that has been soaked/retreated less than 12 months ago.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Because the vast majority of ITNs distributed in Ethiopia since 2005 were LLINs, this report also presents results for ownership of LLINs. **Table 7b** shows that 65.3% of households in malarious areas reported owning at least one LLIN, and 36.6% own more than one LLIN. Overall, 53.1% of the surveyed households own at least one LLIN and the average number of LLIN per household is 0.9. As with ITNs, the percentage of households owning an LLIN was higher in rural areas (56.0%) than in urban areas (39.4%).

Table 7b. Percentage of households with at least one and more than one LLIN, and average number of LLINs per household, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of households that have at least one LLIN	Percentage of households that have more than one LLIN	Average number of LLINs per household	Number of households
Residence				
Rural	56.0	31.2	1.0	6,154
Urban	39.4	21.2	0.7	1,467
Region				
Addis Ababa	2.4	0.0	0.0	50
Afar	88.3	52.8	1.6	122
Amahara	72.4	43.8	1.3	2,609
Benishangul-Gumuz	72.3	42.7	1.2	449
Dire Dawa	54.8	32.7	1.0	75
Gambella	82.7	59.4	1.8	292
Harari	58.7	40.0	1.0	50
Oromiya	41.0	21.4	0.7	2,321
SNNPR	50.7	22.8	0.8	980
Somali	38.9	27.7	0.8	296
Tigray	52.4	32.9	0.9	377
Wealth index				
Poorest	56.8	30.1	0.9	1,553
Second	53.4	29.4	0.9	1,581
Third	54.0	32.1	0.9	1,397
Fourth	58.6	32.9	1.1	1,486
Richest	43.2	23.5	0.8	1,606
Elevation [E]				
E < 2,000m (malarious)	65.3	36.6	1.1	4,745
E > 2,000m (nonmalarious)	28.1	14.9	0.4	2,538
Program target area				
Yes	69.2	40.9	1.2	4, 111
No	39.3	19.8	0.6	3, 510

(continued)

Table 7b. Percentage of households with at least one and more than one LLIN, and average number of LLINs per household, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of households that have at least one LLIN	Percentage of households that have more than one LLIN	Average number of LLINs per household	Number of households
Total	53.1	29.5	0.9	7,621
Total number of households	4,241	2,372		7,621

A long lasting insecticidal net (LLIN) is a factory-manufactured net that does not require any treatment.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

2. Use of mosquito nets, ever-treated nets, ITNs, and LLINs by children under age five years and pregnant women

In this survey, use of nets was assessed in each surveyed household through a complete net roster, which identified each net in the household, its current treatment status, and the members of the household who had slept under the net the night preceding the survey

Table 8a shows that, nationally, 34.7% of children under age five years had slept under a net the night preceding the survey and 33.1% had slept under an ITN. In malarious areas, these percentages increased to 43.8% and 41.5%, respectively. Use of ITNs was similar for boys and girls and was greater in urban (36.4%) than in rural (32.6%) settings. The percentage of children under the age of one year having slept under a net (42.3%) or an ITN (39.7%) during the preceding night was higher than among other age groups.

When one considers mosquito net use by only the children that live in a household with at least one net, net use by children under age five years increases to 59.1%. Again, in a household with at least one net, children under age one year had the highest use of nets (67.7%) and ITNs (66.9%).

Table 8a. Percentage of children under age five years who slept under a mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children under age five years who slept under a mosquito net last night	Percentage of children under age five years who slept under a net in households with at least one net	Percentage of children under age five years who slept under an ever-treated net last night	Percentage of children under age five years who slept under an ITN last night	Percentage of children under age five years who slept under an ITN in households with at least one ITN	Total number of children under age five years
Age (in years)						
<1	42.3	67.7	40.4	39.7	66.9	789
1	34.3	58.2	33.6	33.2	59.6	987
2	32.7	56.5	30.7	30.5	55.3	1,176
3	32.9	56.1	31.4	31.4	55.3	1,142
4	33.5	58.5	32.7	32.4	59.1	1,131
Sex						
Male	34.3	58.6	33.4	33.1	58.5	2,649
Female	35.1	59.5	33.3	33.0	59.3	2,576
Residence						
Rural	34.1	57.1	33.0	32.6	57.3	4,569
Urban	40.5	79.5	36.7	36.4	75.8	656
Region						
Addis Ababa	9.4	100.0-	9.4	9.4	100.0	12
Afar	41.4	49.8	41.4	41.4	49.8	108
Amahara	51.8	63.4	49.0	48.8	61.9	1,547
Benishangul-Gumuz	53.5	63.7	53.5	53.5	63.7	299
Dire Dawa	60.5	77.1	57.7	57.7	76.3	46
Gambella	86.9	98.9	86.9	86.9	98.9	224

(continued)

Table 8a. Percentage of children under age five years who slept under a mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children under age five years who slept under a mosquito net last night	Percentage of children under age five years who slept under a net in households with at least one net	Percentage of children under age five years who slept under an ever-treated net last night	Percentage of children under age five years who slept under an ITN last night	Percentage of children under age five years who slept under an ITN in households with at least one ITN	Total number of children under age five years
Harari	60.3	70.8	60.3	60.3	70.8	28
Oromiya	26.7	56.4	25.0	24.3	57.0	1,762
SNNPR	28.4	56.2	28.3	28.4	55.9	652
Somali	27.8	59.5	27.8	27.8	59.5	302
Tigray	32.7	47.3	32.7	32.3	47.2	245
Wealth index						
Poorest	36.7	59.6	34.9	34.9	59.1	1,052
Second	35.3	61.1	33.7	32.8	61.6	1,258
Middle	29.5	51.1	28.9	28.7	51.9	1,064
Fourth	35.6	57.7	35.2	35.3	58.0	1,072
Richest	37.0	69.1	34.3	33.9	65.9	779
Elevation [E]						
E<2000m (malarious)	43.8	60.2	42.0	41.5	60.1	3,643
E>2000m (nonmalarious)	13.9	52.0	13.7	13.5	51.4	1,582
Program target area						
Yes	44.2	59.9	42.4	41.9	59.9	2,952
No	25.9	58.6	24.9	24.8	58.2	2,273

(continued)

Table 8a. Percentage of children under age five years who slept under a mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children under age five years who slept under a mosquito net last night	Percentage of children under age five years who slept under a net in households with at least one net	Percentage of children under age five years who slept under an ever-treated net last night	Percentage of children under age five years who slept under an ITN last night	Percentage of children under age five years who slept under an ITN in households with at least one ITN	Total number of children under age five years
Total	34.7	59.1	33.4	33.1	58.9	100
Total children	1,936	1,936	1,891	1,876	1,872	5,225

An ever-treated net is 1) a factory-treated net that does not require any re-treatment, 2) any factory treated net, or 3) a net that has been soaked/treated. An ITN is 1) a factory-treated net that does not require any re-treatment, 2) a pre-treated net that was obtained less than 12 months ago, or 3) a net that has been soaked/re-treated less than 12 months ago.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Table 8b shows that 32.7% of children under age five years had slept under an LLIN the night preceding the survey, and that this percentage went up to 41.2% in malarious areas. Use was comparable between sexes and wealth quintiles. In malarious areas, 60% of children under age five years living in households with at least one LLIN had slept under an LLIN the night preceding the survey.

Table 8b. Percentage of children under age five years who slept under a long-lasting insecticidal net (LLIN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children under age five years who slept under an LLIN last night	Percentage of children under age five years who slept under an LLIN in households with at least one LLIN	Total number of children under age five years
Age (in years)			
<1	39.2	66.4	789
1	33.1	59.6	987
2	30.2	55.0	1,176
3	30.8	55.3	1,142
4	32.0	59.0	1,131
Sex			
Male	32.8	58.3	2,649
Female	32.5	59.1	2,576
Residence			
Rural	32.3	57.1	4,569
Urban	35.8	75.6	656
Region			
Addis Ababa	9.4	100.0	12
Afar	41.4	49.8	108
Amahara	48.5	61.9	1,547
Benishangul-Gumuz	53.3	63.4	299
Dire Dawa	57.7	76.3	46
Gambella	86.9	98.9	224
Harari	60.3	70.8	28
Oromiya	23.6	56.5	1,762
SNNPR	28.3	55.9	652
Somali	27.8	59.5	302
Tigray	32.3	47.2	245
Wealth index			
Poorest	34.8	59.0	1,052
Second	32.6	61.6	1,258
Middle	28.6	51.7	1,064
Fourth	34.9	57.9	1,072
Richest	32.4	64.8	779

(continued)

Table 8b. Percentage of children under age five years who slept under a long-lasting insecticidal net (LLIN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children under age five years who slept under an LLIN last night	Percentage of children under age five years who slept under an LLIN in households with at least one LLIN	Total number of children under age five years
Elevation [E]			
E<2000m (malarious)	41.2	60.0	3,643
E>2000m (nonmalarious)	13.3	50.6	1,582
Program target area			
Yes	41.7	59.5	2,952
No	24.3	58.2	2,273
Total	32.7	58.7	100
Total number of children	1,853	3,064	5,225

A long-lasting insecticidal net (LLIN) is a factory-treated net that does not require any re-treatment.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Table 9a shows that, nationally, 34.4% of all women ages 15–49 years reported having slept under a net the night preceding the survey, and 33.0% had slept under an ITN. In malarious areas, use was 43.8% by these women. The vast majority of women who slept under a net the night preceding the survey slept under an ITN (data not shown). The proportion of women in the poorest households who slept under a net the night preceding the survey (39.9%) was shown to be greater than in the wealthiest households (28.8%). Evaluating only the women that live in a household with at least one net, net use was 59.4%. In households that own at least one net located in malarious areas, net use was 61.0% by all women.

Table 9a. Percentage of all women ages 15–49 years who slept under any mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of women who slept under a net last night	Percentage of women who slept under a net in households with at least one net	Percentage of women who slept under an ever-treated net last night	Percentage of women who slept under an ITN last night	Percentage of women who slept under an ITN in households with at least one ITN	Number of women
Residence						
Rural	35.9	59.1	34.7	34.6	59.3	5,292
Urban	28.0	61.3	26.4	26.2	59.5	1,365

(continued)

Table 9a. Percentage of all women ages 15–49 years who slept under any mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of women who slept under a net last night	Percentage of women who slept under a net in households with at least one net	Percentage of women who slept under an ever-treated net last night	Percentage of women who slept under an ITN last night	Percentage of women who slept under an ITN in households with at least one ITN	Number of women
Region						
Addis Ababa	2.6	100.0	2.6	2.6		48
Afar	54.2	61.0	54.2	54.2	61.0	105
Amhara	49.9	63.8	47.8	47.5	63.0	2,258
Benishangul-Gumuz	48.7	63.9	48.7	48.7	63.9	404
Dire Dawa	52.9	74.5	51.0	51.0	73.8	64
Gambella	80.1	93.2	80.1	80.1	93.4	273
Harari	28.4	38.5	28.4	28.4	38.5	42
Oromiya	27.8	57.2	25.9	25.6	57.6	1,977
SNNPR	29.2	55.4	29.2	29.2	55.4	868
Somali	17.3	48.3	17.3	17.3	48.3	291
Tigray	21.4	44.3	21.4	21.0	44.2	327
Wealth index						
Poorest	39.9	62.6	36.7	36.7	61.1	1,256
Second	35.1	60.6	34.1	33.8	62.0	1,378
Middle	32.3	55.2	31.4	31.2	55.4	1,213
Fourth	36.8	58.4	36.4	36.4	59.0	1,341
Richest	28.8	59.7	27.7	27.3	58.4	1,469
Elevation [E]						
E<2000m (malarious)	43.8	61.0	42.0	41.7	60.9	4,358
E>2000m (nonmalarious)	15.2	51.6	15.0	14.9	51.5	2,299
Program target area						
Yes	26.7	57.5	25.5	25.4	57.7	3,048
No	43.6	62.2	42.3	42.1	61.5	3,609
Total	34.4	59.4	33.1	33.0	59.3	
Total number of women	2,424	2,424	2,375	2,362	2,359	6,657

An ever-treated net is 1) a factory-treated net that does not require any re-treatment, 2) any factory treated net, or 3) a net that has been soaked/treated. An ITN is 1) a factory-treated net that does not require any re-treatment, 2) a pre-treated net that was obtained less than 12 months ago, or 3) a net that has been soaked/retreated less than 12 months ago.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Table 9b shows that, among pregnant women ages 15–49 years, 36.7% of those pregnant slept under a net and 35.2% slept under an ITN. In malarious areas, net use was 44.8% among pregnant women. The vast majority of pregnant women who slept under a net the night preceding the survey slept under an ITN (data not shown). The proportion of pregnant women in the poorest households who slept under a net the night preceding the survey (43.6%) was shown to be greater than in the wealthiest households (38.0%). Evaluating only the pregnant women that live in a household with at least one net, net use was 65.3%. In households that own at least one net located in malarious areas, net use was 65.5% by pregnant women.

Table 9b. Percentage of all pregnant women who slept under any mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of pregnant women who slept under a net last night	Percentage of pregnant women who slept under a net in households with at least one net	Percentage of pregnant women who slept under an ever-treated net last night	Percentage of pregnant women who slept under an ITN last night	Percentage of pregnant women who slept under an ITN in households with at least one ITN	Number of pregnant women
Residence						
Rural	36.6	65.6	35.5	34.4	66.0	502
Urban	36.8	62.9	33.5	33.5	60.8	66
Region						
Addis Ababa	0.0		0.0	0.0		0
Afar	39.9	53.4	39.9	39.9	53.4	12
Amhara	52.7	62.7	49.0	49.0	61.0	161
Benishangul-Gumuz	56.9	67.9	56.9	56.9	67.9	44
Dire Dawa	100.0	100.0	100.0	100.0	100.0	2
Gambella	88.1	92.8	88.1	88.1	92.8	20
Harari	100.0	100.0	100.0	100.0	100.0	1
Oromiya	30.9	70.4	29.4	29.1	72.7	200
SNNPR	31.1	63.1	31.1	31.1	63.1	72
Somali	3.8	25.5	3.8	3.8	25.5	31
Tigray	35.4	55.6	35.4	35.4	55.6	25
Wealth index						
Poorest	43.6	69.7	41.5	41.5	68.6	102
Second	34.3	69.8	34.3	33.9	74.4	135
Middle	39.7	66.9	37.4	37.2	65.4	118
Fourth	28.3	51.8	26.8	26.8	51.1	133
Richest	38.0	68.3	38.0	38.0	68.3	80
Elevation [E]						
E<2000m (malarious)	44.8	65.5	42.9	42.7	65.7	364
E>2000m (nonmalarious)	17.7	64.3	17.7	17.7	64.3	204

(continued)

Table 9b. Percentage of all pregnant women who slept under any mosquito net, an ever-treated net, or an insecticide-treated net (ITN) the night preceding the survey, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of pregnant women who slept under a net last night	Percentage of pregnant women who slept under a net in households with at least one net	Percentage of pregnant women who slept under an ever-treated net last night	Percentage of pregnant women who slept under an ITN last night	Percentage of pregnant women who slept under an ITN in households with at least one ITN	Number of pregnant women
Program target area						
Yes	42.8	59.6	40.6	40.3	59.6	251
No	31.3	73.9	30.7	30.7	73.8	317
Total	36.7	65.3	35.4	35.2	65.5	100
Total number of women	204	204	200	198	198	568

An ever-treated net is 1) a factory-treated net that does not require any re-treatment, 2) any factory treated net, or 3) a net that has been soaked/treated. An ITN is 1) a factory-treated net that does not require any re-treatment, 2) a pre-treated net that was obtained less than 12 months ago, or 3) a net that has been soaked/retreated less than 12 months ago.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Table 9c shows that 32.7% of women and 35.0% of pregnant women had slept under an LLIN the previous night. These percentages were 41.5% and 42.5%, respectively, in malarious areas.

Table 9c. Use of long-lasting insecticidal nets (LLINs) by women ages 15–49 years and pregnant women (Ethiopia 2007)

Background characteristic	Percentage of women who slept under an LLIN last night	Percentage of women who slept under an LLIN in households with at least one LLIN	Number of women	Percentage of pregnant women who slept under an LLIN last night	Percentage of pregnant women who slept under an LLIN in households with at least one LLIN	Number of pregnant women
Residence						
Rural	34.3	59.2	5,292	35.2	66.4	502
Urban	25.8	59.2	1,365	33.5	60.8	66
Region						
Addis Ababa	2.6	100.0	48			0
Afar	54.2	61.0	105	39.9	53.4	12
Amhara	47.4	62.9	2,258	49.0	61.0	161
Benishangul - Gumuz	47.7	63.2	404	56.9	67.9	44

(continued)

Table 9c. Use of long-lasting insecticidal nets (LLINs) by women ages 15–49 years and pregnant women (Ethiopia 2007)

Background characteristic	Percentage of women who slept under an LLIN last night	Percentage of women who slept under an LLIN in households with at least one LLIN	Number of women	Percentage of pregnant women who slept under an LLIN last night	Percentage of pregnant women who slept under an LLIN in households with at least one LLIN	Number of pregnant women
Dire Dawa	51.0	73.8	64	100.0	100.0	2
Gambella	80.1	93.4	273	88.1	92.8	20
Harari	28.4	38.5	42	100.0	100.0	1
Oromiya	25.2	57.5	1,977	28.7	73.9	200
SNNPR	29.1	55.3	868	31.1	63.1	72
Somali	17.3	48.3	291	3.8	25.5	31
Tigray	20.9	44.0	327	35.4	56.8	25
Wealth index						
Poorest	36.5	61.0	1,256	41.5	68.6	102
Second	33.6	62.0	1,378	33.2	75.9	135
Middle	31.1	55.2	1,211	37.2	65.4	118
Fourth	36.2	58.9	1,342	26.8	51.4	133
Richest	27.0	58.0	1,47	38.0	69.1	80
Elevation [E]						
E < 2,000m (malarious)	41.5	60.8	4,466	42.5	66.2	412
E > 2,000m (nonmalarious)	14.8	51.2	2,191	17.7	64.3	156
Program target area						
Yes	41.8	57.6	3 609	40.3	59.9	317
No	25.2	61.4	3 048	30.4	74.5	251
Total	32.7	59.2		35.0	65.9	
Total number of women	2,342	2,342	6,657	197	197	568

A long-lasting insecticidal net (LLIN) is a factory-treated net that does not require any re-treatment.

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

3. Indoor residual spraying (IRS)

Table 10 shows that at the national level, 14.2% of all households had been sprayed in the past twelve months, 97.3% of them by government agents. Twenty percent of households in areas below 2,000m had been sprayed in the last 12 months. A greater percentage of rural households was sprayed (15.3%) compared to urban households (9.0%). Twenty percent of households in malarious areas had been sprayed in the last 12 months.

Table 10. Percentage of households reporting indoor residual spraying conducted by either government or private agents and the average number of months ago spraying was conducted, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of households sprayed in the last 12 months	Number of households	Percentage sprayed by private agents	Percentage sprayed by government	Average number of months since house was sprayed	Number of houses sprayed
Residence						
Rural	15.3	6,154	2.4	97.6	4.8	804
Urban	9.0	1,467	5.3	94.7	4.9	181
Region						
Addis Ababa	0.0	50				
Afar	10.5	122	0.0	100.0	4.2	7
Amhara	18.7	2,609	0.5	99.5	5.3	392
Benishangul-Gumuz	24.5	449	0.0	100.0	6.0	102
Dire Dawa	53.7	75	3.1	96.9	3.7	45
Gambella	33.7	292	5.3	94.7	7.6	49
Harari	14.2	50	0.0	100.0	6.0	12
Oromiya	12.5	2,321	5.6	94.4	5.1	267
SNNPR	12.4	980	1.7	98.3	2.3	80
Somali	3.5	296	0.0	100.0	6.3	10
Tigray	7.2	377	0.0	100.0	7.2	21

(continued)

Table 10. Percentage of households reporting indoor residual spraying conducted by either government or private agents and the average number of months ago spraying was conducted, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of households sprayed in the last 12 months	Number of households	Percentage sprayed by private agents	Percentage sprayed by government	Average number of months since house was sprayed	Number of houses sprayed
Wealth index						
Poorest	16.2	1,553	2.9	97.1	5.3	231
Second	13.3	1,580	2.0	98.0	4.5	188
Middle	10.8	1,396	2.0	98.0	4.2	138
Fourth	19.5	1,486	1.0	99.0	4.8	226
Richest	11.5	1,606	6.5	93.5	4.9	202
Elevation [E]						
E < 2,000m (malarious)	20.0	5,083	2.7	97.3	4.7	906
E > 2,000m (nonmalarious)	2.4	2,538	1.9	98.1	6.0	79
Program target areas						
Yes	17.1	4,111	1.3	98.7	5.4	688
No	11.8	3,510	4.5	95.5	4.0	297
Total	14.2		2.7	97.3	5.1	
Total number of households	985	7,621	20	965		985

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

4. Households protected by nets, ITNs, LLINs, and/or IRS

Table 11 presents percentages of protected households, because they owned at least one net, ITN, or LLIN and/or had been sprayed in the past 12 months; 86.4% of the households that had been sprayed in the past 12 months also reported owning at least one ITN (data not shown). Overall, 55.2% of all households reported some type of malaria intervention with either IRS in the past 12 months or owning at least one ITN. Households in malarious areas reported higher coverage with either IRS or ITNs at 68.0% compared with 29.1% for those households above 2,000m.

Table 11. Percentage of households protected by at least one net (any net), at least one insecticide-treated net (ITN), at least one long-lasting insecticidal net (LLIN), and/or indoor residual spraying (IRS) (Ethiopia 2007)

Background characteristic	Percentage of households protected by at least one net and/or IRS	Percentage of households protected by at least one ITN and/or IRS	Percentage of households protected by at least one LLIN and/or IRS	Number of households
Residence				
Rural	60.6	58.3	58.0	6,154
Urban	42.5	41.0	40.8	1,467
Region				
Addis Ababa	2.4	2.4	2.4	50
Afar	88.3	88.3	88.3	122
Amhara	76.2	73.6	73.5	2,609
Benishangul-Gumuz	75.5	75.5	74.8	449
Dire Dawa	66.3	64.7	64.7	75
Gambella	84.1	83.9	83.9	292
Harari	62.2	62.2	62.2	50
Oromiya	47.9	44.1	43.7	2,321
SNNPR	51.4	51.4	51.4	980
Somali	40.7	40.7	40.7	296
Tigray	58.0	56.8	56.7	377
Wealth index				
Poorest	62.7	59.5	59.3	1,553
Second	58.4	55.0	54.8	1,580
Middle	57.6	55.7	55.5	1,396
Fourth	62.8	61.6	61.4	1,486
Richest	46.3	45.2	45.0	1,606
Elevation [E]				
E<2000m (malarious)	71.2	68.0	67.8	5,083
E>2000m (nonmalarious)	29.3	29.1	29.0	2,538

(continued)

Table 11. Percentage of households protected by at least one net (any net), at least one insecticide-treated net (ITN), at least one long-lasting insecticidal net (LLIN), and/or indoor residual spraying (IRS) (Ethiopia 2007)

Background characteristic	Percentage of households protected by at least one net and/or IRS	Percentage of households protected by at least one ITN and/or IRS	Percentage of households protected by at least one LLIN and/or IRS	Number of households
Program target area				
Yes	75.2	72.3	72.2	3,050
No	42.4	40.7	40.4	4,111
Total	57.4	55.2	55.0	
Total number of households	4,549	4,425	4,404	7,621

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

5. Prevalence and prompt treatment of fever

Table 12 shows that fever was most common in children between ages 1 and 2 years, 28.1% of whom reported fever in the last two weeks. A greater percentage of mothers in rural compared to urban areas reported that their children had suffered from fever (23.0% vs. 15.6%, respectively).

According to respondents to the women's questionnaire, 22.3% of children under age five years reported a fever in the two weeks preceding the survey. Of these, 15.4% sought medical attention within 24 hours of onset of fever, 9.5% took an antimalarial drug, and 3.9% took the drug the same day of fever onset.

Table 12. Percentage of children under age five years whose parent/guardian reported a fever in the two weeks preceding the survey and among them the percentage who took an antimalarial drug, took an antimalarial drug the same/next day, and sought treatment from a facility/health provider the same/next day, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children with fever in the last two weeks	Number of children under age five years	Percentage of children with a fever who took an antimalarial drug	Percentage of children with a fever who took an antimalarial drug the same/next day of fever onset	Percentage of children with a fever who sought treatment from a facility/health provider the same/next day of fever onset	Number of children with a fever
Age (in years)						
<1	21.8	668	2.1	1.1	11.9	178
1	28.1	851	8.8	4.7	20.0	234
2	21.7	1,004	17.5	5.7	14.9	235
3	21.9	956	7.7	3.1	18.6	216
4	18.8	905	8.5	4.0	9.8	171
Overall		4,384				1,034
Residence						
Rural	23.0	3,837	9.2	3.9	14.2	926
Urban	15.6	547	12.6	4.2	31.8	108
Sex						
Male	22.8	2,218	7.8	3.0	13.7	536
Female	21.8	2,166	11.3	4.9	17.3	498
Region						
Addis Ababa	6.2	12	0.0	0.0	100.0	1
Afar	30.3	97	12.8	3.4	4.8	32
Amhara	25.2	1,307	6.1	2.1	15.0	369
Benishangul-Gumuz	35.4	280	11.0	3.6	8.9	82
Dire Dawa	6.9	39	0.0	0.0	100.0	2
Gambella	44.5	97	57.8	3.3	19.5	42
Harari	0.0	20				0

(continued)

Table 12. Percentage of children under age five years whose parent/guardian reported a fever in the two weeks preceding the survey and among them the percentage who took an antimalarial drug, took an antimalarial drug the same/next day, and sought treatment from a facility/health provider the same/next day, by background characteristics (Ethiopia 2007)

Background characteristic	Percentage of children with fever in the last two weeks	Number of children under age five years	Percentage of children with a fever who took an antimalarial drug	Percentage of children with a fever who took an antimalarial drug the same/next day of fever onset	Percentage of children with a fever who sought treatment from a facility/health provider the same/next day of fever onset	Number of children with a fever
Oromiya	21.5	1,533	6.6	1.3	16.4	293
SNNPR	20.4	537	15.7	10.9	12.4	120
Somali	13.6	246	2.4	0.0	76.0	35
Tigray	19.4	216	11.4	7.4	4.6	58
Wealth index						
Poorest	22.0	880	13.9	2.4	13.9	203
Second	23.6	1,079	5.1	3.0	8.1	277
Middle	19.2	904	11.2	5.4	18.6	183
Fourth	27.3	864	9.3	5.4	16.4	227
Richest	18.0	657	9.6	3.4	29.5	144
Elevation [E]						
E < 2,000m (malarious)	24.0	3,041	11.9	4.8	16.3	747
E > 2,000m (nonmalarious)	18.4	1,343	2.3	1.4	12.9	287
Program target areas						
Yes	25.3	2,420	9.1	4.0	15.7	655
No	19.5	1,964	9.9	3.7	15.1	379
Total	22.3		9.5	3.9	15.4	
Total number of children	1,034	4,384	92	43	159	1,034

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.
Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Table 13 shows that the main antimalarial drugs given in Ethiopia are artemether-lumefantrine (CoArtem®) and chloroquine (56.2%), which is used principally for *P. vivax* infections. Among children treated with an antimalarial drug, 41.3% took an antimalarial within 24 hours of onset of fever, and 42.6% were treated with an ACT (CoArtem®).

Table 13. Type and timing of antimalarial drug treatment among children under age five years who took antimalarials for fever and/or convulsions in the two weeks preceding the survey, percentage who took first-line drug, second-line drug, or other antimalarial drugs, and percentage who took an antimalarial the same/next day of fever/convulsion onset (Ethiopia 2007)

Background characteristic	Percentage of children who took each type of antimalarial				Percentage of children who took an antimalarial the same/next day	Number of children with fever who took an antimalarial	Number of children with fever
	CoArtem®	SP	Quinine	Chloroquine			
Age (in years)							
<1	58.5	0.0	5.1	36.3	51.7	10	178
1	32.2	0.0	0.0	67.8	53.3	24	234
2	32.3	0.0	0.0	67.7	32.5	24	235
3	68.2	6.0	0.0	25.8	40.3	18	216
4	53.3	0.0	0.6	46.1	46.6	16	171
Residence							
Rural	41.9	1.1	0.2	56.9	42.1	80	926
Urban	49.5	0.0	1.0	49.5	33.3	12	108
Sex							
Male	57.3	0.0	0.7	42.1	38.8	52	536
Female	31.6	1.7	0.0	66.6	43.1	40	498
Region							
Addis Ababa						0	1
Afar	0.0	0.0	0.0	100.0	26.4	4	32
Amhara	53.6	7.0	1.3	38.1	34.9	22	369
Benishangul-Gumuz	52.4	0.0	1.8	45.8	33.2	9	82
Dire Dawa						0	2
Gambella	71.0	0.0	0.0	29.0	40.3	20	42
Harari						0	0
Oromiya	30.3	0.0	0.0	69.7	19.0	13	293
SNNPR	48.2	0.0	0.0	51.8	69.6	16	120
Somali	0.0	0.0	0.0	100.0	0.0	1	35
Tigray	48.7	0.0	0.0	51.3	65.2	7	58

(continued)

Table 13. Type and timing of antimalarial drug treatment among children under age five years who took antimalarials for fever and/or convulsions in the two weeks preceding the survey, percentage who took first-line drug, second-line drug, or other antimalarial drugs, and percentage who took an antimalarial the same/next day of fever/convulsion onset (Ethiopia 2007)

Background characteristic	Percentage of children who took each type of antimalarial				Percentage of children who took an antimalarial the same/next day	Number of children with fever who took an antimalarial	Number of children with fever
	CoArtem®	SP	Quinine	Chloroquine			
Wealth index							
Poorest	28.7	0.0	0.0	71.3	17.3	18	203
Second	72.6	0.0	1.2	26.1	59.5	17	277
Middle	66.0	0.0	0.0	34.0	48.2	20	183
Fourth	15.9	4.4	0.0	79.8	58.3	20	227
Richest	51.9	0.0	0.8	47.3	35.5	17	144
Elevation [E]							
E < 2,000m (malarious)	42.8	1.1	0.1	56.1	40.0	86	747
E > 2,000m (nonmalarious)	39.2		3.0	57.7	61.5	6	287
Program target area							
Yes	43.7	0.0	0.5	55.7	44.4	69	655
No	41.3	2.1	0.0	56.6	37.8	23	379
Total	42.6	1.0	0.3	56.2	41.3		100
Total number of children	46	1	2	43	43	92	1,034

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Table 14 shows that among the 92 children who received antimalarial treatment, most obtained the antimalarial drugs from private (36.4%) or government (27.6%) health facilities, while 12.8% had the drugs at home and 14.9% obtained them from other sources. CoArtem® was equally frequently supplied by government and private health facilities, while chloroquine was more likely to have been obtained from private facilities (46.8% of cases). Government health facilities were the sole providers of quinine (2 cases).

Table 14. Source of antimalarial drug. Percent distribution of antimalarial drugs given to children under age five years with fever in the two weeks preceding the survey, by source of the drug (Ethiopia 2007)

	Already had drug at home	Government		Private heath facility	Shop	Other	Number of children who took drug
		Health extension worker	Health facility				
Antimalarial drug							
CoArtem®	16.8	14.9	21.2	21.6	0.0	25.5	46
SP	0.0	0.0	0.0	100.0	0.0	0.0	1
Quinine	0.0	0.0	100.0	0.0	0.0	0.0	2
Chloroquine	10.1	0.7	32.6	46.8	2.6	7.2	43
Total	12.8	6.7	27.6	36.4	1.5	14.9	92
Total number of children	13	7	34	21	1	16	92

Chapter 4: Malaria parasite and anemia prevalence

During the survey, children under age six years were tested in each household for malaria parasitemia using RDTs (Parascreen®) and for anemia using Hemocue 201 analyzers. The five-year-olds were tested as a safeguard against potential overestimation of age on behalf of parents/guardians, to ensure that all children under age five years had access to anemia or parasitemia treatment if needed. Only children under age five years were included in the data analysis. In every fourth household, all household members were also tested for parasitemia. Whenever blood was taken for malaria RDT, slides were also taken for microscopy. Appropriate treatment or referral was provided to persons testing positive for malaria parasitemia by RDT. The parasitemia results presented here are those obtained when analyzing thick and thin blood slides. Indeed, RDTs were only taken to enable data collectors to treat any positives directly, not to serve for analysis (see treatment algorithm in Appendix E).

1. Malaria prevalence

The slide results are presented in two tables (14a and 14b) because a proportion of slide results could not be linked to individuals, but only to household or cluster level. **Table 15a** presents results for the 48 positives identified to person level (excluding 2 gametocyte-only cases) by individual characteristics (age, sex, and wealth index). The table shows that 0.7% of children under age five years had malaria parasites as determined by a positive slide with asexual parasites. This figure is similar to that for the overall population (0.5%).

Table 15a. Malaria prevalence by blood slide microscopy and individual characteristics (Ethiopia 2007)

Background characteristic	Percentage with Pf. positive slide	Percentage with Pv. positive slide	Percentage with positive slide (Pf., Pv., or mixed)	Number of people
Age (in years)				
0-4	0.5	0.2	0.7	4,560
5-9	0.4	0.0	0.4	1,856
10-19	0.3	0.004	0.3	1,078
20-29	0.6	0.0	0.6	909
30-39	0.04	0.0	0.04	645
40-49	0.0	0.0	0.0	360
50-59	0.0	0.0	0.0	316
60-69	0.0	0.0	0.0	174
70-79	0.0	0.0	0.0	82
80+	0.0	0.0	0.0	27
Sex				
Male	0.5	0.1	0.6	4,852
Female	0.3	0.1	0.4	5,155

(continued)

Table 15a. Malaria prevalence by blood slide microscopy and individual characteristics (Ethiopia 2007)

Background characteristic	Percentage with Pf. positive slide	Percentage with Pv. positive slide	Percentage with positive slide (Pf., Pv., or mixed)	Number of people
Wealth index				
Poorest	1.1	0.1	1.1	2,014
Second	0.6	0.2	0.5	2,416
Middle	0.4	0.2	0.2	2,132
Fourth	0.3	0.3	0.5	2,277
Richest	0.01	0.4	0.08	1,739
Total number of people	40	8	48	10,007
Total	0.4	0.1	0.5	

Table 15b shows results from the whole sample with background characteristics at the cluster level. In the cluster level analysis which included all positive slides, the prevalence was estimated at 0.7%. As expected, prevalence was much higher at lower altitudes (0.9%) than above 2,000m (0.1%) and in rural than urban areas (0.8% vs. 0.3%, respectively).

Table 15b. Malaria prevalence by blood slide microscopy and background characteristics (Ethiopia 2007)

Background characteristic	Percentage with Pf. positive slide	Percentage with Pv. positive slide	Percentage with positive slide (Pf. Pv or mixed)	Number of people
Residence				
Rural	0.6	0.2	0.8	9,009
Urban	0.05	0.3	0.3	1,569
Region				
Addis Ababa	0.0	0.0	0.0	31
Afar	2.4	0.0	2.4	175
Amhara	0.2	0.3	0.6	3,651
Benishangul-Gumuz	8.8	0.07	8.9	698
Dire Dawa	0.0	0.0	0.0	72
Gambella	0.7	0.0	0.7	384
Harari	0.0	0.0	0.0	36
Oromiya	0.1	0.2	0.3	3,392
SNNPR	0.2	0.3	0.6	1,362
Somali	0.0	0.0	0.0	332
Tigray	0.0	0.01	0.01	445

(continued)

Table 15b. Malaria prevalence by blood slide microscopy and background characteristics (Ethiopia 2007)

Background characteristic	Percentage with Pf. positive slide	Percentage with Pv. positive slide	Percentage with positive slide (Pf. Pv or mixed)	Number of people
Elevation [E]				
E < 2,000m (malarious)	0.7	0.3	0.9	7,167
E > 2,000m (nonmalarious)	0.1	0.1	0.1	3,411
Program target area				
Yes	1.0	0.3	1.2	5,664
No	0.1	0.2	0.3	4,914
Total number of people	53	16	69	10,578
Total	0.5	0.2	0.7	

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

2. Hemoglobin

Table 16 shows that the mean hemoglobin value across survey clusters was 11.1g/dL with a standard error of 0.1. Levels did not vary substantially across ages, rural/urban, wealth, and regions.

Children under age five years were also tested for anemia. For the purpose of this survey, severe anemia was defined as a hemoglobin level lower than 8 grams per deciliter (8g/dl) using CDC's 1998 altitude adjustment.

Overall, 5.5% of children under age five years suffered from severe anemia. Proportions of children with severe anemia were highest for children between two and three years of age. The percentage of children from poorer households suffering from severe anemia was greater than the percentage of children from wealthier households (7.2% in the poorest quintile. vs. 2.8% in the wealthiest quintile).

More children living in malarious areas were anemic than children living at higher altitudes (6.6% <2,000m vs. 3.1% above 2,000m).

Table 16. Mean hemoglobin values, standard deviation, and percentage of children under age five years with severe anemia (less than 8 grams/deciliter), by background characteristics (Ethiopia 2007)

Background characteristic	Mean hemoglobin value	Hemoglobin standard error	Percentage of children under age five years with severe anemia	Number of children
Age (in years)				
<1	10.7	0.1	5.7	669
1	10.8	0.1	6.5	936
2	10.9	0.1	8.5	1,111
3	11.4	0.1	4.1	1,078
4	11.7	0.1	2.9	1,052
Residence				
Rural	11.1	0.1	5.8	4,254
Urban	11.5	0.1	3.2	592
Sex				
Male	11.1	0.1	6.2	2,464
Female	11.2	0.1	4.8	2,382
Region				
Addis Ababa	11.1	0.2	0.0	11
Afar	10.3	0.4	9.6	97
Amhara	11.5	0.1	4.6	1,484
Benishangul-Gumuz	10.5	0.3	10.9	294
Dire Dawa	10.4	0.5	9.5	39
Gambella	10.6	0.1	2.6	196
Harari	11.4		8.2	25
Oromiya	11.0	0.1	6.3	1,628
SNNPR	11.4	0.1	1.5	621
Somali	10.0	0.2	21.2	220
Tigray	11.7	0.2	4.9	231
Wealth index				
Poorest	10.9	0.1	7.2	989
Second	11.1	0.1	5.6	1,160
Middle	11.1	0.1	6.5	987
Fourth	11.3	0.1	4.6	997
Richest	11.5	0.1	2.8	713
Elevation [E]				
E < 2,000m (malarious)	10.1	0.1	6.6	3,366
E > 2,000m (nonmalarious)	11.5	0.1	3.1	1,480
Program target area				
Yes	11.0	0.1	6.9	2,721
No	11.3	0.1	4.3	2,125

(continued)

Table 16. Mean hemoglobin values, standard deviation, and percentage of children under age five years with severe anemia (less than 8 grams/deciliter), by background characteristics (Ethiopia 2007)

Background characteristic	Mean hemoglobin value	Hemoglobin standard error	Percentage of children under age five years with severe anemia	Number of children
Total	11.1	0.1	5.5	100.0
Total number of children			285	4,846

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Chapter 5: General malaria knowledge

Eligible women ages 15–49 years were asked about their general knowledge of malaria, its cause, symptoms, and prevention methods. As primary caretakers of children and as a vulnerable population themselves when pregnant, their knowledge is necessary to ensure appropriate treatment and prevention behavior.

Table 17 shows that the majority of surveyed women had heard of malaria (74.6%). A larger proportion of women living in malarious areas (79.5%) had heard of malaria than of those living areas above 2,000m (64.6%). Only 44.4% of women reported fever as a symptom of malaria. Knowledge of this was higher in urban areas (64.8%) than in rural areas (39.5%). A larger proportion of women from the richest households reported fever as a symptom (61.5%) than of those from the poorest quintile (37.4%).

In order to ensure consistent and efficient use of prevention tools, knowing that malaria is caused by mosquito bites is essential. Throughout the survey areas, 35.8% of women reported mosquito bites as a cause of malaria. Knowledge of this was higher among women from urban households (59.7%) than among rural women (30.1%). A higher proportion of women living below 2,000m reported mosquito bites as a cause of malaria (41.1%) than of those living areas above 2,000m (24.9%).

Finally, 32.8% of all surveyed women reported mosquito nets as a prevention method against malaria. A greater percentage of urban women knew this (59.4%) than rural women (26.5%). Knowledge increased across the wealth quintiles from 23.5% in the lowest quintile to 55.3% in the highest quintile. Knowledge was also greater in malarious areas (38.2%) than in areas above 2,000m (21.9%).

Table 17. General malaria knowledge among eligible women ages 15–49 years: percentage who reported having heard of malaria, who recognized fever as a symptom of malaria, who reported mosquito bites as a cause of malaria, and who reported mosquito nets (treated or untreated) as a prevention method, by background characteristic (Ethiopia 2007)

Background characteristic	Percentage who have heard of malaria	Percentage who recognize fever as a symptom of malaria	Percentage who reported mosquito bites as a cause of malaria	Percentage who reported mosquito nets (treated or untreated) as a prevention method	Number of women
Residence					
Rural	71.0	39.5	30.1	26.5	5,247
Urban	89.5	64.8	59.7	59.4	1,360
Region					
Addis Ababa	91.5	62.5	68.4	38.5	48
Afar	99.5	93.4	77.4	79.1	105
Amhara	87.0	50.2	26.7	38.5	2,241
Benishangul-Gumuz	95.7	33.0	23.0	32.7	404
Dire Dawa	67.4	63.3	57.7	62.4	63
Gambella	96.0	84.7	91.2	91.5	271
Harari	76.0	71.7	68.2	71.7	40
Oromiya	68.8	31.6	32.0	22.6	1,963
SNNPR	60.2	42.6	32.8	25.3	855
Somali	84.3	74.1	76.8	54.1	290
Tigray	79.9	60.7	46.6	48.4	327
Wealth index					
Poorest	75.5	34.7	24.3	23.5	1,244
Second	66.7	41.2	31.6	28.0	1,371
Middle	67.9	40.7	27.5	23.2	1,201
Fourth	76.5	40.8	35.2	30.4	1,336
Richest	85.5	61.5	56.7	55.3	1,455

(continued)

Table 17. General malaria knowledge among eligible women ages 15–49 years: percentage who reported having heard of malaria, who recognized fever as a symptom of malaria, who reported mosquito bites as a cause of malaria, and who reported mosquito nets (treated or untreated) as a prevention method, by background characteristic (Ethiopia 2007)

Background characteristic	Percentage who have heard of malaria	Percentage who recognize fever as a symptom of malaria	Percentage who reported mosquito bites as a cause of malaria	Percentage who reported mosquito nets (treated or untreated) as a prevention method	Number of women
Elevation [E]					
E < 2,000m (malarious)	79.5	50.8	41.1	38.2	4,438
E > 2,000m (nonmalarious)	64.6	31.3	24.9	21.9	2,169
Program target area					
Yes	82.2	55.9	41.1	41.3	3,582
No	68.3	34.8	31.4	25.8	3,025
Education*					
None	70.1	39.6	27.9	26.0	4,866
Primary	82.0	49.8	47.7	38.4	1,118
Secondary	93.8	68.2	72.1	70.6	509
Higher	98.1	76.2	79.5	85.3	111
Total	74.6	44.4	35.8	32.8	100.0
Total number of women	5,016	2,955	2,235	2,297	6,607

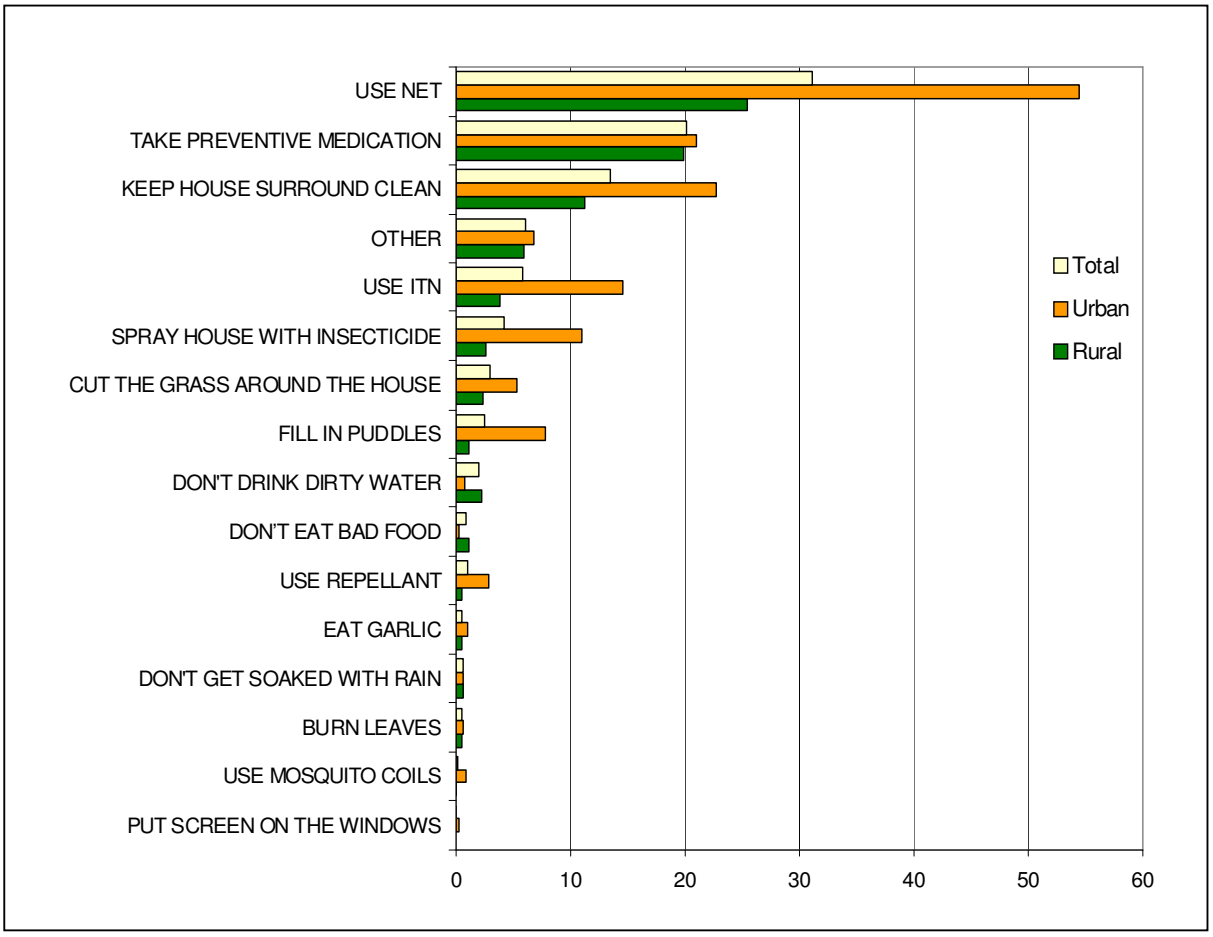
*Total=6,604; 3 women with missing education data

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution. Please refer to the list of EAs per region in Appendix F.

Program target areas are malarious areas designated by regions or woredas as prioritized for malaria prevention interventions.

Figure 2 shows the malaria prevention methods most often reported by women respondents. Women reported use of a net as a prevention method most often, followed by taking preventive medicine and keeping the surroundings of the house clean.

Figure 2. Means of malaria prevention most often reported by women respondents (Ethiopia 2007).



Chapter 6: Lessons learned

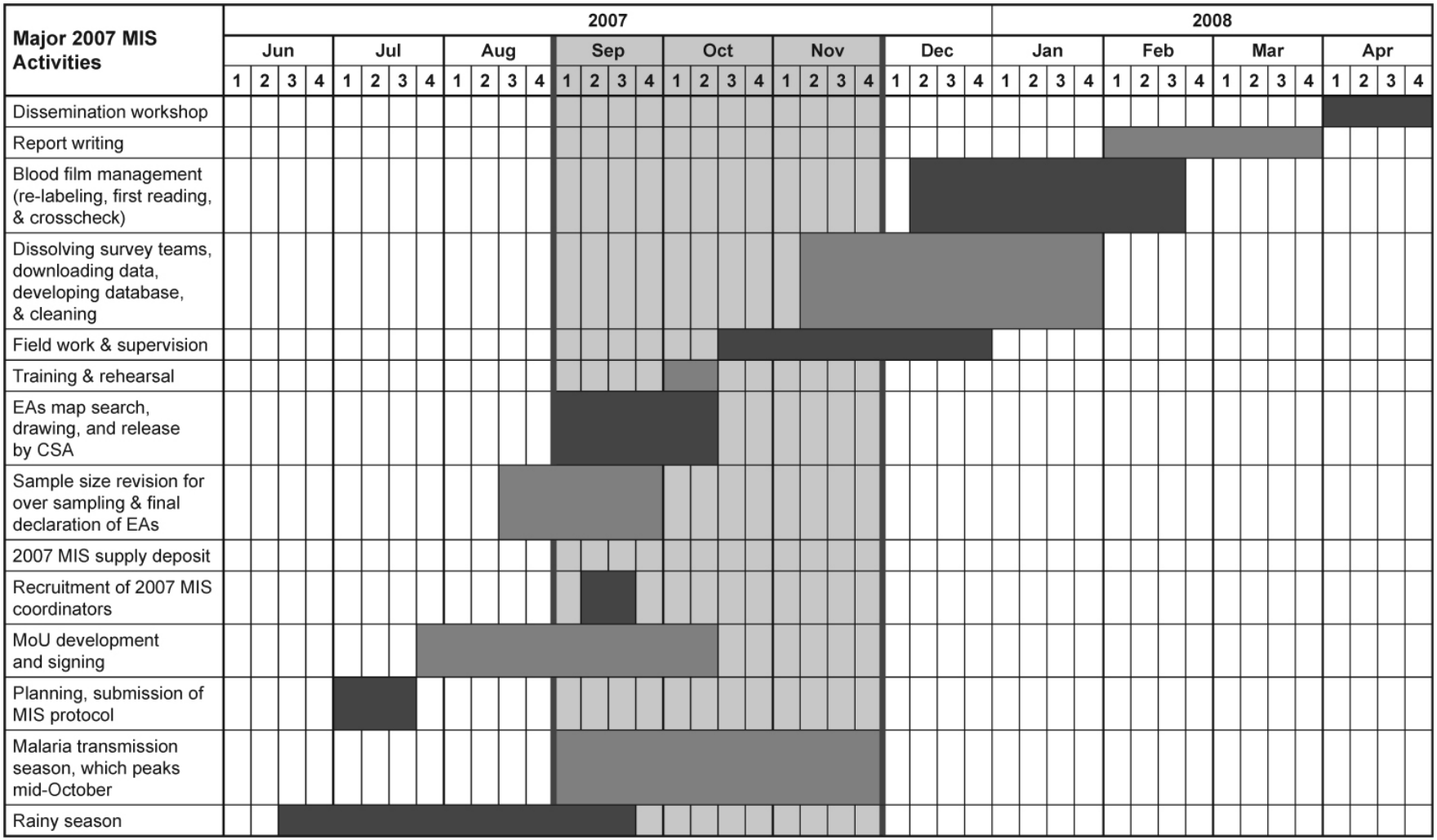
Previous experience with PDA-based surveys in Ethiopia is limited to health institution-based surveys, such as the study supported by WHO, the HIV/AIDS Prevention and Control Office, and the FMoH,[13] which used PDA-based tools to assess the availability of HIV/AIDS services. The 2007 MIS is the first population-based survey of its kind conducted in all the 9 regions and city administrations.

Considering the very short lead time allocated for the preparatory phase, complicated by the rough landscape, as well as the population density of the country, the survey organization and results are highly encouraging. Many extreme challenges were successfully overcome. Below are some of the lessons learned during the survey.

1. Planning the survey and timeline issues

Detailed survey planning started only two months ahead of the malaria transmission season, leaving insufficient lead time for preparatory activities. The short timeline (shown in **Figure 3**) adversely affected all components of the survey including sample size determination, sample selection, logistics and ordering of supplies, training, and initiation of the fieldwork. Experience from Zambia suggests that 5 months lead time prior to the actual field work is needed.

Figure 3. Timeline of Ethiopia's 2007 MIS



Despite these problems, the establishment of a technical working group and frequent consultative meetings in the months prior to the survey were instrumental in establishing common ground and accommodating the interests of various partners.

Ideally, the survey coordinator(s) should be involved from the early stage of the planning phase in order to own the plan. The involvement of multiple partners and delay in hiring survey staff led to lack of clarity in roles and responsibilities, meaning that some tasks were duplicated while others were missed.

Although personnel recruited for the survey were required to speak English in order to conduct the questionnaire, their command of spoken English was not sufficient to fully comprehend the training if delivered in English. The need for constant translation severely slowed the training process and could have been averted by a dedicated training of Amharic speakers as trainers before the main training began.

2. Sampling frame issues

The survey design called for sampling of clusters (EAs) within three strata: <1,500m, urban between 1,500 and 2,500m, and rural between 1,500 and 2,500m. However, complete lists of EAs classified by altitude were not available until very late in the process. This caused severe delays in selection of the clusters, programming of the PDAs, and provision of maps of the selected EAs. It is imperative that future surveys should take the matter seriously and have the complete sampling frame of survey clusters with necessary characteristics well ahead of time. If the characteristics such as altitude are not easily available, they should not be used for stratification.

3. PDA issues

Human resource issues
The number of persons experienced in programming and using PDAs for such a complex survey was too few, and there was no one with this expertise based in the country during the survey period. This contributed to lack of participation by partners in supervision of survey teams. According to lessons learned elsewhere in Africa, it was noted that organizations must anticipate the challenges that arise from introducing new technologies, and develop strategies to minimize and manage them.[2]

Hardware problems
Defective PDAs: 5 out of 120 PDAs were unable to function with simple maintenance procedures. Defective electronic keyboards were detected during the survey and contributed to misspelling of village names. Fortunately this did not lead to data loss since the questionnaires have self-contained numeric pads for keying data.

Charging PDAs: In areas which were inaccessible by road, teams were forced to walk or ride saddle animals for long distances (up to 5 hours), and their PDAs could not be easily recharged from car batteries. Teams took the initiative to resolve this by reserving some PDAs for household listing and some for questionnaire administration. PDAs with solar chargers could solve this problem.

Global Positioning System (GPS): Some PDA GPS units did not acquire signals with reasonable speed. Surveyors had to allow extended time to fix the position of

households and at times had to reinstall the GPS unit into PDAs or exchange GPS units between PDAs.

Software problems

Most of the problems described below could have been avoided had there been sufficient time to test the equipment better before going to the field.

Several issues were encountered during the survey or during the data cleaning process. Some were programming issues that should have been addressed prior to rolling out the PDAs, some should have been picked up during and after the field testing, and others could have been circumvented with clearer instructions to the surveyors.

Ethiopian language and date system: Uploading local versions of the questionnaire (Amharic, Oromifa, and Tigrigna) and the chronology of historical events (to assist in estimating age of respondents) into the PDAs was not possible due to time constraints, leading to the surveyors carrying hard copies of these documents. The PDAs were also designed to accept dates based on the Gregorian calendar, which was not compatible with the local Ethiopian calendar. A separate Ethiopian calendar calculator was programmed into the PDA to assist in accurately converting the dates.

Mapping issues: In the initial mapping of all the households in the EA, the variable to identify the EA was a free text entry that was often very difficult to decipher. The EA-selection option of the GPS program should have been used to ensure correct EA designation and to avoid having to manually reassign the correct EA identifier to each mapped household.

Most of the houses interviewed had no GPS data (latitude, longitude, and altitude) although surveyors were navigating directly from the GPS2 program. Also, during second-stage sampling, the variable on the selected houses in the GPS database did not reveal the exact frequency under each category (primary, additional, and replacement houses).

Programming and coding issues: Some programming errors, such as skipping problems, were identified during the training process. Most were resolved, but some persisted even during the actual survey. More time and checking after training as well as programming expertise on site could have averted this.

PDA memory problems: Many PDAs ran out of memory in the middle of the survey. This was caused by the swapping of SD Cards for the merging and led to the creation of additional SD card folders on the PDA where automatic backups were stored. This quickly consumed the meager main memory in the PDAs, causing nuisance to some survey teams. After supervisors' visits or phone calls, this problem was resolved by transferring the stored data in PDAs to the SD cards.

System date: Verification of current date was a routine and necessary procedure. Despite the strict instructions regarding the need to validate the system date each morning, some PDAs reset to an erroneous date such as May 2005, which had serious implications for the age calculation. This had to be resolved during the data cleaning. A check file should be installed so surveyors are not allowed to resume the survey without verifying the current date.

Slide coding problems: It was intended that the PDA software would generate a unique ID number for every person who volunteered to provide a blood specimen in order to minimize errors arising from the manual coding of slides by technicians. Unfortunately, the IDs generated were not unique, even within the same household. However, the automatic ID generation worked partially (for children under age six years), which caused confusion among survey personnel.

It was a serious oversight not to check the data files collected during the field exercise in the training period, as this would have picked up the problem. Instead, it was reported by team leaders by phone once the survey had begun, leading to hasty and complicated remedial action taken in a crisis situation. A circular was developed to all field team leaders that they must generate IDs manually based on a new coding system using EA code/Household #/Line # of subject. They were directed to use hard copy notes and NOT to mix specimens from different EAs. Nevertheless, slide data from about 15 clusters were affected.

Password problems: Some surveyors inadvertently managed to lock PDAs with passwords and it was difficult to resolve this by phone. The worst scenario was in one PDA where a curious driver accidentally entered a password but he was unable to recall it. We managed to extract the data by sending the contents of the SD card to CDC Atlanta. To avoid this in future, only higher level PDA administrators should be allowed to enter or change passwords.

Compatibility problems: The PDA software is only partially compatible with the Windows Vista operating system.

4. Training issues

Logistics
Delays in providing a sufficient supply of PDAs affected the training schedule, as well as the field work. There were delays in updating the PDA programs. Due to insufficient numbers for PDAs in the first few days of the training, PDAs were initially issued only to main target participants (team leaders and interviewers such as health officers and nurses).

Trainers
The training program covered all the survey techniques and methodology in adequate detail, but there was a lack of sufficient coaches during classroom activities and field exercises. An intensive training of trainers is therefore recommended for core experts prior to the main training, including conducting a field test and checking the data collected. The local facilitators/supervisors for the training course and field activity had the same level or even lower level of knowledge and skill than the trainees. A TOT program is crucial for core staff who eventually shoulder the supervisory responsibilities of the survey. The impact of this was partially reflected during supervision of the survey teams.

Field rehearsal
The delay in selection of EAs by the CSA created inconvenience and delay in selecting sites and obtaining maps for practice surveys and affected the ability to form teams in their final setup. Although the field rehearsal was essential, it was hasty, and results of the census and interview exercise were not adequately probed to amend the

questionnaires and reprogram the PDAs. Adequate field rehearsal could have allowed teams to avoid problems such as the failure of the automatic labeling of blood films which was detected too late during the actual survey.

5. Issues during survey implementation

Communication

A mechanism for tracking surveyors and arrangements to frequently meet team leaders was developed by constructing a telephone directory for 2007 MIS operation and allocating a sufficient communication budget. All team leaders were asked to provide their itinerary to TCC–Ethiopia and local authorities so that they could be easily traced for supportive supervision.

Despite all arrangements made to meet the team leaders frequently, some of them were not tracked for days due to the low network coverage in some parts of the country, especially the rural areas. The use of wireless fixed phones by some team leaders was a good alternative to the cell phone.

Supportive supervision

A standard supervision checklist was prepared for the survey, and two major direct supervision missions were conducted during the survey. Evaluation of teams' performance using the standard checklists included data downloading from PDAs for quick analysis of performance. Supervisors also had supplies to replenish teams when needed.

Supervisors were also able to do minor maintenance of PDAs, for example, restoring memory of PDAs by transferring dislocated data to the SD card. The consultative phone communication by supervisors to resolve the teams' problems was also very instrumental in the successful completion of the survey.

The institutions and professionals involved in the supervision are listed in Appendix C. There was a relatively low level of participation of partners in the supervision. This is partially explained by the lack of trained staff who could provide technical support to the field teams. This could be solved in future surveys by providing a TOT session as mentioned above.

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Appendix A: Sample selection approach

1. Definitions

Household: A household denotes a group of persons who often live in the same housing unit or in connected premises and have common arrangements for cooking and eating their food. A household could consist of a single person, but usually it consists of a husband, his wife, his children, relatives, etc. The members of a household could be composed of relatives and non-relatives. The non-relatives could be friends, servants, employed agricultural workers, etc.

Housing unit: A housing unit is a separate and independent part of the whole of a building or a group of buildings used or intended to be used for habitation by a household; or if not so, originally used or intended to be used as a school, store, bar, barber shop, manufacturing establishment or for other non-residential purposes.

Enumeration area (EA): An enumeration area is a unit of land delineated for the purpose of enumerating housing units and population without omission and duplication. An EA in rural areas usually consist of 150–200 households, whereas an EA in urban centers constitutes 150–200 housing units. An EA may be equal to a kebele, if the number of households in the rural kebele and the number of housing units in the urban kebele are less than or equal to 200.

Stratification: Stratification divides the population into subsets (called strata) where within each an independent sample is selected.

Cluster: A cluster is a group of contiguous elements of a statistical population, e.g., a group of people living in a single house, a consecutive run of observations in an ordered series, or a set of adjacent plots in one part of a field.

Design effect: Design effect is the measure of the efficiency of complex designs as compared to the design using simple random sampling of the same size.

Probability proportional to size (PPS) sampling: This is a sampling procedure whereby each unit in the universe has a probability of selection proportional to the size of some known relevant variable. In the case of household surveys, size is usually defined in terms of number of households or population.

Sampling weights: Sampling weights are the coefficients of a linear function of the values of the sample units used to estimate population, stratum, or higher stage unit totals. They are alternatively known as raising, multiplying, weighting, or inflation factors of the corresponding sample units.

2. Selection approach

A description of the sampling determination is found on page 5.

First stage sampling of primary sampling units
The list containing all villages (kebeles) and their corresponding altitude was initially categorized into below 1,500m and ≥1,500m ≤2,500m altitude. The list was then

matched with the list of EAs obtained from the CSA. Some of the villages did successfully match with EAs from the CSA frame. Some of them, however, did not. For those villages/EAs that did not match the CSA sampling frame, the third source of information from WHO was utilized. Thus, unmatched EAs were verified with the third data source and their altitudes identified. Making use of those two altitude-based frames, the population-based frame of the CSA was stratified into the above-mentioned two altitude categories. In fact, regional states/zones or urban/rural categories were also accounted for in the stratification. Sample EAs were, thus, chosen from this modified and newly prepared frame. Selection of EAs from this new frame was made by making use of the following procedures.

Since EAs varied in sizes, first stage selection was done using PPS sampling, using the total number of households found within each EA as the measure of size. Based on the total number of clusters in each domain, the total number of clusters required to achieve the necessary sample size was used to determine the appropriate sampling interval for systematic random selection from the list of EAs.

All sampled EAs were, finally, verified for their altitude category with the third frame obtained from WHO. The altitude-based DPPA frame was somewhat out-of-date and inaccurate. Thus, the altitudes of some of the sampled EAs were found to be contrary to what was anticipated and, hence, replaced by newly sampled EAs (see below). Eleven EAs were also verified at the field stage, their inaccessibility due to various reasons; thus, they were replaced by new ones.

Five of eight zones of the Somali Region were excluded due to incomplete EA mapping and relative insecurity of the region during the planning phase of the survey.

Second stage sampling of households

A simple random sample of households within each cluster was carried out in the field using PDAs. All households within an EA were enumerated and mapped using PDAs fitted with geo-positioning units, and a random sample of 25 households per EA was selected from all mapped households. The procedures for sampling households using PDAs have been described elsewhere.[1]

3. Replacement strategy

To maintain the representative geographical distribution of sample EAs (which was the direct outcome of the PPS systematic sample selection implemented in this study), inaccessible EAs were replaced by EAs that were selected solely from the same woreda where the former EAs had been drawn. For instance, if replacement was needed for a particular EA, a random sample of an EA was drawn only from among EAs that were found from the same woreda where the EA to be replaced had been drawn. The newly sampled EAs were also checked with the WHO frame for altitude conformity.

4. Sampling weights and estimation procedures

Since the national sample of primary sampling units was distorted from true PPS selection by the needs for oversampling in some domains (e.g, in Oromiya and Amhara), the sample was not self weighting (i.e., each PSU did not have equal probability of selection). In addition, we selected a fixed number of households within each PSU, which means that the probability of selection of a household differed

between PSUs. Therefore, weights must be used to compensate for the resulting differential selection probabilities in different PSUs. Thus, sampling weights were computed based on the implemented survey design and appropriate estimates were calculated using those weights. The algorithm followed in computing sampling weights that were useful in inflating our data and the overall estimation procedures is provided in Appendix B.

Reference

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Appendix B: Sampling weights and estimation procedures of totals and ratios

The following formulas were used to estimate totals for a stratum.

1. For estimating totals:

$$\hat{Y}_h = \sum_{i=1}^{n_h} W_{hi} \sum_{j=1}^{h_{hi}} y_{hij} = \sum_{i=1}^{n_h} W_{hi} y_{hi}$$

in which $W_{hi} = \frac{M_h H_{hi}}{n_h m_{hi} h_{hi}}$ is the basic sampling weight.

Where:

h represents the stratum.

n_h is the total number of sample EAs successfully covered in the h[th] stratum.

M_h is the measure of size of the h[th] stratum as obtained from the sampling frame.

m_{hi} is the measure of size of the i[th] sample EA in the h[th] stratum obtained from the sampling frame.

H_{hi} is the total number of households of the i[th] sample EA in the h[th] stratum.

h_{hi} is the number of sample households successfully covered in the i[th] sample EA in the h[th] stratum.

y_{hij} is the value of a particular characteristic for household j. in the i[th] EA in the h[th] stratum.

y_{hi} is the sample total of the particular characteristics for EA i in stratum h.

$\hat{Y}_h$ is the estimated total for the particular characteristic in stratum h.

Estimate of total at country or any other domain level, $\hat{Y}$, is obtained by summing up stratum total estimates.

$$\hat{Y} = \sum_{h=1} \hat{Y}_h$$

2. For estimating ratio type characteristics In stratum h:

$$\hat{R}_h = \frac{\hat{Y}_h}{\hat{X}_h} \text{ and } \hat{R} = \frac{\hat{Y}}{\hat{X}}$$

The numerator and the denominator are estimates of domain totals of characteristic y and x, respectively.

3. Sampling variance of the estimates:

Sampling variance of estimate of stratum total is given by the following formula:

The variance of domain total estimate is:

$$V(\hat{Y}_h) = \frac{n_h}{n_h - 1}\left[\sum_{i=1}^{n_h} \hat{Y}_{hi}^{\,2} - \frac{\hat{Y}_h^{\,2}}{n_h}\right].$$

in which $\hat{Y}_{hi} = W_{hi} \sum_{j=1}^{h_{hi}} Y_{hij}$

$$V(\hat{Y}) = \sum_h V(\hat{Y}_h)$$

$$SE(\hat{Y}_h) = \sqrt{Var(\hat{Y}_h)}$$

And the variance of domain ratio estimate is given by:

$$Var\left(\hat{R}_h\right) = \frac{1}{\hat{X}_h^{\,2}}\left[Var\left(\hat{Y}_h\right) + \hat{R}_h^2\, Var\left(\hat{X}_h\right) - 2\hat{R}_h\, Cov\left(\hat{Y}_{h,}\hat{X}_h\right)\right]$$

In which, $Cov\left(\hat{Y}_{h,}\hat{X}_h\right) = \frac{n_h}{n_h - 1}\left[\sum_{i=1}^{n_h} \hat{Y}_{hi}\hat{X}_{hi} - \frac{\hat{Y}_h X_h}{n_h}\right]$

4. Confidence interval (CI):

The following formula was used to calculate the CI of a particular total.

The coefficient of variation (CV) of domain total in percentage is:

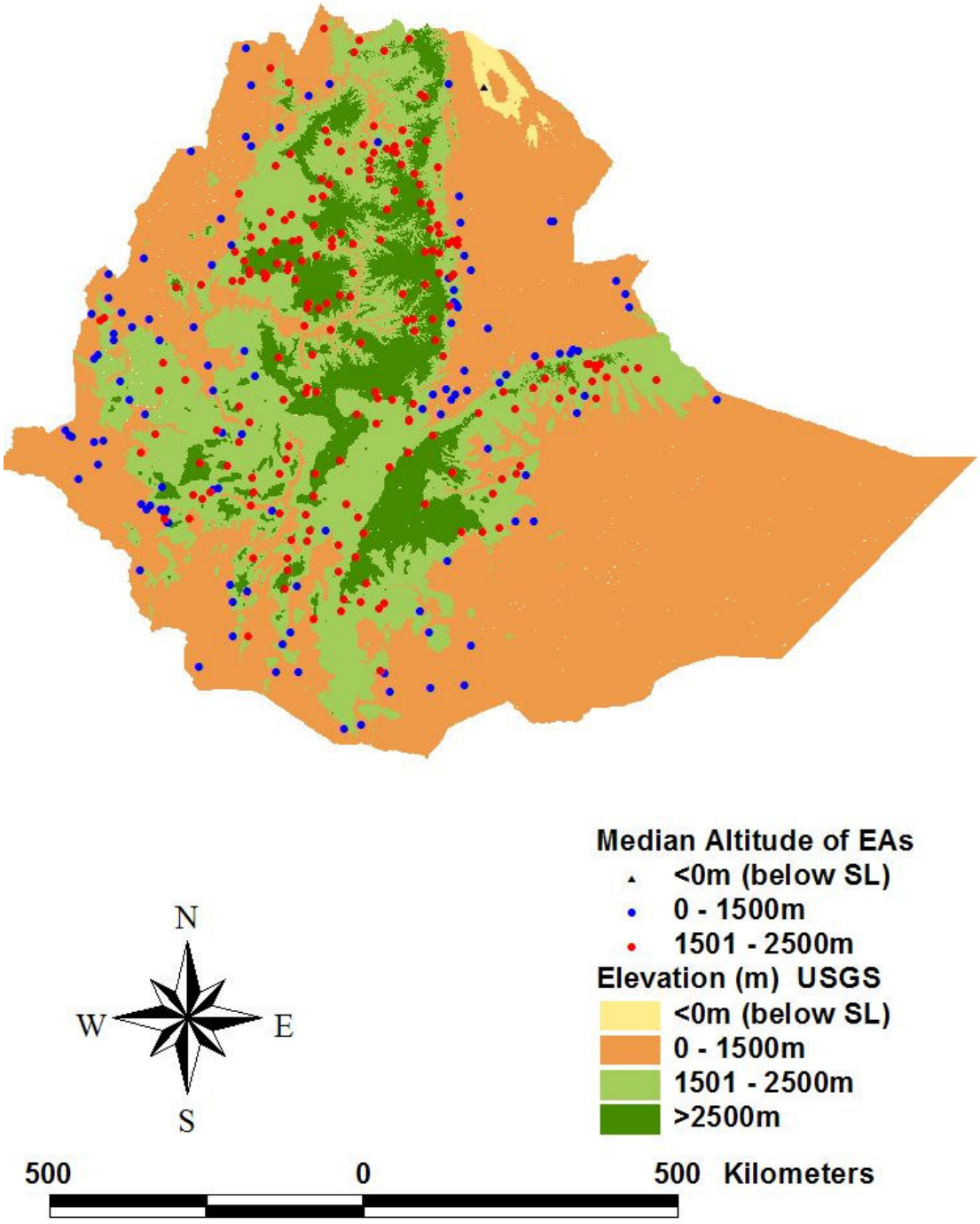
The ninety-five percent confidence interval (CI) of domain total was computed as:

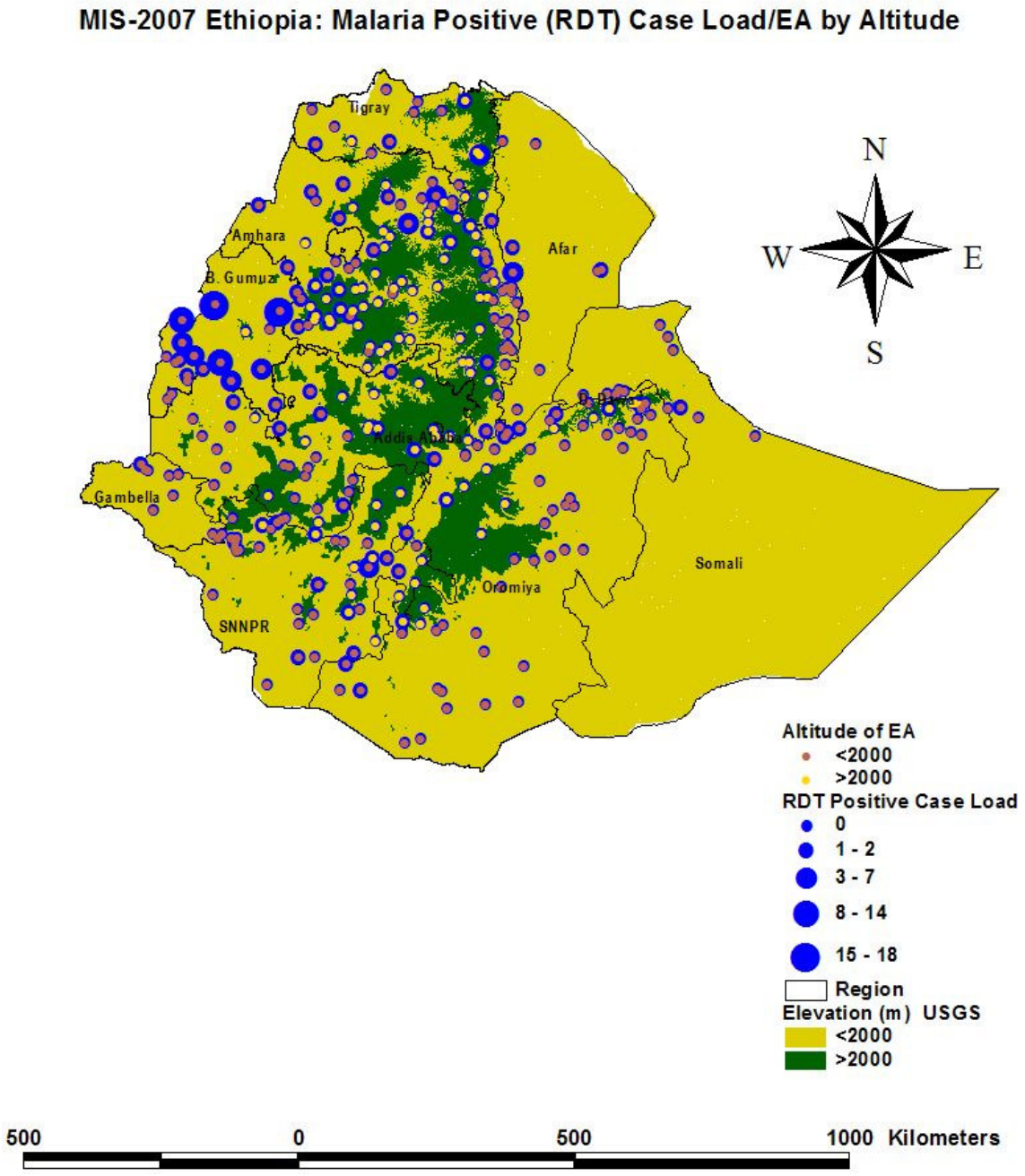
$$\hat{Y}_h \pm 1.96 * SE(\hat{Y}_h)$$

Estimates of standard errors and confidence intervals for the ratio estimate were calculated by adopting formulas given for totals.

Mapping surveyed EAs

Distribution of EAs, Ethiopia 2007 MIS, overlaid on digital elevation model (USGS)




MIS-2007 Ethiopia: Malaria Positive (RDT) Case Load/EA by Altitude
Tigray
Afar
Amhara
B. Gumuz
Addis Ababa
D. Dawa
Gambella
Somali
Oromiya
SNNPR
N
W
E
S
Altitude of EA
<2000
>2000
RDT Positive Case Load
0
1 - 2
3 - 7
8 - 14
15 - 18
Region
Elevation (m) USGS
<2000
>2000
500
0
500
1000 Kilometers

Appendix C: Survey personnel

2007 MIS management

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Field work teams

S.No.	Name of surveyor	Region	Title	Role in 2007 MIS
1	Alo Mohammed	Afar	Nurse	Interviewer
2	Ebrahim Mohammed	Afar	Lab technician	Specimen processor & analyzer
3	Samiya Amie	Afar	health officer	Supervisor
4	Setitual Mesfin	Afar	Lab technician	Specimen processor & analyzer
5	Tesfu Matiwos	Afar	Nurse	Interviewer
6	Abere Agonafir	Amhara	Lab technician	Specimen processor & analyzer
7	Addisie Tesfaye	Amhara	Nurse	Interviewer
8	Addisu Workneh	Amhara	Lab technician	Specimen processor & analyzer
9	Alehegn Amare	Amhara	Lab technician	Specimen processor & analyzer
10	Alemu Feten	Amhara	Nurse	Interviewer
11	Ali Seid	Amhara	Health officer	Supervisor
12	Ayele Atlabachew	Amhara	MALTRA P. Advisor	Supervisor
13	Ayenew Messele	Amhara	MALTRA P. Advisor	Supervisor
14	Behailu Yimer	Amhara	Nurse	Interviewer
15	Besukal Abebe	Amhara	Lab technician	Specimen processor & analyzer
16	Bukayaw Wudie	Amhara	Lab technician	Specimen processor & analyzer
17	Cherenet Shimekaw	Amhara	Health officer	Supervisor
18	Debebe Yehualashet	Amhara	Lab technician	Specimen processor & analyzer
19	Desalegn Lulu	Amhara	Health officer	Supervisor
20	Endalk Adane	Amhara	Lab technician	Specimen processor & analyzer
21	Gashaw Ayalew	Amhara	Lab technician	Specimen processor & analyzer
22	Gashaw Zegeye	Amhara	Nurse	Interviewer
23	Getinet Shewaseged	Amhara	Health Officer	Supervisor
24	Girma Mengesha	Amhara	Nurse	Interviewer
25	Jemberu Nega	Amhara	Lab technician	Specimen processor & analyzer
26	Kassahun Atalel	Amhara	Lab technician	Specimen processor & analyzer
27	Kedir Hussen	Amhara	Health Officer	Interviewer
28	Mekuriaw Alemu	Amhara	Nurse	Interviewer
29	Melish Bahiru	Amhara	Lab technician	Specimen processor & analyzer
30	Menbere Belay	Amhara	Nurse	Interviewer
31	Mohammed Awol	Amhara	Lab technician	Specimen processor & analyzer
32	Nuruhussien Mohammed	Amhara	Nurse	Interviewer
33	Said Ahmed	Amhara	Nurse	Interviewer
34	Seidu Fente	Amhara	Health officer	Supervisor
35	Shirshu Kindu	Amhara	Health officer	Interviewer
36	Solomie Mohammed Seid	Amhara	Nurse	Interviewer
37	Tadesse Hailu	Amhara	Lab technologist	Specimen processor & analyzer
38	Tegegne Getaneh	Amhara	Lab technician	Specimen processor & analyzer
39	Terefe Beyene	Amhara	Nurse	Interviewer
40	Wuhib Bishaw	Amhara	Nurse	Interviewer
41	Abera Assege	B. Gumuz	Biologist	Supervisor
42	Asefaw Bessie	B. Gumuz	Health officer	Interviewer
43	Chekole Guadu	B. Gumuz	Nurse	Interviewer
44	Dawit Degu	B. Gumuz	Lab technician	Specimen processor & analyzer
45	Melaku G/Micheal	B. Gumuz	Lab technologist	Specimen processor & analyzer
46	Tenaw Engida	B. Gumuz	Health officer	Interviewer
47	Hussein Abdi	Diredawa	Lab technician	Specimen processor & analyzer
48	Wasihun Bekele	Diredawa	Nurse	Interviewer

Field work teams, continued

S. No.	Name of surveyor	Region	Title	Role in 2007 MIS
49	Abdo Abafogi	Gambella	Nurse	Interviewer
50	Alemayehu Eddu	Gambella	Nurse	Interviewer
51	Awoke Getahun	Gambella	Lab technician	Specimen processor & analyzer
52	David Dak	Gambella	Health officer	Supervisor
53	Teshome Gobena	Gambella	Lab technician	Specimen processor & analyzer
54	Abdulhamid Ahmed	Harari	Nurse	Interviewer
55	Seid Yassin	Harari	Health officer	Supervisor
56	Shemsedin Mohammed	Harari	Lab technician	Specimen processor & analyzer
57	Abnet Ebisa	Oromiya	Nurse	Interviewer
58	Alemu Deme	Oromiya	Lab technician	Specimen processor & analyzer
59	Bereket Tafesse	Oromiya	Nurse	Interviewer
60	Dereje Ayana	Oromiya	Nurse	Interviewer
61	Etsay Kebedom	Oromiya	Lab technician	Specimen processor & analyzer
62	Fekadu Lamma	Oromiya	Nurse	Interviewer
63	Gizework Kassahun	Oromiya	Health officer	Supervisor
64	Kemal Muza	Oromiya	Health officer	Supervisor
65	Konjit Tekilu	Oromiya	Lab technician	Specimen processor & analyzer
66	Kulani Olani	Oromiya	Lab technician	Specimen processor & analyzer
67	Kumsa Abdisa	Oromiya	Lab technician	Specimen processor & analyzer
68	Lishan Solomon	Oromiya	Lab technician	Specimen processor & analyzer
69	Melaku Merdasa	Oromiya	Nurse	Supervisor
70	Munteha A/Selam	Oromiya	Nurse	Interviewer
71	Paulos Petros	Oromiya	Nurse	Interviewer
72	Rehima Haji	Oromiya	Lab technician	Specimen processor & analyzer
73	Siyum Obsa	Oromiya	Lab technician	Specimen processor & analyzer
74	Star Desta	Oromiya	Nurse	Interviewer
75	Teshome Aboye	Oromiya	Lab technician	Specimen processor & analyzer
76	Teshome Megersa	Oromiya	Nurse	Interviewer
77	Teshome Tura	Oromiya	Health officer	Supervisor
78	Venus Shewagizaw	Oromiya	Nurse	Interviewer
79	Wayu Zeloso	Oromiya	Lab technician	Specimen processor & analyzer
80	Wondimu Tesgera	Oromiya	MALONCHO P. advisor	Supervisor
81	Wondwoson Degu	Oromiya	Lab technician	Specimen processor & analyzer
82	Worku Seboka	Oromiya	Lab technician	Specimen processor & analyzer
83	Wudineh Araya	Oromiya	Lab technician	Specimen processor & analyzer
84	Yehoulashet G/Mariam	Oromiya	Nurse	Supervisor
85	Zegeye Jote	Oromiya	Nurse	Interviewer
86	Abdenagom Bent	SNNPR	Lab technician	Specimen processor & analyzer
87	Abdurehim Redi	SNNPR	Nurse	Interviewer
88	Abraham Mecha	SNNPR	Lab technician	Specimen processor & analyzer
89	Ambaye Areru	SNNPR	MALONCHO P. advisor	Supervisor
90	Asrat Banzikes	SNNPR	Nurse	Interviewer
91	Endale Bekele	SNNPR	Nurse	Interviewer
92	Erdachew Ambaye	SNNPR	Lab technician	Specimen processor & analyzer
93	Eshetu Mua	SNNPR	Health officer	Supervisor
94	Eskinder Wolka	SNNPR	Health officer	Supervisor
95	Gelaglie Doa	SNNPR	Nurse	Interviewer
96	Getenesh H/Giorgis	SNNPR	Nurse	Interviewer
97	Hayatu Muze	SNNPR	Health officer	Supervisor
98	Kedir Argaw	SNNPR	Lab technician	Specimen processor & analyzer
99	Kefale Lelamo	SNNPR	Nurse	Interviewer
100	Kifle Ayalew	SNNPR	Lab technician	Specimen processor & analyzer
101	Napolion Abayneh	SNNPR	Lab technician	Specimen processor & analyzer
102	Shiferaw H/mariam	SNNPR	Health Officer	Interviewer
103	Sitna Jemal	SNNPR	Lab technician	Specimen processor & analyzer
104	Temesgen Eromo	SNNPR	Lab technician	Specimen processor & analyzer
105	Tigist Wondimu	SNNPR	Lab technician	Specimen processor & analyzer

Field work teams, continued

S. No.	Name of surveyor	Region	Title	Role in 2007 MIS
106	Yemanewold Shiferaw	SNNPR	Nurse	Interviewer
107	Zebiba Yimer	SNNPR	Lab technician	Specimen processor & analyzer
108	Abdi Mohammed	Somali	Health Ed. EXP.	Supervisor
109	Abdi Osman	Somali	Lab technician	Specimen processor & analyzer
110	Abdirezak Mohammed	Somali	Lab technician	Specimen processor & analyzer
111	Aliye Abraham	Somali	Nurse	Interviewer
112	Aneb Farah	Somali	Nurse	Interviewer
113	Anwar Abdi	Somali	Nurse	Supervisor
114	Kalid A/Nassir	Somali	Lab technician	Interviewer
115	Mehadi Ismael	Somali	Lab technician	Specimen processor & analyzer
116	Mesfin Akalu	Somali	Nurse	Interviewer
117	Shukria Omer	Somali	Lab technician	Specimen processor & analyzer
118	Desta Birhane	Tigray	Lab technician	Specimen processor & analyzer
119	Enyew Lema	Tigray	Lab technician	Specimen processor & analyzer
120	G/Michael Tesfay	Tigray	Nurse	Interviewer
121	G/Wahid Gezahen	Tigray	Nurse	Interviewer
122	Haftu Kelelew	Tigray	Health officer	Supervisor
123	Kesate Nikodimos	Tigray	Lab technician	Specimen processor & analyzer
124	Moges Tekelau Tiq	Tigray	Lab technician	Interviewer
125	Solomon Abrha	Tigray	Nurse	Interviewer
126	Tasew Demeke	Tigray	Health officer	Supervisor
127	Tesfay Teka	Tigray	Nurse	Interviewer
128	Tsehay G/Yohones	Tigray	Lab technician	Specimen processor & analyzer

Appendix D: Budget

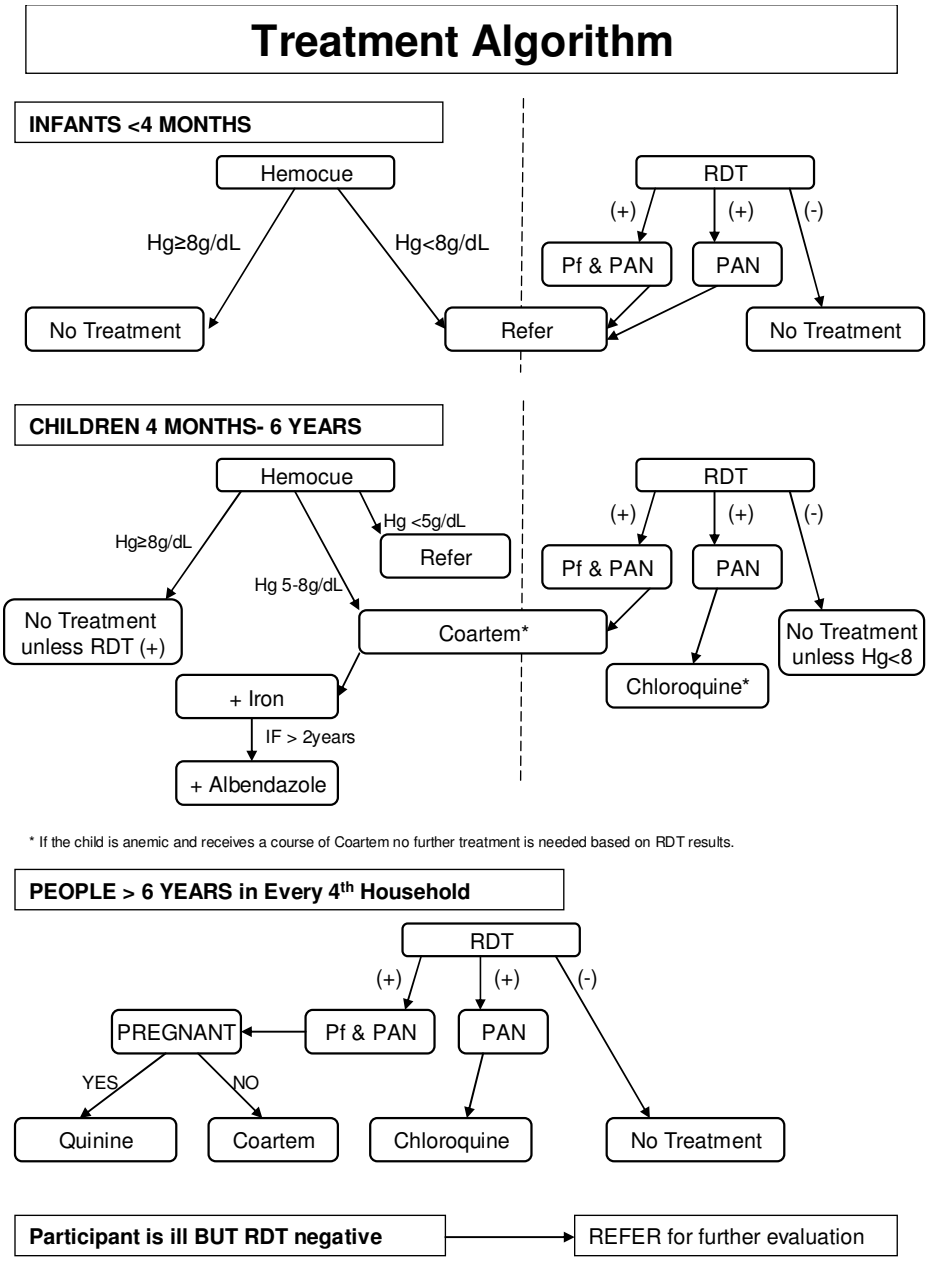
The National Malaria Indicator Survey (2007 MIS) budget summary is presented below. The total cash income for the survey is USD 477,533 contributed by TCC 6%, MACEPA 31% and PMI/USAID 63%. UNICEF's logistic support worth USD 16,534 is not reflected in the budget summary below.

The budget line for each expenditure is general, but it can be used as a reference for future survey planning efforts. Of note, the largest cost drivers for the 2007 MIS are training and actual survey cost (78.6%); travel expenses, per diem, and transportation costs for permanent staff (9.4%); and vehicle expenses for fuel, lubrication, and maintenance (6.5%). Not included in these figures are technical and logistic support from MACEPA, TCC, WHO, and UNICEF's sensitization fund transferred to FMoH. Expenses and staff time for the technical and logistics support from partners involved in the survey were partially covered by individual institutions; technical support from the CDC was supported through a separate agreement between PATH/MACEPA and the CDC.

Summary of 2007 MIS expenditures:

Budget line	Details	Expenditure USD	Percent (%) of total
Interventions: (Training and actual survey)	Survey expenditure: medical supply, enumerator's, data and lab technicians per-diem (training and actual survey), car rental	309,871	78.6
Travel expenses	For permanent staff	36,866	9.4
Vehicle expense	Fuel and lubrication	25,521	6.5
Salaries and benefits	Coordinators	16,595	4.2
Communication and stationery	Telephone, phone allowance, stationery	2,459	0.6
Consulting and labor charges	Statisticians, wage, pack animal & saddle rental	1,932	0.5
Other expenses	Bank service charges, import tax, etc.	827	0.2
Total expenditure		**394,071**	**100**

Appendix E: Treatment algorithm



Appendix F: Number of analyzed enumeration areas (EAs) per region

Region	Number of analyzed EAs
Addis Ababa	2
Afar	10
Amhara	108
Benishangul-Gumuz	18
Dire Dawa	3
Gambella	12
Harari	2
Oromiya	97
SNNPR	40
Somali	12
Tigray	15

Regional data is significant for Amhara and Oromiya, estimates for other regions are provided to show inter-region variability, but, because of smaller sample sizes, should be compared using great caution.

Annex 1: Questionnaires

National Malaria Indicator Survey

Household Questionnaire

ORC Macro
National Malaria Control Programme, Ministry of Health
MACEPA

October 2007

MALARIA INDICATOR SURVEY
MODEL HOUSEHOLD QUESTIONNAIRE

Ethiopia
Ministry of Health

IDENTIFICATION[1]	
PLACE NAME _____	
NAME OF HOUSEHOLD HEAD _____	
CLUSTER NUMBER.....	
HOUSEHOLD NUMBER.....	
REGION	
URBAN/RURAL (URBAN=1, RURAL=2).....	
LARGE CITY/SMALL CITY/TOWN/COUNTRYSIDE[2] ..... (LARGE CITY=1, SMALL CITY=2, TOWN=3, COUNTRYSIDE=4)	

INTERVIEWER VISITS				
	1	2	3	FINAL VISIT
DATE				DAY / MONTH / YEAR
INTERVIEWER'S NAME				NAME
RESULT*				RESULT
NEXT VISIT: DATE				TOTAL NO. 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 NUMBER OF RESPONDENT TO HOUSEHOLD QUESTIONNAIRE

SUPERVISOR	OFFICE EDITOR	KEYED BY
NAME _____		
DATE _____		

[1] This section should be adapted for country-specific survey design.

[2] The following guidelines should be used to categorize urban sample points: "Large cities" are national capitals and places with over 1 million population; "small cities" are places with between 50,000 and 1 million population; the remaining urban sample points are "towns."

HOUSEHOLD MEMBERS LISTING

Now we would like some information about the people who usually live in your household or who are staying with you now.

LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE	ELIGIBLE WOMEN	CURRENTLY PREGNANT?
	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.	What is the relationship of (NAME) to the head of the household?*	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?	CIRCLE LINE NUMBER OF ALL WOMEN AGE 15-49	FOR ELIGIBLE WOMEN, ASK: Is (NAME) currently pregnant?
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			M F	YES NO	YES NO	IN YEARS		YES NO/DK
01			1 2	1 2	1 2		01	1 2
02			1 2	1 2	1 2		02	1 2
03			1 2	1 2	1 2		03	1 2
04			1 2	1 2	1 2		04	1 2
05			1 2	1 2	1 2		05	1 2
06			1 2	1 2	1 2		06	1 2
07			1 2	1 2	1 2		07	1 2
08			1 2	1 2	1 2		08	1 2
09			1 2	1 2	1 2		09	1 2
10			1 2	1 2	1 2		10	1 2

* CODES FOR Q.3 RELATIONSHIP TO HEAD OF HOUSEHOLD:
01 = HEAD
02 = WIFE/HUSBAND
03 = SON OR DAUGHTER
04 = SON-IN-LAW OR DAUGHTER-IN-LAW
05 = GRANDCHILD
06 = PARENT
07 = PARENT-IN-LAW
08 = BROTHER OR SISTER
09 = OTHER RELATIVE
10 = ADOPTED/FOSTER/ STEPCHILD
11 = NOT RELATED
98 = DON'T KNOW

LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE	ELIGIBLE WOMEN	CURRENTLY PREGNANT?
	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.	What is the relationship of (NAME) to the head of the household?*	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?	CIRCLE LINE NUMBER OF ALL WOMEN AGE 15-49	FOR ELIGIBLE WOMEN, ASK: Is (NAME) currently pregnant?
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			M F	YES NO	YES NO	IN YEARS		YES NO/DK
11			1 2	1 2	1 2		11	1 2
12			1 2	1 2	1 2		12	1 2
13			1 2	1 2	1 2		13	1 2
14			1 2	1 2	1 2		14	1 2
15			1 2	1 2	1 2		15	1 2
16			1 2	1 2	1 2		16	1 2
17			1 2	1 2	1 2		17	1 2
18			1 2	1 2	1 2		18	1 2
19			1 2	1 2	1 2		19	1 2
20			1 2	1 2	1 2		20	1 2

TICK HERE IF CONTINUATION SHEET USED ☐

Just to make sure that I have a complete listing:

1) Are there any other persons such as small children or infants that we have not listed? YES ☐→ ENTER EACH IN TABLE NO ☐

2) In addition, 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 ☐→ ENTER EACH IN TABLE NO ☐

3) Are there any guests or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed? YES ☐→ ENTER EACH IN TABLE NO ☐

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
10	What is the main source of drinking water for members of your household?[1]	PIPED WATER PIPED INTO DWELLING ... 11 PIPED INTO 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)	
11	What kind of toilet facility does your household use?[1]	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 (VIP) ... 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)	
12	Does your household have:[2] Electricity? A radio? A television? A telephone? A refrigerator?	YES NO ELECTRICITY ... 1 2 RADIO ... 1 2 TELEVISION ... 1 2 TELEPHONE ... 1 2 REFRIGERATOR ... 1 2	
13	What type of fuel does your household mainly use for cooking?	ELECTRICITY ... 01 LPG/NATURAL GAS ... 02 BIOGAS ... 03 KEROSENE ... 04 COAL/LIGNITE ... 05 CHARCOAL ... 06 FIREWOOD/STRAW ... 07 DUNG ... 08 OTHER _____ 96 (SPECIFY)	

[1] Coding categories to be developed locally and revised based on the pretest; however, the broad categories must be maintained.

[2] Additional indicators of socioeconomic status should be added, especially to distinguish among lower socioeconomic classes.

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
14a	MAIN MATERIAL OF THE FLOOR.[1] 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)	
14b	MAIN MATERIAL OF THE WALL.[1] RECORD OBSERVATION.	NATURAL WALL NO WALLS..... 11 CANE/TRUCKS/BAMBOO/REED ..... 12 RUDIMENTARY WALL BAMBOO/WOOD WITH MUD ..... 21 STONE WITH MUD..... 22 UNCOVERED ADOBE ..... 23 PLYWOOD..... 24 CARTON..... 25 FINISHED WALL CEMENT..... 31 STONE WITH LIME/CEMENT..... 32 BRICKS..... 33 CEMENT BLOCKS..... 34 COVERED ADOBE ..... 35 WOOD PLANKS/SHINGLES..... 36 OTHER _____ 96 (SPECIFY)	
14c	MAIN MATERIAL OF THE ROOF.[1] RECORD OBSERVATION.	NATURAL ROOF Thatch/Leaf ..... 11 Sticks and mud..... 12 RUDIMENTARY ROOF RUSTIC MAT/PLASTIC SHEET ..... 21 REED/BAMBOO..... 22 WOOD PLANKS..... 23 FINISHED WALL CORRUGATED IRON..... 31 WOOD ..... 32 CALAMINE/CEMENT FIBER..... 33 CEMENT/CONCRETE ..... 34 ROOFING SHINGLES..... 35 OTHER _____ 96 (SPECIFY)	
14c	TYPE OF WINDOWS RECORD OBSERVATION.	YES NO ANY WINDOW……1 2 WINDOWS WITH GLASS..... 1 2 WINDOWS WITH SCREENS...1 2 WINDOWS WITH CURTAINS OR SHUTTERS……...1 2	
9b	How many separate rooms are in this household? INCLUDE ALL ROOMS, INCLUDING KITCHEN, TOILET, SLEEPING ROOMS, SALON, etc.	NUMBER OF ROOMS ☐☐	

9c	How many rooms in this household are used for sleeping? INCLUDE ONLY ROOMS WHICH ARE USUALLY USED FOR SLEEPING.	NUMBER OF SLEEPING ROOMS ☐☐	
9d	How many separate sleeping spaces are there in your household? INCLUDE ALL SLEEPING SPACES, INCLUDING IF THERE IS MORE THAN ONE SLEEPING SPACE IN EACH ROOM USED FOR SLEEPING.	NUMBER OF SLEEPING SPACES ☐☐	
15	Does any member of your household own: A bicycle? A motorcycle or motor scooter? A car or truck?	YES NO BICYCLE .....1 2 MOTORCYCLE/SCOOTER .....1 2 CAR/TRUCK 1 2	
15A	At any time in the past 12 months, has anyone sprayed the interior walls of your dwelling against mosquitoes?[2]	YES .....1 NO .....2 DON'T KNOW 8	→15D
15B	How many months ago was the house sprayed?[2] IF LESS THAN ONE MONTH, RECORD '00' MONTHS AGO.	MONTHS AGO ..... ☐☐	
15C	Who sprayed the house?[2]	GOVERNMENT WORKER/PROGRAM ... 1 PRIVATE COMPANY .....2 HOUSEHOLD MEMBER .....3 OTHER _____ 6 (SPECIFY) DON'T KNOW 8	
15D	At any time in the past 12 months, have the walls in your dwelling been plastered or painted?	YES .....1 NO .....2 DON'T KNOW 8	→16
15E	How many months ago were the walls plastered or painted? IF LESS THAN ONE MONTH, RECORD '00' MONTHS AGO.	MONTHS AGO ☐☐	
16	Does your household have any mosquito nets that can be used while sleeping?	YES .....1 NO 2	→ 27
17	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS ..... ☐	

[1] Categories to be developed locally and revised based on the pretest; however, the broad categories must be maintained. In some countries, it may be desirable to ask an additional question on the material of walls or ceilings.

[2] This question should be deleted in countries that do not have an indoor residual spraying program for mosquitoes.

		NET #1	NET #2	NET #3
18	ASK RESPONDENT TO SHOW YOU THE NET(S) IN THE HOUSEHOLD. IF MORE THAN THREE NETS, USE ADDITIONAL QUESTIONNAIRE(S).	OBSERVED .... 1 NOT OBSERVED 2	OBSERVED............. 1 NOT OBSERVED............. 2	OBSERVED .... 1 NOT OBSERVED 2
19	How long ago did your household obtain the mosquito net?	MOS AGO [ ][ ] MORE THAN 3 YEARS AGO.......................... 95	MOS AGO [ ][ ] MORE THAN 3 YEARS AGO 9	MOS AGO [ ][ ] MORE THAN 3 YEARS AGO 95
20	OBSERVE OR ASK THE BRAND OF MOSQUITO NET. IF BRAND IS UNKNOWN, AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS TO RESPONDENT.	'PERMANENT' NET[1] Permanet…………11 Olyset……………..12 Safenite………….. 13 Other/Don't Know……16 (SKIP TO 24) 'PRETREATED' NET[2] Salam Enkilfe…..... 21 KO Nets………….. 23 Other/Don't Know…... 26 (SKIP TO 22) OTHER………………..31 DON'T KNOW BRAND……………..98	'PERMANENT' NET[1] Permanet…………11 Olyset……………..12 Safenite………….. 13 Other/Don't Know……16 (SKIP TO 24) 'PRETREATED' NET[2] Salam Enkilfe……. 21 KO Nets………….. 23 Other/Don't Know……26 (SKIP TO 22) OTHER………………..31 DON'T KNOW BRAND……………..98	'PERMANENT' NET[1] Permanet…………11 Olyset……………...12 Safenite…………..13 Other/Don't Know….. 16 (SKIP TO 24) 'PRETREATED' NET[2] Salam Enkilfe…….21 KO Nets…………..23 Other/Don't Know…. 26 (SKIP TO 22) OTHER……………….31 DON'T KNOW BRAND……………. 98
	Where did you obtain the net?	GOVERNMENT CLINIC/HOSPITAL NEIGHBORHOOD HEALTH COMMITTEE HEALTH EXTENSION WORKER COMMUNITY HEALTH WORKER / AGENT RETAIL SHOP PHARMACY WORKPLACE OTHER (SPECIFY)__________ DON'T KNOW	GOVERNMENT CLINIC/HOSPITAL NEIGHBORHOOD HEALTH COMMITTEE HEALTH EXTENSION WORKER COMMUNITY HEALTH WORKER / AGENT RETAIL SHOP PHARMACY WORKPLACE OTHER (SPECIFY)_______ DON'T KNOW	GOVERNMENT CLINIC/HOSPITAL NEIGHBORHOOD HEALTH COMMITTEE HEALTH EXTENSION WORKER COMMUNITY HEALTH WORKER / AGENT RETAIL SHOP PHARMACY WORKPLACE OTHER (SPECIFY)__________ DON'T KNOW
	Did you purchase the net?	YES..............................1 NO ....2 (SKIP TO 21) NOT SURE...................8	YES........................... 1 NO ....2 (SKIP TO 21) NOT SURE.................. .8	YES..............................1 NO ....2 (SKIP TO 21) NOT SURE....................8
	How much did you pay for the net when it was purchased?	In Birr [ ][ ]	In Birr [ ][ ]	In Birr [ ][ ]
21	When you got the net, was it already factory-treated with an insecticide to kill or repel mosquitoes?	YES..............................1 NO...............................2 NOT SURE...................8	YES..........................1 NO............................2 NOT SURE................8	YES..............................1 NO...............................2 NOT SURE...................8
22	Since you got the mosquito net, was it ever soaked or dipped in a liquid to kill or repel mosquitoes or bugs?	YES..............................1 NO...............................2 (SKIP TO 24) NOT SURE...................8	YES..........................1 NO............................2 (SKIP TO 24) NOT SURE................8	YES..............................1 NO...............................2 (SKIP TO 24) NOT SURE....................8

23	How long ago was the net last soaked or dipped? IF LESS THAN 1 MONTH AGO, RECORD >00' MONTHS. IF LESS THAN 2 YEARS AGO, RECORD MONTHS AGO. IF '12 MONTHS AGO' OR '1 YEAR AGO,' PROBE FOR EXACT NUMBER OF MONTHS.	MOS AGO ☐☐ MORE THAN 2 YEARS AGO ……95 NOT SURE.....98	MOS AGO ☐☐ MORE THAN 2 YEARS AGO.....95 NOT SURE.....98	MOS AGO ☐☐ MORE THAN 2 YEARS AGO..... 95 NOT SURE.....98
	Where was the net soaked or dipped?	HOME GOVERNMENT CLINIC/HOSPITAL RETAIL SHOP PHARMACY WORKPLACE OTHER (SPECIFY)_____ DON'T KNOW	HOME GOVERNMENT CLINIC/HOSPITAL RETAIL SHOP PHARMACY WORKPLACE OTHER (SPECIFY)_____ DON'T KNOW	HOME GOVERNMENT CLINIC/HOSPITAL RETAIL SHOP PHARMACY WORKPLACE OTHER (SPECIFY)_____ DON'T KNOW
	Did you pay to soak or dip the net?	YES….....1 NO.....2 (SKIP TO 24) NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 24) NOT SURE.....8	YES.....1 NO……..2 (SKIP TO 24) NOT SURE.....8
	How much did you pay to soak or dip the net?	In Birr ☐☐	In Birr ☐☐	In Birr ☐☐
	PLEASE RECORD OR ASK THE GENERAL CONDITION OF THE NET.	GOOD (no holes)……..1 FAIR (no holes that fit a torch battery)……2 POOR (1-4 holes that fit a torch battery)……3 UNSAFE (>5 holes that fit a torch battery……4 UNUSED (still in package)...5 UNKNOWN……6	GOOD (no holes)……1 FAIR (no holes that fit a torch battery)……2 POOR (1-4 holes that fit a torch battery)……3 UNSAFE (>5 holes that fit a torch battery)……4 UNUSED (still in package)..5 UNKNOWN……6	GOOD (no holes ….)……..1 FAIR (no holes that fit a torch battery)……2 POOR (1-4 holes that fit a torch battery)……3 UNSAFE (>5 holes that fit a torch battery)……4 UNUSED (still in package)..5 UNKNOWN……6
24	Did anyone sleep under this mosquito net last night?	YES.....1 NO.....2 (SKIP TO 26) NOT SURE.....8	YES ……..1 NO ……2 (SKIP TO 26) NOT SURE ……8	YES.....1 NO.....2 (SKIP TO 26) NOT SURE.....8

[1] "Permanent" is a factory-treated net that does not require any further treatment.
[2] "Pretreated" is a net that has been pretreated, but requires further treatment after 6-12 months.

		NET #1	NET #2	NET #3
25	Who slept under this mosquito net last night? RECORD THE RESPECTIVE 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 [ ] NAME ________ LINE NO [ ] NAME ________ LINE NO [ ] NAME ________ LINE NO [ ]
26		GO BACK TO 18 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 27.	GO BACK TO 18 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 27.	GO BACK TO 18 IN THE FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE NETS, GO TO 27.

HEMOGLOBIN/MALARIA PARASITE MEASUREMENT

CHECK COLUMN (7) OF HOUSEHOLD LISTING: RECORD THE LINE NUMBER, NAME AND AGE OF ALL CHILDREN UNDER AGE 6. THEN ASK THE DATE OF BIRTH.

CHILDREN UNDER AGE 6 YEARS/HOUSEHOLD MEMBER				CONSENT STATEMENT FOR CHILDREN UNDER SIX (BORN IN 2002[1] OR AFTER) (AND HOUSEHOLD MEMBERS)	
LINE NUMBER FROM COL. (1)	NAME FROM COL. (2)	AGE FROM COL. (7)	What is (NAME's) date of birth? COPY MONTH AND YEAR OF BIRTH FROM 215 IN MOTHER'S BIRTH HISTORY AND ASK DAY. FOR CHILDREN NOT INCLUDED IN ANY BIRTH HISTORY, ASK DAY, MONTH AND YEAR.	LINE NUMBER OF PARENT/ADULT RESPONSIBLE FOR THE CHILD RECORD '00' IF NOT LISTED IN HOUSEHOLD SCHEDULE	READ CONSENT STATEMENT TO PARENT/ADULT RESPONSIBLE FOR THE CHILD
(27)	(28)	(29)	(30)	(31)	(32)
☐☐		☐☐	DAY ☐☐ MONTH ☐☐ YEAR ☐☐☐☐	☐☐	GRANTED YES......1 NO......2
☐☐		☐☐	☐☐ ☐☐ ☐☐☐☐	☐☐	YES......1 NO......2
☐☐		☐☐	☐☐ ☐☐ ☐☐☐☐	☐☐	YES......1 NO......2
☐☐		☐☐	☐☐ ☐☐ ☐☐☐☐	☐☐	YES......1 NO......2
☐☐		☐☐	☐☐ ☐☐ ☐☐☐☐	☐☐	YES......1 NO......2
☐☐		☐☐	☐☐ ☐☐ ☐☐☐☐	☐☐	YES......1 NO......2
[1] For fieldwork beginning in 2006, 2007 or 2008, the year should be 2001, 2002 or 2003, respectively.		TICK HERE IF CONTINUATION SHEET USED ☐	CONSENT STATEMENT: Insert consent form text here		NOTE: In countries where some enumeration areas are higher than 1,000 meters, altitude information should be collected in a separate form for each enumeration area higher than 1,000 meters so that the anemia estimates can be adjusted appropriately.

LINE NUMBER FROM COL. (1)	HEMOGLOBIN LEVEL (G/DL)	ANEAMIA TREATMENT	RESULT 1 MEASURED 2 NOT PRESENT 3 REFUSED 4 OTHER	RDT RESULT	TREATMENT	BLOODSLIDE 1 DONE 2 NOT PRESENT 3 REFUSED 4 OTHER	BLOODSLIDE NUMBER
(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
	.	CoArtem……………1 Iron…………………2 Albendazole……….3		PAN/Pf……………...1 PAN…………………2 NEGATIVE…………3 NOT VALID…………4	CoArtem……………..1 Chloroquine………….2 Quinine………………..3 No treatment………...4		A B
	.	CoArtem……………1 Iron…………………2 Albendazole……….3		PAN/Pf……………...1 PAN…………………2 NEGATIVE…………3 NOT VALID…………4	CoArtem……………..1 Chloroquine………….2 Quinine………………..3 No treatment………...4		A B
	.	CoArtem……………1 Iron…………………2 Albendazole……….3		PAN/Pf……………...1 PAN…………………2 NEGATIVE…………3 NOT VALID…………4	CoArtem……………..1 Chloroquine………….2 Quinine………………..3 No treatment………...4		A B
	.	CoArtem……………1 Iron…………………2 Albendazole……….3		PAN/Pf……………...1 PAN…………………2 NEGATIVE…………3 NOT VALID…………4	CoArtem……………..1 Chloroquine………….2 Quinine………………..3 No treatment………...4		A B
	.	CoArtem……………1 Iron…………………2 Albendazole……….3		PAN/Pf……………...1 PAN…………………2 NEGATIVE…………3 NOT VALID…………4	CoArtem……………..1 Chloroquine………….2 Quinine………………..3 No treatment………...4		A B
	.	CoArtem……………1 Iron…………………2 Albendazole……….3		PAN/Pf……………...1 PAN…………………2 NEGATIVE…………3 NOT VALID…………4	CoArtem……………..1 Chloroquine………….2 Quinine………………..3 No treatment………...4		A B

41	CHECK 34: NUMBER OF CHILDREN WITH HEMOGLOBIN LEVEL BELOW 7 G/DL ONE OR MORE ☐ → GIVE EACH PARENT/ADULT RESPONSIBLE FOR THE CHILD THE RESULT OF THE HEMOGLOBIN MEASUREMENT, AND CONTINUE WITH 36.[1] NONE ☐ → GIVE EACH PARENT/ADULT RESPONSIBLE FOR THE CHILD THE RESULT OF THE HEMOGLOBIN MEASUREMENT AND END THE HOUSEHOLD INTERVIEW.
42	We detected a low level of hemoglobin in the blood of [NAME OF CHILD(REN)]. This indicates that (NAME OF CHILD(REN) has/have developed severe anemia, which is a serious health problem. We would like to inform the doctor at _____ about the condition of [NAME OF CHILD(REN)]. This will assist you in obtaining appropriate treatment for the condition. Do you agree that the information about the level of hemoglobin in the blood of [NAME OF CHILD(REN)] may be given to the doctor?

NAME OF CHILD WITH HEMOGLOBIN BELOW 7 G/DL	NAME OF PARENT/RESPONSIBLE ADULT	AGREES TO REFERRAL?
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2
		YES.....1 NO.....2

[1] If more than one child is below 7 g/dl, read statement in Q.42 to each parent/adult responsible for a child who is below the cutoff point.

Malaria Indicator Survey

Women's Questionnaire

ORC Macro
Calverton, Maryland

October 2007

MALARIA INDICATOR SURVEY
WOMEN'S QUESTIONNAIRE

Ethiopia
Ministry of Health

IDENTIFICATION[1]	
PLACE NAME _____	
NAME OF HOUSEHOLD HEAD _____	
CLUSTER NUMBER	
HOUSEHOLD NUMBER	
REGION	
URBAN/RURAL (URBAN=1, RURAL=2)	
LARGE CITY/SMALL CITY/TOWN/COUNTRYSIDE[2] ..... (LARGE CITY=1, SMALL CITY=2, TOWN=3, COUNTRYSIDE=4)	
NAME AND LINE NUMBER OF WOMAN _____	

INTERVIEWER VISITS				
	1	2	3	FINAL VISIT
DATE				DAY MONTH YEAR
INTERVIEWER'S NAME				NAME
RESULT*				RESULT
NEXT VISIT: DATE				
TIME				TOTAL NO. OF VISITS

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

COUNTRY-SPECIFIC INFORMATION: LANGUAGE OF QUESTIONNAIRE, LANGUAGE OF INTERVIEW, NATIVE LANGUAGE OF RESPONDENT, AND WHETHER TRANSLATOR USED

SUPERVISOR	OFFICE EDITOR	KEYED BY
NAME _____		
DATE _____		

[1] This section should be adapted for country-specific survey design.

[2] The following guidelines should be used to categorize urban sample points: "Large cities" are national capitals and places with over 1 million population; "small cities" are places with between 50,000 and 1 million population; and the remaining urban sample points are "towns."

SECTION 1. RESPONDENT'S BACKGROUND

INTRODUCTION AND CONSENT

INFORMED CONSENT

Hello. My name is _____ and I am working with the Ministry of Health. We are conducting a national survey about malaria. We would very much appreciate your participation in this survey. The information you provide will help the government to plan health services. The survey usually takes between 10 and 20 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this survey since your views are important.

At this time, do you want to ask me anything about the survey?
May I begin the interview now?

Signature of interviewer: _____ Date: _____

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

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?[1]	PRIMARY..... 1 SECONDARY ..... 2 HIGHER..... 3	
106	What is the highest (grade/form/year) you completed at that level?[1]	GRADE..... ▒▒ Tech/Voc. Certificate……..12 University College Diploma……..13 University/College Degree of Higher…..14	
107	CHECK 105: PRIMARY ☐ ↓ SECONDARY OR HIGHER ☐		—<109

[1] Revise according to the local education system.

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
108	Now I would like you to read this sentence to me. SHOW CARD TO RESPONDENT.[1] 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	COUNTRY-SPECIFIC QUESTION ON RELIGION.	ORTHODOX CATHOLIC PROTESTANT MOSLIM TRADITIONAL OTHER _____(specify)	
110	COUNTRY-SPECIFIC QUESTION ON ETHNICITY.	AFFAR AMHARA GURAGIE OROMO SIDAMO SOMALI TIGRAWAY WELAITA OTHER_____(specify)	

[1]Each card should have four simple sentences appropriate to the country (e.g., “Parents love their children,” “Farming is hard work,” “The child is reading a book,” “Children work hard at school”). Cards should be prepared for every language in which respondents are likely to be literate.

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.	NONE.....00 TOTAL ..... ▒▒	<345
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	CHECK 208: ONE BIRTH ☐ → Was this child born in the last six years? IF NO, CIRCLE '00.' TWO OR MORE BIRTHS ☐ → How many of these children were born in the last six years?	NONE.....00 TOTAL IN LAST SIX YEARS..... ▒▒	<345

211 Now I would like to record the names of all your births in the last six years,[1] whether still alive or not, starting with the most recent one you had.
RECORD NAMES OF ALL BIRTHS IN THE LAST 6 YEARS IN 212. RECORD TWINS AND TRIPLETS ON SEPARATE LINES.

212 What name was given to your (most recent/previous) birth? (NAME)	213 Were any of these births twins?	214 Is (NAME) a boy or a girl?	215 In what month and year was (NAME) born? PROBE: What is his/her birthday?	216 Is (NAME) still alive?	217 IF 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 HOUSEHOLD LINE NUMBER OF CHILD (RECORD '00' IF CHILD NOT LISTED IN HOUSEHOLD).	220 Were there any other live births between (NAME) and (NAME OF BIRTH ON PREVIOUS LINE)?
01	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (NEXT BIRTH)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐ (NEXT BIRTH)	
02	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (GO TO 220)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐	YES.....1 NO.....2
03	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (GO TO 220)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐	YES.....1 NO.....2
04	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (GO TO 220)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐	YES.....1 NO.....2
05	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (GO TO 220)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐	YES.....1 NO.....2
06	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (GO TO 220)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐	YES.....1 NO.....2
07	SING...1 MULT..2	BOY..1 GIRL..2	MONTH ☐☐ YEAR ☐☐☐☐	YES....1 NO.....2 (GO TO 220)	AGE IN YEARS ☐☐	YES.....1 NO.....2	LINE NUMBER ☐☐	YES.....1 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 BIRTH 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) CHECK: FOR EACH BIRTH: YEAR OF BIRTH IS RECORDED. FOR EACH LIVING CHILD: CURRENT AGE IS RECORDED.		☐☐
223	CHECK 215 AND ENTER THE NUMBER OF BIRTHS IN 2000[1] OR LATER. IF NONE, RECORD '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 2000[1] OR LATER ☐ NO BIRTHS IN 2000 OR LATER ☐		<345

[1]For fieldwork beginning in 2006, 2007, or 2008, the year should be 2001, 2002, or 2003, respectively.

GENERAL MALARIA KNOWLEDGE

	Have you ever heard of an illness called malaria?	YES.....1 NO.....2	If 2, skip to 301
	Can you tell me the main signs or symptoms of malaria? MULTIPLE RESPONSES PROBE ONCE (Anything else?)	FEVER FEELING COLD HEADACHE NAUSEA AND VOMITING DIARRHEA DIZZINESS LOSS OF APPETITE BODY ACHE OR JOINT PAIN PALE EYES SALTY TASTING PALMS BODY WEAKNESS REFUSING TO EAT OR DRINK OTHER (SPECIFY)_____ _____ DON'T KNOW	
	In your opinion, what causes malaria? MULTIPLE RESPONSES PROBE ONCE (Anything else?)	MOSQUITO BITES EATING IMMATURE SUGARCANE EATING MAIZE INHALING MAIZE POLLEN HUNGER (EMPTY STOMACH) EATING OTHER DIRTY FOOD DRINKING DIRTY WATER GETTING SOAKED WITH RAIN COLD OR CHANGING WEATHER WITCHCRAFT OTHER (SPECIFY)_____ DON'T KNOW.....	
	How can someone protect themselves against malaria? MULTIPLE RESPONSES PROBE ONCE (Anything else?)	SLEEP UNDER A MOSQUITO NET SLEEP UNDER A INSECTICIDE TREATED MOSQUITO NET USE MOSQUITO REPELLANT AVOID MOSQUITO BITES TAKE PREVENTIVE MEDICATION SPRAY HOUSE WITH INSECTICIDE USE MOSQUITO COILS CUT THE GRASS AROUND THE HOUSE FILL IN PUDDLES (STAGNANT WATER) KEEP HOUSE SURROUNDINGS CLEAN BURN LEAVES DON'T DRINK DIRTY WATER DON'T EAT BAD FOOD (IMMATURE SUGARCANE/LEFTOVER FOOD) PUT MOSQUITO SCREENS ON THE WINDOWS EAT GARLIC DRINK ALCOHOL DON'T GET SOAKED WITH RAIN OTHER (SPECIFY)_____ DON'T KNOW.....	
	What are the danger signs and symptoms of malaria? MULTIPLE RESPONSES PROBE ONCE (Anything else?)	SEIZURE / CONVULSIONS GOES UNCONSCIOUS ANY FEVER VERY HIGH FEVER STIFF NECK WEAKNESS NOT ACTIVE CHILLS/SHIVERING NOT ABLE TO EAT VOMITING FAINTING CRYING ALL THE TIME RESTLESS, WON'T STAY STILL DIARRHOEA	

		OTHER (SPECIFY:_____) DON'T KNOW	
	Have you ever seen or heard messages about malaria?	YES……..1 NO……2	
	If yes, where did you see or hear these messages/information? PROBE ONCE (Anything else?)	GOVERNMENT CLININC/HOSPITAL NEIGHBORHOOD HEALTH COMMITTEE HEALTH EXTENSION WORKER COMMUNITY HEALTH WORKER FRIENDS/FAMILY WORKPLACE DRAMA GROUPS PEER EDUCATORS POSTERS/BILLBOARDS ON TV ON THE RADIO IN THE NEWSPAPER OTHER (SPECIFY) DON'T KNOW……..	
	How long ago did you see or hear these messages?	MONTHS.....| | |	
	What type of malaria messages/information did you see or hear? PROBE, but do not provide answers. Multiple answers possible. POSSIBLE ANSWERS INCLUDE	SLEEPING UNDER NET SLEEPING UNDER ITN SEEK TREATMENT FOR FEVER SEEK TREATMENT FOR FEVER WITHIN 24 HOURS IMPORTANCE OF SPRAYING NOT PLASTERING WALLS AFTER SPRAYING ENVIRONMENTAL SANITATION ACTIVITIES OTHER(SPECIFY) DON'T KNOW……	
	Did you recently receive education/information on malaria at your home?	YES……..1 NO……2	
	If yes, from whom did you receive this information/education? PROBE, but do not provide answers	HEALTH CARE WORKER HEALTH EXTENSION WORKER COMMUNITY HEALTH WORKER FRIENDS/FAMILY EMPLOYER PEER EDUCATORS OTHER (SPECIFY) DON'T KNOW……	
	How long ago did someone visit your home?	MONTHS.....| | |	
	What type of information/education about malaria did you receive at your home? PROBE, but do not provide answers. Multiple answers possible. POSSIBLE ANSWERS INCLUDE:	SLEEPING UNDER NET SLEEPING UNDER ITN SEEK TREATMENT FOR FEVER SEEK TREATMENT FOR FEVER WITHIN 24 HOURS IMPORTANCE OF SPRAYING NOT PLASTERING WALLS AFTER SPRAYING ENVIRONMENTAL SANITATION ACTIVITIES OTHER (SPECIFY) DON'T KNOW……	

SECTION 3AB. FEVER IN CHILDREN

311	ENTER IN THE TABLE THE LINE NUMBER AND NAME OF EACH LIVING CHILD BORN IN 2000[1] OR LATER. (IF THERE ARE MORE THAN 2 LIVING CHILDREN BORN IN 2000[1] OR LATER, USE ADDITIONAL QUESTIONNAIRES). Now I would like to ask you some questions about the health of all your children less than 5 years old. (We will talk about each one separately.)		
312	NAME AND LINE NUMBER FROM 212	YOUNGEST CHILD LINE NUMBER..... ▒▒ NAME _____	NEXT-TO-YOUNGEST CHILD LINE NUMBER ..... ▒▒ NAME _____
313	Has (NAME) been ill with a fever at any time in the last 2 weeks?	YES.....1 NO .....2 (GO TO 313 FOR NEXT CHILD OR, IF NO MORE CHILDREN, SKIP TO 345) = DON'T KNOW 8	YES .....1 NO .....2 (GO BACK TO 313 FOR NEXT CHILD OR, IF NO MORE CHILDREN, SKIP TO 345) = DON'T KNOW 8
314	How many days ago did the fever start? IF LESS THAN ONE DAY, RECORD '00'.	DAYS AGO ..... ▒▒ DON'T KNOW.....98	DAYS AGO ..... ▒▒ DON'T KNOW.....98
315	Did you seek advice or treatment for the fever from any source?	YES.....1 NO .....2 (SKIP TO 317) =	YES .....1 NO .....2 (SKIP TO 317) =
316	Where did you seek advice or treatment?[2] Anywhere else? RECORD ALL SOURCES MENTIONED.	PUBLIC SECTOR GOVT. HOSPITAL ..... A GOVT. HEALTH CENTER..... B GOVT. HEALTH POST ..... C MOBILE CLINIC..... D HEALTH EXTENSION WORKER E FIELD WORKER.....F OTHER PUBLIC _____G (SPECIFY) PRIVATE MEDICAL SECTOR PVT. HOSPITAL/CLINIC ..... H PHARMACY.....I PRIVATE DOCTOR.....J MOBILE CLINIC.....K FIELD WORKER..... L OTHER PVT. MEDICAL _____M (SPECIFY) OTHER SOURCE SHOP.....N TRAD. PRACTITIONER.....O OTHER _____ X (SPECIFY)	PUBLIC SECTOR GOVT. HOSPITAL .....A GOVT. HEALTH CENTER .....B GOVT. HEALTH POST ..... C MOBILE CLINIC..... D HEALTH EXTENSION WORKER E FIELD WORKER.....F OTHER PUBLIC _____G (SPECIFY) PRIVATE MEDICAL SECTOR PVT. HOSPITAL/CLINIC..... H PHARMACY.....I PRIVATE DOCTOR .....J MOBILE CLINIC..... K FIELD WORKER.....L OTHER PVT. MEDICAL _____M (SPECIFY) OTHER SOURCE SHOP.....N TRAD. PRACTITIONER.....O OTHER _____ X (SPECIFY)
316 A	How many days after the fever began did you first seek advice or treatment for (NAME)? IF THE SAME DAY, RECORD '00'.	DAYS ..... ▒▒	DAYS ..... ▒▒

[1] For fieldwork beginning in 2006, 2007, or 2008, the year should be 2001, 2002, or 2003, respectively.
[2] Coding categories to be developed locally and revised based on the pretest; however, the broad categories must be maintained.

		YOUNGEST CHILD NAME _____	NEXT-TO-YOUNGEST CHILD NAME _____
317	Is (NAME) still sick with a fever?	YES ..... 1 NO ..... 2 DON'T KNOW 8	YES ..... 1 NO ..... 2 DON'T KNOW 8
318	At any time during the illness, did (NAME) take any drugs for the fever?	YES ..... 1 NO ..... 2 (SKIP 344) =——┤ DON'T KNOW 8	YES ..... 1 NO ..... 2 (SKIP 344) =——┤ DON'T KNOW 8
319	What drugs did (NAME) take?[1] Any other drugs? RECORD ALL MENTIONED. ASK TO SEE DRUG(S) IF TYPE OF DRUG IS NOT KNOWN. IF TYPE OF DRUG IS STILL NOT DETERMINED, SHOW TYPICAL ANTIMALARIAL DRUGS TO RESPONDENT.	ANTIMALARIAL COARTEM ..... A CHLOROQUINE ..... B QUININE ..... C OTHER ANTIMALARIAL _____ F (SPECIFY) OTHER DRUGS ASPIRIN ..... G ACETAMINOPHEN/ PARACETAMOL ..... H IBUPROFEN ..... I OTHER _____ X (SPECIFY) DON'T KNOW ..... Z	ANTIMALARIAL COARTEM ..... A CHLOROQUINE ..... B QUININE ..... C OTHER ANTIMALARIAL _____ F (SPECIFY) OTHER DRUGS ASPIRIN ..... G ACETAMINOPHEN/ PARACETAMOL ..... H IBUPROFEN ..... I OTHER _____ X (SPECIFY) DON'T KNOW ..... Z
320	CHECK 319: ANY CODE A-F CIRCLED?	YES ☐ NO ☐ (GO BACK TO 313 IN NEXT COLUMN; OR IF NO MORE BIRTHS, SKIP TO 344)	YES ☐ NO ☐ (GO BACK TO 313 IN NEXT COLUMN; OR IF NO MORE BIRTHS, SKIP TO 344)
320A	CHECK 319: COARTEM('A') GIVEN?	CODE 'A' CIRCLED ☐ CODE 'A' NOT CIRCLED ☐ (SKIP TO 324)	CODE 'A' CIRCLED ☐ CODE 'A' NOT CIRCLED ☐ (SKIP TO 324)
321	How long after the fever started did (NAME) first take COARTEM?	SAME DAY ..... 0 NEXT DAY ..... 1 TWO DAYS AFTER THE FEVER ..... 2 THREE DAYS AFTER THE FEVER ..3 FOUR OR MORE DAYS AFTER THE FEVER ..... 4 DON'T KNOW 8	SAME DAY ..... 0 NEXT DAY ..... 1 TWO DAYS AFTER THE FEVER ..... 2 THREE DAYS AFTER THE FEVER ..3 FOUR OR MORE DAYS AFTER THE FEVER ..... 4 DON'T KNOW 8

[1] Revise list of drugs as appropriate; however, the broad categories must be maintained. Include all drugs or drug combinations that are commonly given as separate categories.

		YOUNGEST CHILD NAME _____	NEXT-TO-YOUNGEST CHILD NAME _____
322	For how many days did (NAME) take the COARTEM? IF 7 OR MORE DAYS, RECORD '7'.	DAYS ..... ▒▒ DON'T KNOW 8	DAYS ..... ▒▒ DON'T KNOW 8
323	Did you have the Coartemat home or did you get it from somewhere else? IF SOMEWHERE ELSE, PROBE FOR SOURCE. IF MORE THAN ONE SOURCE MENTIONED, ASK: Where did you get the Coartemfirst?	AT HOME..... 1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER..... 3 PRIVATE HEALTH FACILITY/WORKER..... 4 SHOP..... 5 OTHER_____6 (SPECIFY) DON'T KNOW 8	AT HOME..... 1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER..... 3 PRIVATE HEALTH FACILITY/WORKER..... 4 SHOP..... 5 OTHER_____6 (SPECIFY) DON'T KNOW 8
	Did you purchase the COARTEM?	YES..... 1 NO ..... 2 If NO, SKIP TO 324	YES..... 1 NO ..... 2 If NO, SKIP TO 324
	How much did you pay for the COARTEM?	In Birr ☐☐	In Birr ☐☐
324	CHECK 319: WHICH MEDICINES?	CODE 'B' CIRCLED ☐ CODE 'B' NOT CIRCLED ☐ (SKIP TO 328)	CODE 'B' CIRCLED ☐ CODE 'B' NOT CIRCLED ☐ (SKIP TO 328)
325	How long after the fever started did (NAME) first take chloroquine?	SAME DAY..... 0 NEXT DAY ..... 1 TWO DAYS AFTER THE FEVER..... 2 THREE DAYS AFTER THE FEVER 3 FOUR OR MORE DAYS AFTER THE FEVER..... 4 DON'T KNOW 8	SAME DAY..... 0 NEXT DAY ..... 1 TWO DAYS AFTER THE FEVER..... 2 THREE DAYS AFTER THE FEVER. 3 FOUR OR MORE DAYS AFTER THE FEVER..... 4 DON'T KNOW 8
326	For how many days did (NAME) take chloroquine? IF 7 OR MORE DAYS, RECORD '7'.	DAYS ..... ▒▒ DON'T KNOW 8	DAYS ..... ▒▒ DON'T KNOW 8
327	Did you have the chloroquine at home or did you get it from somewhere else? IF SOMEWHERE ELSE, PROBE FOR SOURCE. IF MORE THAN ONE SOURCE MENTIONED, ASK: Where did you get the chloroquine first?	AT HOME..... 1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER..... 3 PRIVATE HEALTH FACILITY/WORKER..... 4 SHOP..... 5 OTHER_____6 (SPECIFY) DON'T KNOW 8	AT HOME..... 1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER..... 3 PRIVATE HEALTH FACILITY/WORKER..... 4 SHOP..... 5 OTHER_____ 6 (SPECIFY) DON'T KNOW 88

332	CHECK 319: WHICH MEDICINES?	CODE 'D' CIRCLED ☐ CODE 'D' NOT CIRCLED ☐ (SKIP TO 336)	CODE 'D' CIRCLED ☐ CODE 'D' NOT CIRCLED ☐ (SKIP TO 336)
333	How long after the fever started did (NAME) first take Quinine?	SAME DAY .....0 NEXT DAY.....1 TWO DAYS AFTER THE FEVER.....2 THREE DAYS AFTER THE FEVER..3 FOUR OR MORE DAYS AFTER THE FEVER.....4 DON'T KNOW.....8	SAME DAY .....0 NEXT DAY.....1 TWO DAYS AFTER THE FEVER .....2 THREE DAYS AFTER THE FEVER..3 FOUR OR MORE DAYS AFTER THE FEVER .....4 DON'T KNOW.....8
334	For how many days did (NAME) take Quinine? IF 7 OR MORE DAYS, RECORD '7'.	DAYS..... ☐☐ DON'T KNOW 8	DAYS..... ☐☐ DON'T KNOW 8
335	Did you have the Quinine at home or did you get it from somewhere else? IF SOMEWHERE ELSE, PROBE FOR SOURCE. IF MORE THAN ONE SOURCE MENTIONED, ASK: Where did you get the Quinine first?	AT HOME .....1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER .....3 PRIVATE HEALTH FACILITY/WORKER .....4 SHOP.....5 OTHER_____6 (SPECIFY) DON'T KNOW.....8	AT HOME .....1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER .....3 PRIVATE HEALTH FACILITY/WORKER .....4 SHOP .....5 OTHER_____6 (SPECIFY) DON'T KNOW.....8
	Did you purchase the Quinine?	YES ..... 1 NO ..... 2 If NO, SKIP TO 336	YES ..... 1 NO ..... 2 If NO, SKIP TO 336
	How much did you pay for the Quinine?	In Birr ☐☐	In Birr ☐☐
336	CHECK 319: WHICH MEDICINES?	CODE 'E' CIRCLED ☐ CODE 'E' NOT CIRCLED ☐ (SKIP TO 340)	CODE 'E' CIRCLED ☐ CODE 'E' NOT CIRCLED ☐ (SKIP TO 340)
337	How long after the fever started did (NAME) first take (NAME OF OTHER ANTIMALARIAL)?	SAME DAY .....0 NEXT DAY.....1 TWO DAYS AFTER THE FEVER.....2 THREE DAYS AFTER THE FEVER..3 FOUR OR MORE DAYS AFTER THE FEVER.....4 DON'T KNOW.....8	SAME DAY .....0 NEXT DAY.....1 TWO DAYS AFTER THE FEVER .....2 THREE DAYS AFTER THE FEVER..3 FOUR OR MORE DAYS AFTER THE FEVER .....4 DON'T KNOW.....8
338	For how many days did (NAME) take (NAME OF OTHER ANTIMALARIAL)? IF 7 OR MORE DAYS, RECORD '7'.	DAYS..... ☐☐ DON'T KNOW 8	DAYS..... ☐☐ DON'T KNOW 8
339	Did you have the (NAME OF OTHER ANTIMALARIAL) at home or did you get it from somewhere else? IF SOMEWHERE ELSE, PROBE FOR	AT HOME .....1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER .....3 PRIVATE HEALTH	AT HOME .....1 HEALTH EXTENSION WORKER.....2 GOVERNMENT HEALTH FACILITY/WORKER .....3 PRIVATE HEALTH

	SOURCE. IF MORE THAN ONE SOURCE MENTIONED, ASK: Where did you get the (NAME OF OTHER ANTIMALARIAL) first?	FACILITY/WORKER..... 4 SHOP..... 5 OTHER_____6 (SPECIFY) DON'T KNOW 8	FACILITY/WORKER..... 4 SHOP..... 5 OTHER_____ 6 (SPECIFY) DON'T KNOW 8
340	Did you purchase the (NAME OF OTHER ANTIMALARIAL)?	YES..... 1 NO ..... 2 If NO, Skip to 344	YES..... 1 NO ..... 2 If NO, Skip to 344
341	How much did you pay for the (NAME OF OTHER ANTIMALARIAL)?	In Birr ☐☐	In Birr ☐☐
342		GO BACK TO 313 IN NEXT COLUMN, OR, IF NO MORE CHILDREN, GO TO 345.	GO BACK TO 313 IN FIRST COLUMN OF NEW QUESTIONNAIRE, OR, IF NO MORE CHILDREN, GO TO 345.
343	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 THE SUPERVISOR:_____ DATE: _____

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