MIS 2011

Ethiopia National Malaria Indicator Survey 2011

The Ethiopian Health and Nutrition Research Institute & partners

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ACRONYMS

ACT	Artemisinin-based combination therapy
CDC	US Centers for Disease Controland Prevention
CSA	Central Statistics Agency
DHS	Demographic and Health Surveys
EAs	Enumeration Areas
EHNRI	Ethiopian Health & Nutrition Research Institute
FHI	Family Health International
FMOH	Federal Ministry of Health
GPS	Global positioning system
HSDP IV	Health Sector Development Plan Four
ICAP	International Center for AIDS Care and Treatment Programs
IRS	Indoor residual spraying(of households with insecticides)
ITN	Insecticide-treated mosquito net
LLIN	Long-lasting insecticidal net
MACEPA	Malaria Control and Evaluation Partnership in Africa
MCE	Malaria Consortium Ethiopia
MERG	Monitoring and Evaluation Reference Group
MIS	Malaria Indicator Survey
NGO	Nongovernmental organization
PATH	Program for Appropriate Technology in Health
PDA	Personal digital assistant
PMI	US President's Malaria Initiative
PPS	Probability proportional to size
PSU	Primary sampling unit
RHB	Regional Health Bureau
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
RTI	Research Triangle Institute
SNNPR	Southern Nations, Nationalities, and Peoples' Region
SOP	Standard operating procedures
TCC-Ethiopia	The Carter Center-Ethiopia
UNICEF	United Nations Children's Fund
USAID	US Agency for International Development
WHO	World Health Organization

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PREFACE

Achieving malaria prevention and control goals is an essential element of realizing Ethiopia's goal of growing and transforming into a healthy and productive society. The Ethiopia Malaria Indicator Survey 2011 (MIS 2011),the country's second MIS, evaluatesthe overall progress of malaria prevention and control in the country. The Ethiopian Health &Nutrition Research Institute (EHNRI) led the survey with strong collaboration of partner organizations.

A community-based survey, the MIS generates reliable information that augments the routine data collected at the health facility level. In the last few years, huge resources have been mobilized to tackle the burden of malaria leading to encouraging results regarding the population at risk of the disease,especially children and pregnant women. Scale-up of malaria interventions (like the large-scale distribution of long-lasting insecticidal nets and indoor residual spraying), the improvmentof diagnostic facilities, and prompt treatments as well as behavioral change communication against malaria are among the government and partners'coordinated efforts to tackle the burden of malaria.

A periodical survey is an effort to maintain our success and to understand how much of a threat malaria poses as to the well being of our society and developmental endeavors of the country. We sincerely hope that deaths from malaria will be a thing of the past if we continue the momentum of high scale-up for impact and maintain successful accomplishments. If we fail to maintain the achievements that we have registered so far, our success will be complicated by challenges such as resistance to anti-malaria drugs and insecticides. Therefore, planned and periodic evaluation of our malaria prevention and control program is the best approach to identify on time the multiprongedchallenges that we are facing.

The MIS 2011 has come up with important information that makes the malaria control program and partners vigilant in reviewing and monitoring strategic and programmatic decisions. And it informs us to consolidate existing achievements and address the weaknesses that have been observed.

The survey employed robust research tools including software-embedded handheld machines that enhanced the quality of the data gathered from the field. The MIS 2011 survey results focused on malarious areas under 2000m above sea levelas well as main malaria intervention areas. It assessed various malaria intervention indicators including net ownership and use of nets, IRS coverage, and prevalence of malaria as well as under-five haemoglobin levels.

We have learnt much from conducting this survey and feel confident enough to undertake the next survey with improved planning and enhanced data quality.

We hope that all stakeholders directly involved and working in the area of malaria prevention and control will benefit from the information gathered from this survey andthat academic institutions, researchers, and implementing partners use the information to move forward in the battle against malaria.

Finally, we are grateful to all partners and individuals who devoted their energy and time to the successful implementation of the survey. This survey would have been impossible without strong commitment and efforts of partners and dedicated individuals.

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EXECUTIVE SUMMARY

Malaria is a major public health problem in Ethiopia despite a relatively low malaria prevalence compared to most other malaria-endemic countries in Africa. Unstable malaria transmission patterns make Ethiopia prone to focal and multifocal epidemics that have on occasion caused catastrophic public health emergencies. Malaria is seasonal in most parts of Ethiopia, with variable transmission and prevalence patterns affected by the large diversity in altitude, rainfall, and population movement. Generally, areas below 2,000 meters above sea level (<2,000m) in altitude are considered as malaria-endemic. The massive scale-up of malaria control interventions, including case diagnosis and treatment, distributionof long-lasting insecticidal nets (LLIN), andindoor residual spraying of households with insecticides (IRS)have preferentially targeted these areas in Ethiopia.

The 2011 Ethiopia National Malaria Indicator Survey (MIS2011) is a large, nationally representative survey of coverage of key malaria control interventions, treatment-seeking behavior, and malaria prevalence. MIS 2011 alsoassessed anemia prevalence in childrenunder5 years of age (U5), malaria knowledge among women, and indicators of socioeconomic status. The survey was conducted by the Ethiopian Health and Nutrition Institutes/Ministry of Health in collaboration with theCentral Statistics Agency (CSA), US President's Malaria Initiative (PMI), United Nations Children's Fund (UNICEF), Malaria Control and Evaluation Partnership in Africa (MACEPA/PATH), Malaria Consortium, The Carter Center (TCC), WorldHealth Organization (WHO), and ICAP. The survey was based on a two-stage cluster sample of 10,444 households in 440 census enumeration areas (EAs), randomly selected from all regions and six urban areas of the country, from two strata.The strata were:1) all areas <2,000min altitudeand 2) areas<2,500m. Of the 440 EAs, 8 EAs were excluded from analysis because they were located at >2,500m and during the survey all households at that altitude were considered not malaria-endemic; 181 EAs were classified as having altitudes of 2,000–2,499 meters, and 241 EAs had altitudes of <2,000m.This MIS2011 report focuses on areas <2,000m mapped by global positioning system (GPS) during the survey. To meet the needs of partner organizations, four regional states (Amhara, Oromia, Tigray, and Southern Nations, Nationalities, and Peoples' Region(SNNPR) were oversampled. In addition, oversampling was done for two combined regions (Afar/Somali and Benishangul-Gumuz/Gambella).The survey was conducted from October to December 2011 by deploying 31survey teams who used standard questionnaires programmed into personal digital assistants (PDAs)and collected blood samples from the households.

Sampled households contained 47,248 residents,including7,148 (15.7%)children U5, 8,817(18.7%)women of child-bearing age,and 3,166 (6.7%) self-reported pregnant women.Blood samples were taken from all children U5 (with parents' consent) in every household and from persons of all ages in every fourth household.Malaria parasite testing was done using multi-speciesCareStart™ rapid diagnostic tests (RDTs) and microscopic examination of both thick and thin smeared blood slides. A hemoglobin level of children U5 was done using portable spectrophotometers (HemoCue Hb 201, Angelholm, Sweden). During the survey, 12,791 individuals had RDTs and 11,933 hadblood slide examinations, and 6,313 children U5 had hemoglobin tests.Below 2,000m results are based on a total of 5,819 households from 241 EAs(classified by median altitude of GPS recorded within the EAs), with6,697 blood slides examined and 4,846 hemoglobin tests.

The results indicate that 55.2% of households have at least one mosquito net (of any type), and 54.8% of households have at least one long-lasting insecticidal net (LLIN). Of children U5, 38.2% slept under a net the night before the survey, and 64.5% of children U5 slept under a net in a household that owned at least one net.These figures were 35.3% and 63.8%respectively for pregnant women. IRS had been conducted in 46.6% of households in the last 12 months preceding the survey.

It was reported that 19.7% of children U5had suffered from a fever in the two weeks preceding the survey. Of these children, 51.3% sought medical attention within 24 hours of onset of fever; 32.6% took an antimalarial drug and 8.5% took the drug on the day of fever onset. Among the febrile children who were treated with an antimalarial on theday of fever onset, 68.9% sought their treatment from public health facilities.Malaria parasite prevalenceinareas <2,000m was 1.3% by microscopy blood-slide examination for all ages, with 1% of these being*Plasmodium (P.) falciparum* and 0.3% being*P. vivax*. Similarly, RDTs indicated the prevalence of infection to be 4.5% among all ages,and severe anemia (<5g/dL) was found in 0.9% of children U5.

The MIS 2011 shows achievements and weaknesses of the malaria prevention and control strategic plan (2005–2010) and the combined efforts of the Federal Ministry of Health and partner organizations. The results of the survey will also inform all concerned bodies to maximize efforts toward implementation and progress of the malaria prevention, control, and elimination strategic plan (2011-2015).

CHAPTER 1.INTRODUCTION

A. Background

Approximately 75% of Ethiopia's landmass is malaria-endemic;areas of diseaseare primarily associated with altitude and rainfall [1, 2, 15, 24]. The peak of malaria illness incidence usually follows the main peak rainfall season (June toSeptember) each year. However, certain areas in the south and west of the country have a peak rainfall season beginning earlier in April and May or have no clearly defined rainfall season[2]. Depending on these variable rainfall and altitude patterns, malaria transmission tends to be highly heterogeneous geo-spatially within each year as well as between years. Additionally, focal and multifocal malaria epidemics may occur, peaking every 5 to 8 years, with the most recent widespread epidemics reported between 2003 and 2005 [17, 22]. In 2009/2010, malaria was the leading cause of outpatient visits and health facility admissions, accounting for 14% of outpatient visits and 9% of admissions [11,12]. In 2010, the Federal Ministry of Health (FMOH) reported 4,068,764clinical and confirmed malaria cases to the World Health Organization (WHO) as recorded in the 2011 World Malaria Report[29].The estimated annual number of malaria-related illnesses, however,may range even higher (7 to 8 million per year), considering there is only 40% reporting completeness by Public Health Emergency Management (PHEM).*Plasmodium (P.) falciparum*and *P. vivax* are the dominant species of the malaria parasite in Ethiopia, in respective order.

Demographic and Health Surveys (DHSs) were conducted in Ethiopia in 2000, 2005, and 2011, including a malaria module in 2005[6, 7]. In 2005, the FMOH developed a five-year (2005-2010) National Strategic Plan for Malaria Prevention and Control [10]. According to the strategy, areas lower than 2,000 meters in altitude (<2,000m)were considered 'malaria-endemic' and targeted to receive key malaria control interventions, including long-lasting insecticidal nets (LLINs), indoor residual spraying (IRS),andprompt diagnosis, using microscopic examinations of blood smears and rapid diagnostic tests (RDTs)for malaria, coupled with prompt and effective case management with Artemisinin-based Combination Therapy (ACT). The strategy outlined an ambitious national goal of 100% household LLIN coverage in malaria-endemic areas, with a mean of two LLINs per household, to be achieved through distribution of about 20 million LLINs by the end of 2007. Moreover, the FMOH National Malaria Prevention and Control Strategy stated that IRS should be scaledup to cover 60% of households targeted for IRS and also included the rapid scale-up of provision of RDTs and ACTs to newly established community health posts.

Implementation of the above strategy greatly benefited from several grants from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM): Round 2 (2002-2008; total budget: $73 million), Round 5 (2005-2010; $140 million) [17], and recently Round 8 (2009-2013; $276 million). With the abovesupport as well as the support from other in-country malaria stakeholders, more than 38.7million RDTs, 48 million ACT treatment courses, and 42 million insecticide-treated nets (ITNs) and LLINs were procured and distributed to malaria-endemic areas of the country. Additionally, the number of structures targeted for IRS increased from 3.4 to 4.2 million [8].

In 2010, the next five-year National Strategic Plan for Malaria Prevention, Control, and Elimination2011–2015 was developed[19];this plan is embedded in the health sector's overarching framework,the Government of Ethiopia's Health Sector Development Plan Four

(HSDP IV) 2011–2015. The stated goals of the National Strategic Plan for Malaria Prevention, Control, and Elimination 2011–2015 are:

- By 2015, achieve malaria elimination within specific geographical areas with historically low malaria transmission.
- By 2015, achieve near-zero malaria death in the remaining malaria-endemic areas of the country.

B. Malaria stratification

The malaria transmission pattern in Ethiopia is seasonal and unstable [2] often characterized by focal and large-scale cyclic epidemics [16, 20]. A relatively longer transmission season exists in western lowland areas, river basins, and valleys. Due to the unstable and seasonal transmission of malaria, protective immunity is generally low and all age groups of the population are at risk of the disease. The central highlands, which are >2,500m above sea level,are generally free of malaria. Areas between 2,000m and 2,500m are affected by infrequent malaria epidemics;Malaria Indicator Survey (MIS) 2011 resources were usedto determine the level of malaria transmission in these areas and its programmatic importance in malaria prevention and control.Due to the altitude and rainfall, Ethiopia has a varied pattern of malaria transmission, with transmission season ranging from less than three months to more than six months duration. In the most recent malaria epidemic (during2003/2004), more than 2 million cases and over 3,600 deaths were recorded in 211 epidemic-affected districts.

C. Current status of malaria indicators

Severalmodestly sized malaria surveys have been conducted since 2000 in Ethiopia, with reported malaria prevalence ranging from 1.0% to 10.4% [3, 5,8, 13, 18, 21]. However, many of these surveys were not large enough to provide nationally representativedata.The four major surveys that are considered to be nationally representative include the DHS2000 [6], DHS 2005[7], a large survey by the Carter Center[5, 8] and the MIS 2007[13, 18]. Various findings of these four surveys have been reported extensively[4, 5–9, 13, 17, 18, 21, 22, 26].

The MIS 2007 was the most recent large, nationally representative survey of key malaria interventions, treatment-seeking behavior, anemia prevalence in childrenU5, malaria prevalence in all age groups, malaria knowledge among women, and indicators of socioeconomic status [13, 18]. The survey results were stratified by regional state, altitude, and districts designated for FMOH targeting. Compared to the DHS 2005[7], results from the MIS 2007 reflected the significant effort of the FMOH-led scale-up of malaria prevention and control interventions, with substantial increases in ITNownership and use, as well as malaria knowledge.

The MIS 2007 also showed the gaps in the scale-up of malaria interventions, clearly indicating the need for a comprehensive information, education, and communication (IEC) andbehavior change communication (BCC) approach to (i) maximize use of ITNs; (ii) maximize the efforts made in scalingup IRS activities (e.g., by reducing refusal rates of households to be sprayed and decreasing the practice of plastering after IRS); (iii) substantially increase access as well as use of malaria case-management services; and (iv) increase community knowledge of malaria signs and symptoms, prevention, and control.

D. Rationale for MIS 2011

The model for the MIS protocolwas developed by the Roll Back Malaria (RBM) Monitoring and Evaluation Reference Group (MERG) with the aim ofhelpingministries of health collect key and timely information on malaria control at the national level, particularly whenever such data arenot available through the routine health management information systems (HMIS) or other nationally representative surveys (e.g., DHS or Multiple Indicator Cluster Surveys [MICS]) [25,27].Thus, data collected through MIScomplement national-level data collected through theHMISand are comparable with existing DHS and MICS protocols. This allows for comparison of data among the surveys and monitoring ofthe progress of national malaria control program efforts.

A national follow-up MIS survey was necessary in 2011 to measure the progress of malaria prevention and control efforts undertaken since 2007 and to assess how well the goals set forth in the FMOH National Strategic Plan for Malaria Prevention andControl2005–2010 [10] were achieved. Additionally, the MIS 2011complements HMIS and other data collected on an annual basis to provide a more comprehensive picture of the malaria-related burden for the population at risk in Ethiopia, particularly as the FMOH embarks on its next HSDP IV (already embarked) and the implementation of its National Strategic Plan for Malaria Prevention, Control, and Elimination 2011–2015[14]. It is expected that the findings of the MIS will be important to document the progress and impact of malaria prevention and control efforts in Ethiopiaand will serve as an important source of data for advocacy toward continued malaria support by funding sources.

E. Objectives

The main objective of the MIS 2011isto measure progress toward achieving the goals and targets set in the Ethiopia National Strategic Plan for Malaria Prevention and Control 2005-2010 [10], following the RBMMERG–recommended MIS guidelines [19,25].

F. Specific objectives

- To measure access to, coverage, and use of the core malaria-control interventions, including LLINs, IRS, diagnostic services, and antimalarial drugs; particularly to measure:
    - Household-level ownership of LLINs.
    - Use of LLINs among target populations (especially children U5 and pregnant women).
    - IRS status of households.
    - Provision and promptness of diagnosis and antimalarial drugs for management of malaria-related fevers.
- To measure the prevalence of malaria parasitemia,malaria-related fever,and anemia among children U5, as well asmalaria parasitemia among populations older than 5 years at the household level;
- To estimate the knowledge, attitudes, and practices of women of reproductive age (15 to 49 years) with regard to malaria and methods for its prevention and control.

G. Sample design

The MIS 2011 assessed household populations in Ethiopia living in malarious areas, defined as areas below 2,000m mean sea level, and malaria epidemic–prone areas, defined as areas between 2,000m and 2,500m mean sea level. Administratively, Ethiopia is divided into nine regional states and two city administrations. Regions are further divided into zones, woredas (districts), and kebeles (sub-districts). In 2007, kebeles were further divided into enumeration areas (EAs) for the purpose of population census by the Central Statistics Agency (CSA).

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 Oromia Regional State (requested by the US President's Malaria Initiative [PMI]) and the Amhara Regional State (requested by The Carter Center [TCC]).

All enumeration areas in the country in kebeles (villages) with a mean altitude below 2,500m were stratified into ≤2,000m and ≤2,500m altitude categories. The altitude-based strata were further stratified by urban/rural and region state strata. Domains of estimations for the survey were:

- National (country): urban for mean altitude of ≤2,000m.
- National (country): rural for mean altitude of ≤2,000m.
- National (country): for mean altitude of <2,500m.
- Sub-national: Amhara, Oromia, SNNP, and Tigray regional states as well as combined Afar/Somali regional states and Benishangul-Gumuz/Gambella regional states.

H. Sampling frame

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

- The list of EAs along with their corresponding population size obtained from the 2007 population and housing census and digitized map for EAs obtained from geographic information systems (GIS) and cartographic map work from the CSA.
- A 90m-resolution satellite image obtained from WHO, used to identify the altitudes of unmatched EAs.

I. Sample size determination and allocation

The sample size was determined using the key indicator that was taken from MIS 2007, which is 20% IRS coverage, a relative precision of 12%, 95% confidence limits, 80% power, a design effect of 2.00, and 20% adjustment for non-response (from household refusal or abandoned households). In addition, the sample size assumes that 82% of households have children U5. Based on the above inputs and assumptions, a minimum sample of 7,725

householdswascalculatedtobenecessarytoobtainbothrobustnational-level information for altitudes below 2,500m and urban- and rural-level information for altitudes below 2,000m.

To satisfy the specific programmatic needs of partners and FMOH,oversampling took place in certain regions (namely Oromia, SNNP, Tigray, and Amhara, as well as combined Afar/Somali regional states and Benishangul-Gumuz/Gambella regional states) and an additional3,375 households were surveyed. Tokeepsampling errorsas low as possible(apartfrom using a smaller clustersize in terms of the number of households that is managableand using a constant EAinstead of different size)it is recommended to use as many clusters(EAs)as operationally feasible.Takingboththecostrequiredandtheprecisiontobegainedinto account,surveying25samplehouseholdsperEAwasdecidedtobeoptimum.
However,itwasdecidednot to selectanyadditionalhouseholdstocompensatefor not-at-home or absent households since the non–response rate was enough for such conditions. While originally planned, the sample of urban EAs was too smallfor meaningful disaggregation of urban and rural data. The overall distribution of sample clusters (EAs) and households by stratum are provided in Appendix A.

The first stage of sample selection was based on probability proportional to size (PPS) to select the clusters from each of the sample domains/sub-domains using the list of EAs from the 2007 census with population projections for 2012 classified into regional and altitude domains by using landmass projections from the 90m-resolution satellite image obtained from WHO. The following domains are used:

- Enumeration areas with average altitude below 2,000m based on GIS mapping.
    - Sub-divided by region: Amhara, Oromia, SNNP, Tigray, the combined Afar/Somali regional states and Benishangul-Gumuz/Gambella regional states.
- Enumeration areas with an average altitude of 2,500m and not included in the first domain based on GIS mapping.
    - Sub-divided by region: Amhara, Oromia, SNNP, Tigray, the combined Afar/Somali regional states and Benishangul-Gumuz/Gambella regional states.

EAs classified with an average altitude above 2,500m were excluded, as well as inaccessible areas inthe Somali region. Maps were provided to guide enumerators to the specific location.

In the secondstage, field teams registered all households in each EA/cluster to randomly select households for inclusion in the survey. Registration was conducted at the time of the field work using personal digital assistants (PDAs) with global positioning system (GPS) capability. Using built-in software, 25 registered households were randomly selected from the list of potential households in the EA.

Thus, bearing in mind the above sample requirements, a total of 444 EAs (25 households each) were sampled nationally, randomly selected with population proportional to size.A list of EA allocations by regional state are detailed in Appendix F.

J. Samples obtained

During the data cleaning and analysis stage, the altitude domains were reviewed and revised based on multiple sources of altitude data. As the household registration included altitude measures of every potential household in the EA, alternative altitude classifications were obtained.Three options for altitude were considered: the original CSA EA landmass classification, the median altitude of all EA households collected using PDAs, and classification by household altitude without regard for EA altitude classification. As the survey assesses the programmatic performance based on population residence, the technical working group(a group composed of individuals representing malaria control partner organizations) recommended using the median household altitude as the method to best represent the programmatic intention to make key interventions available in malarious areas (under 2,000m). In a separate analysis, no significant differences in the results presented in this report were found between using the CSA altitude domain classification and the PDA median household attitude domain classification.

In addition, four clusters were omitted due to inaccessibility at the time of the survey and a further eight clusters were excluded because the lowest household altitude measured in the EA was over 2,500m, beyond the limits for inclusion as malarious or epidemic-prone areas.

Due primarily to the reclassification of the altitude, the sample obtained for each of the domains and sub-domains varied significantly from the planned assignments, particularly in the large mountainous regions. A total of 432 clusters, 10,444 households, and 47,248 people were surveyed, with more than half (5,819 households) in areas under 2,000m. Improving stratification by altitude for sample design in future surveys is addressed in more detail in the lessons learned section.

K. Survey stratification and terminology

Table 1. Survey stratification terms and definitions (Ethiopia MIS 2011)

Stratification	Definition
National	All EAs surveyed (national-level information for altitudes<2,000m and from 2,000m to 2,500m).
Malaria-endemic vs. non malaria-endemic	Areas <2,000m altitude are considered malaria-endemic.
Program target areas	Top-priority areas were <2,000m, although in some regional states or districts, because of varied topography target areas can also include areas at or >2,000m. In Amhara, Oromia, and SNNPR, the definition was based on the stratification of kebeles (villages) in the UNICEF/FMOH microplan. In Tigray, the definition is based on altitude and history of malaria.
Regional level	The sample size is sufficient for the four big regions (Amhara, Tigray, SNNPR, and Oromia) for regional comparisons, as oversampling was done in these regions to provide regional data. Oversampling was also done for two combined regions (Afar/Somali and Benishangul-Gumuz/ Gambella).

Stratification	Definition
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, 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; 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)or housing units (in the urban kebele) is less than or equal to 150-200.
Stratification	Dividing the population into subsets (called strata), within each of which an independent sample is selected.
Cluster	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	The measure of the efficiency of complex designs as compared to the design using simple random sampling of the same size.
PPS sampling	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	The coefficients of a linear function of the values of the sample units used to estimate population, stratum, or higher-stage unit totals are called sampling weights (alternatively known as raising, multiplying,weighting, or inflation factors of the corresponding sample units).

L. Questionnaire

Two questionnaires were used for the MIS 2011: (i) a household questionnaireand (ii) a women's questionnaire (Annex 1). The content of each is based on the questionnaires developed for the MIS 2007. These questionnaires originally were developed by the Macro MEASURE DHS project and adopted and recommended for use for malaria indicator surveysby the RBM MERG Task Force on Household Surveys[25].

The household questionnaire was used to list all usual members and overnight visitors of the selected households. Some basic characteristics of each person were collected including age, sex, and relationship to the head of the household. The main purpose of the household questionnaire was to list all household members and identify women who were eligible to

answer the woman's questionnaire (i.e.,women 15 to 49 years of age). Through the household questionnaire, the following data were collected:

- Household socioeconomic status.
- Household status of IRS, e.g., whether a household was sprayed with insecticide in the past 12 months.
- Household LLIN ownership, e.g., whether a household has one or more LLINs.
- Prevalence of anemia and malaria in children U5.
- Malaria prevalence from all ages in every fourth household.

The women's questionnaire was used to collect information for women aged 15 to 49 years. The questionnaire aims at collecting the following data:

- Background characteristics of the respondent, e.g., ethnicity, religion, education level, literacy.
- Reproduction, birth history, pregnancy status of the respondent.
- Respondent's general malaria knowledge and sources of relevant malaria messaging.
- Fever prevalence among children U5 and fever treatment with antimalarial drugs.

Both questionnaires were programmed into PDAs to eliminate the need for paper transcription, to facilitate faster interviewing with built-in skip patterns, and to allow quicker data processing and tabulation.

M. Personal digital assistants(PDAs)

PDAs were used for the second-stage random sampling and for recording questionnaires and malaria RDT/anemia results. A total of 170 PDAs (Socket Mobile SoMo 650) were available, including those for supervision and reserve;five PDAs per team were used in the survey (one for the team leader and one for each of the four sub-teams). The questionnaires, as well as the household listing, sampling, and navigation programs, were integrated and installed in the Windows Mobile 6.0 operating system using Visual Basic developed by the US Centers for Disease Control (CDC). This integrated program enabled surveyors to conduct the second-stage sampling and complete interviewing and specimen collection and testing.

Each PDA was equipped with a BC 337 WAAS GPS receiver (Compact–Flash GPS) used to record location of all households within an EA;these data were then used for the second-stage sampling. The GPS devices also allowed surveyors to navigate back to selected households.

N. Training and pre-testing activities

Training of field teamswas conducted at the Ethiopian Management Training Institute in Debrezeit/Bisheftu and facilitated by FMOH/Ethiopian Health &Nutrition Research Institute (EHNRI), CSA, and various MIS 2011 Steering Committee members.Overall, 240 data collectors (all from RHBs: 118 interviewers and 122 laboratory technicians), 31 field team leaders (all from RHBs), and 21 supervisors (from RHBS, FMOH/EHNRI, and partners including PMI,TCC, ICAP, UNICEF, WHO, MC, 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 15-day workshop on the rationale and methodology of the survey and the PDA/GPS-based data collection technique. The first 5

dayswere training of trainers (TOT) only for supervisors and the next 10 days were a full package of training for interviewers and team leaders. 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 as well as 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 EAs (5 urban and 5 rural) close to the training center.

O. Community sensitization

Community sensitization activities implemented by FMOH/EHNRI, UNICEF-Ethiopia, and MACEPA/PATH included formal letters, radio spots, posters, and leaflets. These approaches included providing information onthe purpose of the MIS, the procedures, and expectations from local authorities and communities, as well as on the importance of household participation. Furthermore, a series of television and radio spots was aired in the national language and in Afan Oromo, Tigrigna, Somali, and Afar. The spots were aired three times a week, starting one week before the survey, for a total period of five weeks.

P. Survey organization and management

Similar to the MIS 2007, a number of in-country malaria stakeholders contributed technically, operationally, and financially to planning and implementing the MIS 2011. At the request of the FMOH, the MIS 2011wasplanned and implemented under the leadership of the EHNRI, an FMOH entity mandated to carry out surveillance and operational evaluation. Malaria Consortium/Ethiopia managed the administrative issues of the survey. The MIS 2011 Steering Committee (led by EHNRI)supported the FMOH in planning and implementing the survey; members of this committee included representatives of the CSA, international and bilateral organizations, and nongovernmental organizations (NGOs). The detailed list of individuals and organizations involved is in Appendix C.

Q. Survey organization, field work, and supportive supervision

Surveyors were organized in 31 teams (89 functional sub-teams). Each team carried supplies and materials required for the survey, 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.

R. Survey organization

During the first two weeks of the survey, a typical survey team consisted of11persons including a driver. In total, 31 teams were assigned to conduct the survey. A team is divided into four sub-teams, each including a laboratory technician and interviewer. A regional supervisor and a team leader were assigned for each team. All the sub-teams were supported by a local guide to map and demarcate an EA.

Fifteen regional supervisors, 19 central-level supervisors, 31 team leaders, 272 surveyors, and more than 40 drivers were deployed to their respective survey areas. Data were collected

from 440 EAs: 11 regional states,413 districts, and 2 city administrations.Interviews and tests (i.e.,anemia, RDTs and blood films) were conducted by all 31 teams.

S. Questionnaire administration, specimen collection, and testing

The specimen processing was organized in such a way that all three tests (anemia, malaria RDT,and blood films for microscopic examination of malaria parasites)were performed simultaneously from one surveyed individual's single finger prick as per WHO guidelines.

Blood samples were taken from all children under five years of age in every household and from persons of all ages in every fourth household. Malaria parasite testing was done using CareStart^{TM}rapid diagnostic tests 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 U5. Results from the anemia testing and RDTs (processed and interpreted as per manufacturer's instructions) were readily available during the survey.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.

T. Slide examination

All microscopic slides were stained with 10% Giemsa in the field[22,28]. The first reading of all slides was done by a team of six microscopists at EHNRI after the field work was completed (per WHO guidelines).

A crosscheck reading of all positive slides and 5% of the negatives from each EAwereread at Adama Malaria Reference Training Center by two microscopists to estimate the quality of the first reading. There were 34 slides with discordant slide results that were reread by a third senior microscopist, with the result of this microscopist being considered final.

U. Treatment

For children diagnosed with anemia (i.e., hemoglobin 5–8g/dL), results were shared with the parent/guardian, and the children were given albendazole (if aboveage 24 months) and a two-week supply of supplemental iron[11]. All such infants under 4 months and children with hemoglobin <5g/dL were referred to the nearest health facility for further evaluation and treatment.

Subjects with a positive RDT indicating either *P. falciparum* or mixed infection, if not first-trimester pregnant, received immediate treatment for malaria using artemether-lumefantrine, as per the national protocol.First-trimester pregnant women with positive RDT (*P. falciparum* or mixed infection) were treated with quinine tablets. Those individuals who were positive for *P. vivax* were treated using chloroquine. Subjects who were found to be seriously ill, as determined by the survey nurses, were advised to immediately visit the nearest health facility.

V. Supportive supervision

Survey teams were supervised by regional and central-level supervisors. The regional supervisors supervised the teams for the first two weeks of the survey period and the central-

level supervisors, gathered from partner institutions, visited the teams at least twiceduring the survey period. Supervisors used a checklist during the supervision.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; supplying of items in shortage; resolving PDA challenges and changing those failed; fuel utilization by cars; and observing a team's overall harmony and performance as well as providing feedback and sharing the experience of other teams supervised.

CHAPTER 2. CHARACTERISTICS OF HOUSEHOLDS AND WOMEN RESPONDENTS

A. 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 cooking arrangement. The household questionnaire collected basic demographic and socioeconomic 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.

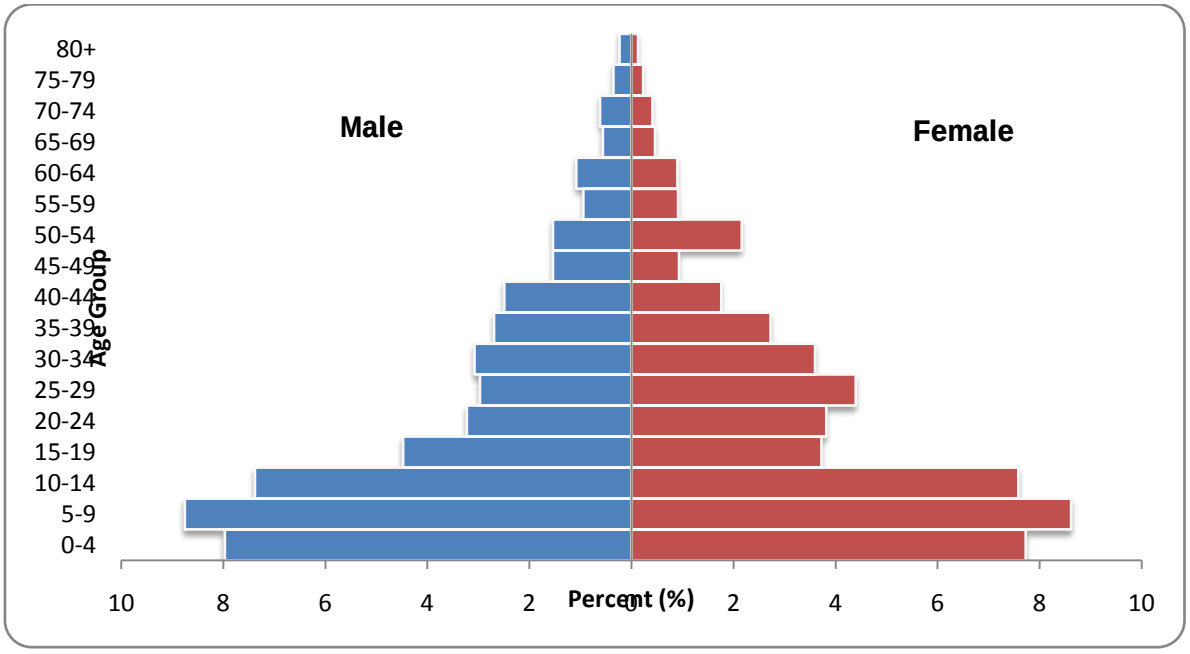
Table 2shows that there were nearly an equal proportion of men and women in the sampled population (49.9% vs. 50.1%, respectively).

Table 2. Percentage distribution of household population by age andsex (Ethiopia MIS 2011)

Age range	Male	Female	Total
0–4	8.0	7.7	15.7
5–9	8.8	8.6	17.4
10–14	7.4	7.6	15.0
15–19	4.5	3.7	8.2
20–24	3.2	3.8	7.0
25–29	3.0	4.4	7.4
30–34	3.1	3.6	6.7
35–39	2.7	2.7	5.4
40–44	2.5	1.8	4.3
45–49	1.5	0.9	2.5
50–54	1.5	2.2	3.7
55–59	0.9	0.9	1.9
60–64	1.1	0.9	2.0
65–69	0.6	0.5	1.0
70–74	0.6	0.4	1.0
75–79	0.4	0.2	0.6
80+	0.2	0.1	0.4
Total percent	49.9	50.1	100.0
Total number	**23,579**	**23,669**	**47,248**

The data show that the sampled Ethiopian population was young, as individuals less than15 years of age represented nearly half (48.1%) of the population. Only 3% of the population was aged 65 years and older. The population pyramid data illustrated in Figure1 are characteristic of populations with strong fecundity and high mortality—i.e., there is a wide base that rapidly shrinks with age. The figure also shows gaps between men and women at different ages: for instance, there were more men than women at ages 15–19 and 40–49. Conversely, there were more women than men at ages 20–34 and 50–54.

Figure 1. Age pyramids of sampled population (EthiopiaMIS 2011)



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 3shows that approximately 80% of households were headed by men.

Table 3. Distribution of surveyed households by sex of household head and household size (Ethiopia MIS 2011)

Characteristic	Number	Percent
Sex of household head		
Male	8,332	79.8
Female	2,112	20.2
Total	10,444	100.0
Number of usual household members		
1	677	6.5
2	1,369	13.1
3	1,635	15.7
4	1,764	16.9
5	1,631	15.6
6	1,369	13.1
7	987	9.4
8	551	5.3
9+	462	4.4
Total	10,444	100.0

Table 4 shows that the majority of surveyed households did not have electricity (96.2%) or windows (62.8%). The most common sources of drinking water were unprotected springs

(24.7%), public tap/standpipe (21.3%), and surface water (18.9%). Firewood/straw was the most common fuel type used for cooking (92.2%). The majority of households reported having no sanitation facilities (38.6%) or using open pits (31.2%). Only 17.5% of the population reported access to facilities with a flushing system. The vast majority of households surveyed had earth or sand floors (80.3%) and walls made of bamboo/wood with mud (65.5%).The most common types of roofing material were thatched/leaf roofs (38.3%) and corrugated iron (36.0%).

Table 4. Percentage distribution of households by household characteristic (Ethiopia MIS 2011)

Household characteristic	Percent
Electricity	
Yes	3.8
No	96.2
Total	100.0
Windows	
Yes	37.2
No	62.8
Total	100.0
Source of drinking water	
Piped into dwelling	2.5
Piped into yard/plot	2.9
Public tap/standpipe	21.3
Tube well or borehole	3.6
Protected well	5.5
Unprotected well	5.7
Protected spring	12.0
Unprotected spring	24.7
Rainwater	2.3
Tanker truck	0.4
Cart with small tank	0.2
Surface water	18.9
Other	0.0
Total	100.0
Cooking fuel type	
Electricity	0.2
LPG/natural gas	0.0
Biogas	0.0
Kerosene	0.3
Charcoal	1.9
Firewood/straw	92.2
Dung	5.3
Other	0.2
Total	100.0
Sanitation facilities	

Household characteristic	Percent
Flush to pipe sewer	0.4
Flush to septic tank	0.1
Flush to pit latrine	9.9
Flush to somewhere else	5.0
Flush, don't know where	1.9
Ventilated improved pit latrine	0.6
Pit latrine with slab	8.0
Pit latrine without slab/open pit	31.2
Composting toilet	1.5
Bucket toilet	0.2
Hanging toilet/hanging latrine	1.5
No facility/bush/field	38.6
Other	1.0
Total	100.0
Floor type	
Earth/sand	80.3
Dung	11.8
Wood planks	4.2
Palm/bamboo	1.4
Parquet or polished wood	0.6
Vinyl or asphalt strips	0.0
Ceramic tiles	0.2
Cement	1.1
Carpet	0.0
Other	0.5
Total	100.0
Wall type	
No walls	0.9
Cane/trucks/bamboo/reed	4.5
Bamboo/wood with mud	65.5
Stone with mud	12.4
Uncovered adobe	0.9
Plywood	9.3
Carton	0.3
Corrugated iron	0.2
Cement	0.4
Stone with lime/cement	0.3
Bricks	0.0
Cement blocks	0.1
Covered adobe	0.0
Wood planks/shingles	1.8
Other	3.4
Total	100.0
Roof type	
Thatch/leaf	38.3

Household characteristic	Percent
Sticks and mud	6.6
Rustic mat/plastic sheet	0.9
Reed/bamboo	2.8
Wood planks	6.7
Corrugated iron	36.0
Wood	6.0
Calamine/cement fiber	0.1
Cement/concrete	0.1
Roofing shingles	1.3
Other	1.1
Total	100.0
Total number of households	10,444

Table 5shows that 28.1% of all households possess a radio and 6.3% of households report having a phone.

Table 5. Percentage distribution of household possession of various durable consumer goods (Ethiopia MIS 2011)

Consumer good	Percent
Radio	28.1
Television	1.7
Phone	6.3
Refrigerator	0.2
Bicycle	0.5
Motorcycle	0.2
Car	0.3
Animal cart	3.4
Boat	0.0
Donkey	0.0
Total number of households	10,444

B. Characteristics of women respondents

Eligible women 15 to 49 years of age were interviewed using the women's questionnaire. Table 6 shows that the majority (55.8%) of women who completed this questionnaire were between the ages of 15 and 29 years. Of all women, 29.3% reported having undergone formal education. The women surveyed were mainly Orthodox (39.6%), Muslim (34.5%), or Protestant/other Christian (24.1%).Oromo (37.3%) and Amhara (25.8%) were the most common ethnic groups.

Table 6. Distribution of women ages 15 to 49 who completed the women's questionnaire (Ethiopia MIS 2011)

Background characteristic	Number	Percent
Age		
15–19	1,363	15.5
20–24	1,608	18.2
25–29	1,948	22.1
30–34	1,569	17.8
35–39	1,188	13.5
40–44	754	8.6
45–49	386	4.4
Total	8,817	100.0
Region		
Addis Ababa	34	0.4
Afar	169	1.9
Amhara	2,023	22.9
Benishangul-Gumuz	244	2.8
Diredawa	48	0.5
Gambella	73	0.8
Hararii	60	0.7
Oromia	3,352	38.0
SNNPR	1,872	21.2
Somali	299	3.4
Tigray	643	7.3
Total	8,817	100.0
Education		
None	6,234	70.7
Primary	1,995	22.6
Secondary	507	5.8
Higher	81	0.9
Total	8,817	100.0
Religion		
Orthodox	3,471	39.6
Roman Catholic	33	0.4
Protestant/other Christian	2,116	24.1
Muslim	3,024	34.5
Traditional	74	0.8

Background characteristic	Number	Percent
Other	46	0.5
Total	8,764	100.0
Ethnic group		
Afar	173	2.0
Agaw	58	0.7
Amhara	2,259	25.8
Anuak	8	0.1
Argobba	1	0.0
Awi	16	0.2
Basketo	1	0.0
Berta	90	1.0
Beta Abraham	1	0.0
Danta	3	0.0
Dawro	40	0.5
Gabra	3	0.0
Gamo	50	0.6
Gedeo	126	1.4
Greeks in Ethiopia	1	0.0
Gumuz	28	0.3
Gurage	113	1.3
Hadiya Kingdom	146	1.7
Hamer	19	0.2
Kambaata	78	0.9
Kichepo	2	0.0
Konso	45	0.5
Koore	58	0.7
Maale	18	0.2
Majangir	24	0.3
Mekan	2	0.0
Murle	2	0.0
Oromo	3,272	37.3
Qemant	4	0.0
Shanqella	1	0.0
Shinasha	2	0.0
Sidama	552	6.3
Silt'e	99	1.1
Somali	294	3.4
Surma	1	0.0
Tigray-Tigrinya	644	7.4
Welayta	188	2.1
Weyto	2	0.0
Yem	7	0.1
Other	337	3.8
Total	8,764	100.0

CHAPTER 3.COVERAGE OF KEY MALARIA INTERVENTIONS

A. Ownership of mosquito netsand LLINs

The distribution and use of insecticide-treated bednets (ITNs) is one of the central interventions for preventing malaria infection. National policy aims to provide one ITN for every sleeping space (approximately one net per1.8 persons in malaria-endemic areas<2,000m).

This MIS2011 report will focus on LLIN availability and use: the current internationally recognized standard for malaria protection from mosquito bites is the LLIN.Proper useof LLINsprotects the entire local community from malaria for at least three years without need for additional insecticide reapplication. Tables7 and8 show that in areas <2,000m, 55.2%and 54.8% of households surveyed currently own a mosquito netor LLIN,respectively.In all areas <2,000m, the mean number of nets was found to be 0.8 per household. Net ownership at higher altitudes (>2,000m) was also found to be lower, with 37.9% of households reporting ownership of at least one net.

The survey revealed that net ownershipdiffered by wealth status, with 66.4% of the richest households owning at least one net, compared to 44.6% of the poorest households.

Comparison among regional states reveals that households in Amhara have the highest percentage of net ownership (73.7%), followed by Benishangul-Gumuz/Gambella (70.1%). Oromia was found to have the lowest net ownership (44.3%).

Table 7.Percentage of households with at least one and more than one mosquito net, and average number of nets of each type per household,by background characteristics (Ethiopia MIS 2011)

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	Number of households
Region*				
Amhara	73.7	29.3	1.1	893
B.Gumuz & Gambella	70.1	32.0	1.1	487
Diredawa	78.9	40.1	1.3	45
Oromia	44.3	17.7	0.6	2,060
SNNPR	57.2	28.4	0.9	1,167
Somali & Afar	45.1	14.0	0.6	838
Tigray	65.8	35.3	1.2	329
Wealth index				
Poorest	44.6	15.0	0.6	1,337
Second	52.7	19.3	0.7	1,266
Third	55.5	24.4	0.9	1,090
Fourth	61.2	30.6	1.0	1,033
Richest	66.4	34.5	1.1	1,093

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	Number of households
Median EA altitude/elevation (E)				
E<2,000m	55.2	23.9	0.8	5,819
E>2,000m (non-malarious)	37.9	17.0	0.6	4,625
Total for all EAs	47.2	20.8	0.7	10,444

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
*Regional estimates are valid for Amhara, Oromia, SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table 8 demonstrates household LLIN ownership.For households living <2,000m (i.e., in malaria-endemic areas),54.8% owned at least one LLIN, 23.6% owned more than one LLIN, and the average number of LLINs per household was 0.7. Amhara reported the highest LLIN coverage, with 73.6% of surveyed households having at least one LLIN, while Oromia had the lowest coverage at 43.7%. Of households living >2,000m, 37.6% owned at least one LLIN, with the average number of LLINs per household at 0.6, nearly the same LLIN average per household as in malaria-endemicareas, suggesting some mis-targeting of LLINs to non-malaria-endemicareas at high altitudes.The poorest quintile of households had 44.2% LLIN ownership while the richest quintile had 66.4% LLIN ownership.

Table 8. Distribution of households with at least one and more than one LLIN and average number of LLINs per households, by background characteristics (Ethiopia MIS 2011)

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
Region*				
Amhara	73.6	29.2	1.1	893
B.Gumuz & Gambella	69.0	31.1	1.1	487
Diredawa	78.9	40.1	1.3	45
Oromia	43.7	17.3	0.6	2,060
SNNPR	57.0	28.1	0.9	1,167
Somali & Afar	45.0	14.0	0.6	838
Tigray	65.8	35.3	1.2	329
Wealth index				
Poorest	44.2	14.9	0.6	1,337
Second	52.4	19.2	0.7	1,266
Third	54.6	23.8	0.8	1,090
Fourth	61.2	30.5	1.0	1,033
Richest	66.4	34.1	1.1	1,093

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
Median EA altitude/elevation (E)				
E<2,000m	54.8	23.6	0.7	5,819
E>2,000m (non-malarious)	37.6	16.7	0.6	4,625
Total	46.9	20.5	0.7	10,444

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
*Regional estimates are valid for Amhara, Oromia, SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

B. Use of mosquito nets and LLINs by children U5 and pregnant women

Use of nets was assessed in each surveyed household through a complete net roster,which identified eachnet in the household along withits current treatment status.The members of the household who had slept under a net the night preceding the surveywere evaluated. While all individuals benefit from sleeping under an LLIN, young children and pregnant women are particularly vulnerable to malaria and hence are an important target for LLIN use.

Table 9 shows that in areas <2,000m, 38.2% of children U5had slept under an LLIN the night preceding the survey. In households >2,000m, LLIN usage was 19.4% for children U5. LLIN use appears to be higher in children under 3 years of age than among those aged 3 or 4 years.There was almost no difference in the rates for nets versus LLINs because nearly all malaria nets owned and used within households in this 2011survey were LLINs.Net utilization was defined as having slept under a net during the night preceding the survey.

Table 9. Percentage of children U5 who slept under a mosquito net or LLIN the night preceding the survey, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of children under age 5 years who slept under a net	Percentage of children under age 5 years who slept under an LLIN	Total number of children under age 5 years
Age (in years)			
<1	41.9	41.6	633
1	41.9	41.7	664
2	42.3	42.2	935
3	32.8	32.6	971
4	35.5	35.5	1,319
Sex			
Male	37.8	37.7	2,300
Female	38.5	38.4	2,222

Background characteristic	Percentage of children under age 5 years who slept under a net	Percentage of children under age 5 years who slept under an LLIN	Total number of children under age 5 years
Region*			
Amhara	51.2	51.2	565
B.Gumuz & Gambella	62.5	60.6	331
Diredawa	47.4	47.4	24
Oromia	26.6	26.5	1,728
SNNPR	42.3	42.3	864
Somali & Afar	41.3	41.3	760
Tigray	46.7	46.7	250
Wealth index			
Poorest	32.0	32.0	1,062
Second	36.2	36.2	955
Middle	39.2	39.0	816
Fourth	41.3	41.3	823
Richest	44.6	44.2	866
Median EA altitude/elevation (E)			
E<2,000m	38.2	38.0	4,522
E>2,000m (non-malarious)	19.4	19.0	3,003
Total for all EAs	30.3	30.1	7,525

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

* Regional estimates are valid for Amhara, Oromia, SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Net-userates in households that owned a mosquito net or LLIN demonstrates favorable trends of behavioral change toward net utilization. Table 10 shows netuse in households that owned at least one net or LLIN. Accordingly, 64.7% of children U5 in households <2,000m with nets had slept under an LLIN the previous night, compared to 50% LLIN usage in households >2,000m. Use of LLINs among children U5 in households <2,000m with nets was nearly the same for girls (65.4%) and boys (64.1%), and also nearly the same for the poorest and richest households (63.6% and 64.0%, respectively). The survey shows use of LLINs by children under age 12 months (71.4%) wasmodestly higher than among most other age groups.

Benishangul-Gumuz and Gambella combined together reported the highest use of nets in children U5 (83.6%), and Oromia reported the lowest (55%).Somali and Afar reported that 77.6% of children U5 slept under a net the night preceding the survey.

Table 10. Percentage of children U5 who slept under a mosquito net or LLIN in households that own a net or LLIN the night preceding the survey, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of children under age 5 years who slept under a net	Percentage of children under age 5 years who slept under an LLIN	Total number of children under age 5 years in households with at least one net of any type
Age (in years)			
<1	71.3	71.4	381
1	68.7	68.9	401
2	71.4	71.5	559
3	56.6	56.8	558
4	59.9	60.3	784
Sex			
Male	63.9	64.1	1,362
Female	65.1	65.4	1,321
Region*			
Amhara	64.7	64.7	447
B.Gumuz & Gambella	83.6	83.1	238
Diredawa	51.1	51.1	22
Oromia	55.0	55.4	865
SNNPR	66.1	66.5	544
Somali & Afar	77.6	78.0	378
Tigray	67.7	67.7	189
Wealth index			
Poorest	62.9	63.6	533
Second	64.0	64.5	551
Middle	68.3	68.9	476
Fourth	63.2	63.2	555
Richest	64.6	64.0	568
Median EA altitude/elevation (E)			
E<2,000m	64.5	64.7	2,683
E>2,000m (non-malarious)	50.5	50.0	1,096
Total for all EAs	60.1	60.1	3,779

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

* Regional estimates are valid for Amhara, Oromia, SNNPR,Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Tables11 and 12 show netuse by women in all surveyed households and specifically in households owning at least one netor LLIN. Of women aged 15 to 49 in all surveyed households, 36.4% reported having slept under an LLIN on the night preceding the survey.

Table 11. Percentage of all women who slept under any mosquito net or LLIN on the night preceding the survey, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of women who slept under a net last night	Percentage of women who slept under an LLIN last night	Number of women
Age group			
15-19	26.7	26.5	745
20-29	38.2	38.0	2,117
30-39	39.1	39.1	1,564
40-49	36.5	36.3	602
School attended			
Primary	38.2	37.9	1,307
Secondary	35.9	35.9	3,695
Region*			
Amhara	49.2	49.2	704
B.Gumuz &Gambella	57.5	55.9	432
Diredawa	33.6	33.6	35
Oromia	28.2	28.0	1,770
SNNPR	40.2	40.2	1,042
Somali & Afar	27.5	27.5	753
Tigray	40.2	40.2	292
Wealth index			
Poorest	29.3	29.3	1,054
Second	33.2	33.1	1,098
Middle	38.0	37.4	918
Fourth	40.0	40.0	952
Richest	43.9	43.8	1,006
Median EA altitude/elevation (E)			
E<2,000m	36.5	36.4	5,028
E>2,000m (non-malarious)	20.4	20.2	3,874
Total for all EAs	29.2	29.0	8,902

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

* Regional estimates are valid for Amhara, Oromia, SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table 12 shows that 62.1% of all women in households <2,000m that owned at least one LLIN reported having slept under an LLIN on the night preceding the survey.

Table 12.Percentage of all women who slept under any mosquito net or LLIN on the night preceding the survey in a household that owns at least one net or LLIN, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of women who slept under a net last night	Percentage of women who slept under an LLIN last night	Number of women
Age group			
15-19	44.4	44.4	457
20-29	66.1	66.3	1,207
30-39	66.8	66.9	909
40-49	59.8	59.7	360
School attended			
Primary	59.3	59.4	856
Secondary	63.5	63.6	2,063
Region*			
Amhara	62.6	62.7	544
B.Gumuz & Gambella	76.9	76.4	306
Diredawa	41.7	41.7	28
Oromia	58.5	58.8	873
SNNPR	65.9	66.1	633
Somali & Afar	55.7	55.9	334
Tigray	59.4	59.4	215
Wealth index			
Poorest	60.6	61.0	504
Second	60.5	60.8	594
Middle	64.9	64.7	528
Fourth	62.4	62.4	623
Richest	62.4	62.3	684
Median EA altitude/elevation (E)			
E<2,000m	62.1	62.2	2,933
E>2,000m (non-malarious)	52.2	52.1	1,498
Total for all EAs	58.6	58.6	4,431

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
* Regional estimates are valid for Amhara, Oromia, SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table 13 shows the percentage of pregnant women who slept under a net the night preceding the survey.In malaria-endemic areas(<2,000m), 35.3% of pregnant women had slept under a net and 34.7% had slept under an LLIN. Benishan-gul-Gumuz and Gambella combined together reported the highest proportion of pregnant women who slept under a net the night preceding the survey(53.0%) whereas Oromia reported the lowest (27.5%). Pregnant women aged 30-39 reported the highest (38.0%) and 40-49 reported the lowest (22.5%).

Table 13.Percentage of pregnant women who slept under any mosquito net or LLIN the night preceding the survey, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of pregnant women who slept under a net last night	Percentage of pregnant women who slept under an LLIN last night	Number of pregnant women
Age group			
15-19	30.0	27.8	52
20-29	35.8	35.2	218
30-39	38.0	38.0	109
40-49	22.5	22.5	11
School attended			
Primary (1)	38.5	36.2	97
Secondary (2)	33.5	33.5	290
Region*			
Amhara	48.4	48.4	53
B.Gumuz & Gambella	53.0	47.5	26
Diredawa	0	0	2
Oromia	27.5	26.7	128
SNNPR	45.1	45.1	74
Somali & Afar	24.7	24.7	79
Tigray	33.8	33.8	28
Wealth index			
Poorest	21.3	21.3	95
Second	44.6	43.2	92
Middle	40.8	39.1	62
Fourth	26.9	26.9	61
Richest	44.2	44.2	80
Median EA altitude/elevation (E)			
E <2,000m	35.3	34.7	390
E>2,000m (non-malarious)	21.4	21.4	209
Total for all EAs	29.2	29.0	599

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
* Regional estimates are valid for Amhara, Oromia, Tigray,SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table 14 shows that in households <2,000m that owned at least one net, 63.8% of pregnant women had slept under an LLIN. A regional difference in net use among pregnant women was observed, with the highest proportion in SNNPR and the lowest in Tigray,where respectively 75.2% and 42.1% of pregnant women that own a net slept under a net the night preceding the survey.

Table 14.Percentage of pregnant women who slept under any mosquito net or LLIN the night preceding the survey in households that own at least one net or LLIN, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of pregnant women who slept under a net in households with at least one net	Percentage of pregnant women who slept under an LLIN in households with at least one LLIN	Number of pregnant women
Age group			
15-19	57.4	55.5	29
20-29	64.3	63.8	119
30-39	71.4	71.4	56
40-49	33.8	33.8	6
School attended			
Primary (1)	66.3	64.8	58
Secondary (2)	62.8	62.8	149
Region*			
Amhara	69.7	69.7	34
B.Gumuz & Gambella	66.6	64.1	21
Diredawa	NA	NA	NA
Oromia	64.8	64.0	57
SNNPR	75.2	75.2	45
Somali & Afar	54.4	54.4	30
Tigray	42.1	42.1	23
Wealth index			
Poorest	58.9	58.9	33
Second	75.6	74.9	47
Middle	73.6	72.7	37
Fourth	59.4	59.4	33
Richest	53.9	53.9	60
Median EA altitude/elevation (E)			
E <2,000m	64.2	63.8	208
E >2,000m (non-malarious)	59.3	59.3	75
Total for all EAs	30.2	29.8	283

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

* Regional estimates are valid for Amhara, Oromia, SNNPR,Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

C. Condition and age of nets

Table 15 shows the condition of observed nets. According to the survey, 58% of households havenets in good condition.Regional differences were observed, with households in Tigray having thegreatest percentage of nets in good condition (71.3%).With regard to wealth index, the richest segment owns the highest percentage of nets in good condition.There were minimal differences in observed net condition between households located above and below 2,000m.

Table 15. Percentage of households with various conditions of nets, by background characteristics (Ethiopia MIS 2011)

Background characteristics	Not observed	Percentage of nets in good condition	Percentage of nets in fair condition	Percentage of nets in poor condition	Percentage of nets that should no longer be used	Percentage of unused nets	Percentage of nets with unknown condition	Total
Region								
Amhara	2.1	62.2	15.5	11.6	5.2	3.2	0.3	939
B.Gumuz & Gambella	0.1	65.9	25.1	7.4	1.6	0	0	522
Diredewa	5.9	66.5	15.6	1.5	6.6	3.9	0	55
Oromia	2.0	60.4	14.5	12.6	7.9	2.4	0.3	1,399
SNNPR	1.4	46.6	33.9	10.7	4.9	2.5	0	1,041
Somali & Afar	1.8	41.0	30.3	15.8	9.3	1.8	0	483
Tigray	0.2	71.3	10.2	14.1	0.9	3.3	0	437
Wealth index								
Poorest	1.6	49.6	23.4	14.4	8.0	3.0	0	830
Second	3.3	52.6	21.1	11.8	7.9	3.0	0.3	948
Middle	1.2	57.2	19.3	14.6	4.9	2.7	0	932
Fourth	0.8	61.0	20.5	11.5	4.4	1.5	0.3	1,035
Richest	1.0	66.9	19.8	7.0	2.9	2.2	0.1	1,131
Median EA altitude/elevation (E)								
E<2,000m	1.6	58.0	20.7	11.7	5.5	2.4	0.2	4,876
E>2,000m (non-malarious)	1.4	63.6	16.4	8.5	6.1	3.7	0.2	2,569
Total for all EAs	1.5	60.0	19.1	10.5	5.7	2.9	0.1	7,445

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
* Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table 16showsthe age of nets. The survey indicates that 46.6% of the nets had been in the household between 1 and 3 years. Among rural malaria-endemic areas, Amhara and the poorest segment had the highest percentage of nets between 1-3 years (54.1% and 53.5% respectively).

Table 16. Percentage of households with various ages of nets, by background characteristics (Ethiopia MIS 2011)

Background characteristics	Percentage of nets less than 1 year old	Percentage of nets between 1 and 3 years old	Percentage of nets with older than 3 years	Don't know	Total
Region*					
Amhara	29.3	54.1	14.6	2.1	939
B.Gumuz & Gambella	35.1	45.3	14.7	4.9	522
Diredawa	25.8	70.3	2.0	2.0	55
Oromia	38.3	46.4	11.6	3.6	1,399
SNNPR	30.6	44.9	22.7	1.8	1,041
Somali & Afar	36.8	47.4	12.3	3.4	483
Tigray	27.7	34.4	37.9	0.0	437
Wealth index					
Poorest	34.2	53.5	9.2	3.0	830
Second	37.8	45.8	14.9	1.4	948
Middle	27.0	45.1	23.7	4.2	932
Fourth	29.3	47.7	20.9	2.1	1,035
Richest	37.0	42.2	18.5	2.3	1,131
Median EA altitude/elevation (E)					
E<2,000m	33.1	46.6	17.7	2.6	4,876
E>2,000m	26.9	45.4	25.2	2.5	2,569
Total for all EAs	30.8	46.1	20.5	2.5	7,445

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

* Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

D. Indoor residual spraying

Table 17 presents the survey results for IRS coverage. In malaria-endemic areas, 46.6% of all households evaluated had been sprayed in the past 12 months.Most (95.2%)spraying was done by government agents.

Table 17. Percentage of households reporting indoor residual spraying, the sprayer, and the time since spraying was conducted, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of households sprayed in the last 12 months	Number of households	Percentage sprayed by private agents	Percentage sprayed by government agents	Other	Do not know	Average number of months since house was sprayed
Regions							
Amhara	53.0	893	0.8	98.6	0	0.6	3.1
B.Gumuz & Gambella	62.2	487	0	99.6	0	0.4	4.1
Diredawa	93.1	45	0	100.0	0	0	4.3
Oromia	43.0	2,060	6.9	91.7	0.6	0.8	2.9
SNNPR	58.6	1,167	4.5	94.5	0	1.1	3.4
Somali & Afar	11.9	838	1.9	98.1	0	0	5.1
Tigray	40.5	329	0	100.0	0	0	3.1
Wealth index							
Poorest	42.5	1,337	4.3	95.7	0	0	3.0
Second	43.5	1,266	4.7	93.5	0.7	1.1	3.2
Middle	48.2	1,090	6.1	93.1	0	0.8	3.2
Fourth	48.9	1,033	3.2	95.6	0.2	1.1	3.3
Richest	52.1	1,093	1.1	98.0	0.3	0.6	3.7
Median EA altitude/elevation (E)							
E<2,000m	46.6	5,819	3.9	95.2	0.2	0.7	3.3
E>2,000m (non-malarious)	8.5	4,625	2.1	97.2	0	0.7	3.4
Total for all EAs	29.2	10,444	3.7	95.5	0.7	0.7	3.3

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

* Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

E. Households protected by nets, LLINs, and/or IRS

Table 18 depicts thepercentage of households protected by at least one FMOH-recommended antimalarial intervention, including LLIN and/or IRS. The survey shows that 71.7% of households living <2,000mare protected by either LLIN or IRS. Of ruralmalaria-endemic areas, the greatest percentages of households receiving a net and/or IRS was found in Amhara (86.3%),and the lowest was observed in Oromia (63.9%). With regard to economic status, as wealth index increases, the proportion of households protected by net and/or IRS increases. MIS 2011 results revealed that 40.3% of surveyed households >2,000m also had received LLINs and/or IRS protection, suggesting some mis-targeting of these resources to non-malaria-endemic areas.

Table 18. Percentage of households protected by any net, LLIN, and/or IRS, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of households protected by at least by one net and/or IRS	Percentage of households protected by at least by one LLIN and/or IRS	Number of households
Region*			
Amhara	86.3	86.3	893
B.Gumuz & Gambella	84.9	84.3	487
Diredewa	100.0	100.0	45
Oromia	63.9	63.7	2,060
SNNPR	79.5	79.4	1,167
Somali & Afar	46.6	46.4	838
Tigray	77.6	77.6	329
Wealth index			
Poorest	62.7	62.4	1,337
Second	69.9	69.8	1,266
Middle	72.7	72.4	1,090
Fourth	78.3	78.3	1,033
Richest	79.1	79.1	1,093
Median EA altitude/elevation (E)			
<2,000m	71.8	71.7	5,819
>2,000m (non-malarious)	40.7	40.3	4,625
Total for all EAs	57.5	57.3	10,444

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
* Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

F. Prevalence and prompt treatment of fever

With the scale-up of the national health extension programme, both community-based and facility-based health workers provide free treatment for malaria. Importantly, national policy requires that all fever cases should be confirmed by either microscopy or rapid diagnostic test prior to treatment.

Table 19presents the results obtained for fever prevalence among children U5 and whether they received an antimalarial drug and got finger/heel stick. MIS 2011 revealed that 19.7% of children U5 living <2,000m had suffered from a fever in the two weeks preceding the survey.Of these children, 51.3% sought medical attention within 24 hours of onset of fever, and32.6% took an antimalarial drug. Among those who were treated with an antimalarial drug,8.5%took the drug within 24 hours of onset of fever.

The highest proportion of recent fever was found in children between the ages of 1and 2(23.5%). Important differences in the percentage of children U5 reporting fever were

observed across regional states,with Benishangul-Gumuzand Gambella together reporting the highest percentages (29.8%).

The result shows that among all children U5 living <2,000m who had fever in the two weeks preceding the survey, 16.5% got finger/heel stick; of children U5 living >2,000m (non-malarious areas), 26.7%got finger/heel stick.Benishangul-Gumuz andGambella combined together reported the highest proportion of children with finger/heel stick (34.0%),and Oromia reported the lowest (11.9%).

Table 19. Percentage of children U5 who reported a fever in the two weeks preceding the survey, along with percentage who sought care, got a finger/heel stick, and took an antimalarial drug the same day, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage of children with fever in the last two weeks	Number of children U5	Percentage of children that received a finger/heel stick	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	Percentage of children with a fever who sought treatment from a facility/health provider the same/next day	Number of children with a fever
Age (in years)							
<1	14.9	423	15.7	24.9	2.7	50.6	66
1	23.5	455	18.5	33.5	3.8	58.7	112
2	21.4	632	15.4	31.4	9.2	50.3	134
3	16.2	622	20.1	35.6	13.3	45.6	106
4	21.5	818	14.0	34.1	10.2	51.2	166
Sex							
Male	22.0	1,495	17.3	32.4	10.5	48.5	324
Female	17.4	1,455	15.5	32.8	5.8	55.0	260
Region							
Amhara	20.3	438	24.8	25.7	7.4	32.2	90
B.Gumuz & Gambella	29.8	257	34.0	38.6	3.0	64.8	66
Diredawa	*	*	*	*	*	*	1
Oromia	15.4	1,165	11.9	38.8	13.8	59.5	187
SNNPR	23.9	359	14.6	33.4	6.5	46.3	97
Somali & Afar	19.2	540	9.6	29.5	4.1	67.9	93
Tigray	24.9	179	18.2	18.4	6.8	26.5	50

Background characteristic	Percentage of children with fever in the last two weeks	Number of children U5	Percentage of children that received a finger/heel stick	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	Percentage of children with a fever who sought treatment from a facility/health provider the same/next day	Number of children with a fever
Wealth index							
Poorest	16.5	792	9.3	27.8	12.1	47.8	140
Second	21.5	586	13.0	27.2	7.0	44.9	116
Middle	19.8	544	30.3	43.2	7.2	55.0	112
Fourth	21.6	526	16.0	40.9	8.6	59.1	119
Richest	20.1	502	17.0	23.7	6.5	50.4	97
Median EA altitude/elevation (E)							
E<2,000m	19.7	2,950	16.5	32.6	8.5	51.3	595
E>2,000m (non-malarious)	13.0	1,741	26.7	12.9	4.1	36.7	229
Total for all EAs	16.9	4,691	19.8	26.3	7.1	46.6	824

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
*Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table 20represents the source of treatment for fever in the two weeks preceding the survey in children U5. Of these febrile children, 68.9% sought treatment from a health facility or a health provider.In Benishangul-Gumuz and Gambella allfebrile children (100%)sought care atapublic health facility. Many children sought care from multiple types of providers and facilities.

Table 20. Percentage of sources of treatment for children U5 with fever in the two weeks preceding the survey, by background characteristics (Ethiopia MIS 2011)

Background characteristics	Public health facility	Private heath facility/worker	Pharmacy	Traditional	Other	Shop	Number of children who sought care
Age (in years)							
<1	70.0	22.6	14.3	7.2	5.1	0.0	35
1	71.3	30.0	11.8	1.0	11.7	3.6	66
2	66.1	32.5	11.4	8.3	14.4	8.5	66
3	67.4	23.0	20.2	5.6	14.1	5.0	57
4	69.5	30.9	10.1	5.7	14.4	4.9	90
Sex							
Male	71.2	31.2	12.1	4.5	14.9	4.2	167
Female	66.1	26.0	13.9	6.5	10.2	5.6	147
Region							
Amhara	77.9	13.7	13.5	0.0	14.5	3.5	31
B.Gumuz & Gambella	100.0	21.1	19.5	0.0	7.4	0.0	41
Diredawa	*	*	*	*	*	*	1
Oromia	52.7	37.8	8.4	3.9	18.6	8.9	119
SNNPR	56.1	36.7	24.0	10.5	4.9	0.0	46
Somali & Afar	92.4	10.4	7.2	9.9	4.0	1.3	62
Tigray*	78.3	33.9	10.0	4.9	34.1	17.8	14
Wealth index							
Poorest	65.1	19.0	12.0	3.3	16.5	7.5	76
Second	67.3	35.2	12.6	2.2	15.9	6.3	56
Middle	74.1	30.0	12.1	2.8	7.8	4.4	61
Fourth	53.5	39.0	18.0	6.7	13.1	3.9	72
Richest	93.3	17.0	7.6	12.9	9.1	1.9	49
Median EA altitude/eleva-tion (E)							
E<2,000m	68.9	28.8	12.9	5.4	12.7	4.9	314
E>2,000m	86.9	39.2	8.4	3.8	22.3	4.7	76
Total	73.4	31.4	11.8	5.0	15.1	4.8	390

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

*Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

Table21shows that among children U5 with fever in the previous two weeks who received treatment, 28.6% took artemether-lumefantrine and 34.9% took other drugs. Among children U5who received an antimalarial for treatment, boyswere twice as likely as girls to receive Coartem®.

Table 21. Type of drugs taken for fever in the two weeks preceding the survey among children under 5 years of age, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Type of drug used									Total number of children
	Coartem ®	Chloroquine	Quinine	Aspirin	Paracetamol	Coartem ® and quinine	Other(antimalarial)	Other	Don't know	
Age (in years)										
<1	3.6	29.4	5.4	7.2	6.7	0	0.0	25.2	22.6	24
1	21.4	9.6	0.0	5.2	4.9	0	5.1	49.3	4.5	49
2	23.9	8.7	2.5	6.6	8.3	0	5.8	38.7	5.4	59
3	40.2	4.2	0.0	5.5	2.0	0	9.5	36.9	1.7	46
4	38.9	19.9	1.1	2.9	1.0	2.1	3.2	24.1	6.9	70
Sex										
Male	36.5	10.9	1.5	4.8	4.0	1.0	3.2	29.4	8.8	136
Female	18.3	16.4	1.3	5.78	4.5	0	7.5	42.1	4.2	112
Region										
Amhara	31.8	16.9	0.0	3.0	5.9	0.0	1.9	32.3	8.2	32
B.Gumuz & Gambella	26.0	33.8	2.8	0.0	0.0	0.0	2.7	18.2	16.5	29
Diredawa	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	1
Oromia	19.6	13.6	0.0	2.3	5.2	0.0	4.7	48.4	6.2	88
SNNPR	44.2	9.4	5.5	1.5	0.0	2.8	7.0	21.6	8.1	42
Somali & Afar	19.1	3.5	0.0	20.1	11.2	0.0	8.7	37.4	0.0	46
Tigray	66.5	6.5	0.0	0.0	0.0	0.0	0.0	24.2	2.9	10
Wealth index										
Poorest	21.4	18.5	0.0	5.7	9.2	0.0	5.8	35.9	3.3	53
Second	24.0	6.3	0.0	5.9	2.7	0.0	9.2	38.0	14.0	47
Middle	30.8	10.8	0.0	2.0	1.8	0.0	3.3	42.3	9.0	55
Fourth	30.5	22.0	4.8	4.1	5.9	2.4	0.0	29.1	1.3	56
Richest	39.9	4.5	2.3	10.5	0.0	0.0	9.6	26.4	6.8	37
Median EA altitude/ele-vation (E))										
E<2,000m	28.6	13.3	1.5	5.2	4.2	0.6	5.1	34.9	6.8	248
E>2,000m	20.0	4.8	2.2	3.5	14.4	0.0	4.8	43.8	6.5	44
Total for all EAs	27.1	11.8	1.6	4.9	6.0	0.5	5.0	36.4	6.7	292

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

*Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray,and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

CHAPTER 4. MALARIA PARASITE AND ANEMIA PREVALENCE

This survey carried out malaria testing by RDT and microscopy. During the survey, children U5were tested in each household for malaria parasitemia using an RDT (CareStart™) and for anemia using HemoCue 201 analyzers. In every fourth household, all household members were also tested for parasitemia.Whenever blood was taken for malaria testing byRDT, thick and thin blood films were also collected for microscopy. Appropriate treatment or referral was provided to persons testing RDT-positive.

A. Malaria prevalence by microscopic examination

Of 6,697 persons tested using microscopy in areas <2,000m (malaria-endemic areas), 1.3% were found to be positive for malaria. In areas >2,000m, the slide positivity rate was just 0.1%.

Table 22 shows that 1.4% of children under 10 years of age living <2,000m and tested using microscopy had malaria parasites: 1% had *P. falciparum* infection and0.3% had*P.vivax.* There were very few mixed infections (both *P. falciparum* and *P. vivax* detected). Nationally, *P. falciparum* constitutes the larger proportion of cases detected by microscopy(77%) in areas <2,000m. In Oromia, however, *P. vivax* was the main etiologic agent of cases confirmed by microscopy,with 60% of slide-positive cases. Oromia also had the lowest malaria prevalence (0.5%) compared to other Ethiopian regions. The highest proportion ofparasitemia was seen in SNNPR (2.5%). Nationally,maleswerefound to be more affected than females (1.6% versus 1.0% respectively).

Table 22. Percentage of surveyed population with malaria parasites identified by positive slide microscopic examination, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage with malaria	Percentage with *P. falciparum*	Percentage with *P. vivax*	Percentage with mixed infection	Number of people
Age (in years)					
0-9	1.4	1.0	0.4	0	4,244
10-19	1.5	1.5	0	0	700
20-29	0.9	0.5	0.3	0	626
30-39	1.1	1.1	0	0	504
40-49	0.7	0.5	0.3	0	255
50-59	1.2	1.2	0	0	207
60-69	0	0	0	0	94
70-79	0	0	0	0	42
80+	0	0	0	0	25
Sex					
Male	1.6	1.2	0.4	0	3,145
Female	1.0	0.8	0.2	0	3,552
Region					
Amhara	2.0	1.4	0.5	0	750
B.Gumuz & Gambella	1.5	1.5	0	0	562

Background characteristic	Percentage with malaria	Percentage with *P. falciparum*	Percentage with *P. vivax*	Percentage with mixed infection	Number of people
Oromia	0.5	0.2	0.3	0	2,630
SNNPR	2.5	2.2	0.4	0	1,433
Somali & Afar	0.8	0.8	0	0	955
Tigray	0.6	0.2	0.4	0	367
Wealth index					
Poorest	0.6	0.3	0.2	0.1	1,532
Second	0.8	0.6	0.2	0	1,410
Middle	1.7	1.5	0.2	0	1,243
Fourth	2.0	1.6	0.4	0	1,280
Richest	1.6	1.1	0.5	0	1,232
Median EA altitude/elevation					
E<2,000m	1.3	1.0	0.3	0	6,697
E>2,000m (non-malarious)	0.1	0	0.1	0	5,236
Total for all EAs	0.7	0.5	0.2	0	11,933

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.
*Regional estimates are valid for Amhara, Oromia, SNNPR,Tigray, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

B. Malaria prevalence by rapid diagnostic testing

RDT results revealed that malaria prevalence is 4.5% in malaria-endemic areas <2,000m. Of the total RDT-positive cases, 1.9% were positive for *P. falciparum* only, 1.4% for *P. falciparum* or mixed, and 1.1% for *P. vivax*/*P.malare*/*P.ovale*. The highest proportion of RDT-positive malaria cases was found in age group 10–19 (5.5%) and the lowest in age group 70–79 (1.1%).

C. Hemoglobin

In addition to investigating the prevalence of malaria, the survey examined the hemoglobin levelsof childrenU5. The mean hemoglobin value across survey EAswas 11.1g/dL with a standard deviation of 0.1.Considering the wide range in altitude across surveyed areas and normal increases in hemoglobin levels among populations living at high altitude, anemia was defined according to WHO classifications(29).For the purpose of this survey, severe anemia was defined as adjusted hemoglobin level of less than5 grams per decilitre (5g/dL).

Table 23 shows that 0.9% of childrenU5 suffered from severe anemia in malaria-endemic areas (<2,000m). Children U5 had slightly lower hemoglobin levels and variably higher frequencies of mild, moderate, and severe anemia when living in malaria-endemic areas compared to those children living at higher altitudes.

Table 23. Mean hemoglobin values, standard deviation, and percentage of children U5 with mild, moderate, and severe anemia, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Mean hemoglobin value	Hemoglobin standard deviation/ error	Percentage of children U5with mild anemia (8-11mg/dL)	Percentage of children U5with moderate anemia (5-8 mg/dL)	Percentage of children U5with severe anemia (<5mg/dL)	Number of children tested for hemoglobin level
Age (in years)						
<1	10.2	0.2	53.8	17.0	0	181
1	10.4	0.1	53.6	12.5	1.5	618
2	10.7	0.1	46.4	12.4	1.3	866
3	11.3	0.1	42.3	6.3	0.8	896
4	11.6	0.1	35.6	4.4	0.6	1,201
Sex						
Male	11.0	0.1	43.6	8.9	1.0	1,915
Female	11.1	0.1	43.3	8.3	0.8	1,847
Region						
Amhara	11.5	0.1	42.6	4.8	0.6	488
B.Gumuz & Gambella	11.0	0.2	41.1	7.3	0.3	285
Diredawa	9.7	0.4	38.8	21.7	8.6	23
Oromia	11.0	0.1	42.6	10.6	0.8	1,425
SNNPR	11.5	0.1	39.7	4.7	0.9	725
Somali & Afar	10.0	0.2	54.5	15.5	2.0	598
Tigray	11.4	0.3	45.0	2.9	0.0	218
Wealth index						
Poorest	10.7	0.1	44.7	12.8	2.1	875
Second	11.0	0.1	44.9	8.5	0.7	790
Middle	11.1	0.1	43.9	8.7	0.4	699
Fourth	11.4	0.1	43.3	3.8	0.5	687
Richest	11.3	0.1	39.4	7.4	0.5	711
Median EA altitude/elevation (E)						
E <2,000m	11.1	0.1	43.4	8.6	0.9	3,762
E >2,000m	11.8	0.1	42.5	4.6	0.34	2,551
Total for all EAs	11.4	0	43.1	6.9	0.7	6,313

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

*Regional estimates are valid for Amhara, Oromia, SNNPR, Tigray, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

CHAPTER 5. GENERAL MALARIA KNOWLEDGE

Eligible women ages 15 to 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 24 shows that the majority (71.3%) ofsurveyed women had heard of malaria, and 76.0%of women reported fever as a symptom of malaria. Similar proportions of women from the richest and poorest households reported fever as a symptom (76.2% and 71.3% respectively).

In order to ensure consistent and efficient use of prevention tools, knowing that malaria is transmitted by mosquito bites is essential. Throughout the survey EAs, 71.2% of women reported that malaria is caused by mosquito bite. Knowledge of this was higher among women who live in the richest households (79.6%) than among women in the poorest households (68.7%).

Of all surveyed women (<2000m), 63.4% reported mosquito nets as a prevention method against malaria. Knowledge very slightly increased across the wealth quintiles from 60.7% in the lowest quintile to 66.8% in the highest quintile.

Table 24.General malaria knowledge among women aged 15 to 49 years, by background characteristics (Ethiopia MIS 2011)

Background characteristic	Percentage who have heard of malaria	Percentage who recognize fever as a symptom of malaria	Percentage who report mosquito bites as a cause of malaria	Percentage who report mosquito nets (treated or untreated) as a prevention method	Number of women
Region					
Amhara	70.8	70.9	48.4	64.9	704
B.Gumuz & Gambella	61.8	85.5	89.2	82.0	432
Diredawa	67.1	86.7	51.5	70.4	35
Oromia	68.7	71.3	73.2	65.5	1,770
SNNPR	68.4	77.8	70.0	53.3	1,042
Somali & Afar	88.0	91.5	88.3	68.6	753
Tigray	82.9	72.2	68.3	57.5	292

Background characteristic	Percentage who have heard of malaria	Percentage who recognize fever as a symptom of malaria	Percentage who report mosquito bites as a cause of malaria	Percentage who report mosquito nets (treated or untreated) as a prevention method	Number of women
Wealth index					
Poorest	71.3	74.4	68.7	60.7	1,054
Second	66.6	73.7	67.4	62.5	1,098
Middle	73.6	75.6	69.7	63.2	918
Fourth	69.5	72.4	70.9	64.3	952
Richest	76.2	83.7	79.6	66.8	1,006
School attended					
Yes	78.4	74.7	77.2	66.4	1,307
No	68.6	76.7	68.6	62.2	3,695
Median EA altitude/ elevation (E)					
E<2,000m	71.3	76.0	71.2	63.4	5,028
E>2,000m (non-malarious)	58.5	64.1	51.4	50.4	3,874
Total	65.5	71.2	63.2	58.2	8,902

All sub-group estimates except for the median enumeration area (EA) altitude group are restricted to EAs with median altitudes <2,000m.

*Regional estimates are valid for Amhara, Oromia, Tigray, SNNPR, and Somali/Afar. Estimates for other regions are provided to show inter-region variability, but due to small sample sizes should be compared using great caution.

CHAPTER 6. COMPARISON OF MIS RESULTS: 2007 VS. 2011

Ethiopia's 2007 MIS was the first national malaria indicator survey conducted in the country. The second MIS was conducted five years later, in 2011. This chapter compares both surveys' results demonstrating achievements and challenges of the malaria prevention and control program. The comparison revealed regional differences both in achievements and challenges related to key malaria interventions. It also focuses on main regions with sufficient data for comparison. However, the comparison of the two surveys did not employ robust statistical approaches to make statistical inferences except between the descriptive findings of the two studies. Therefore, differences in the results of the two surveys should be interpreted cautiously.

A. Net ownership

Nationally, the results show that the percentage of households with at least one mosquito net in malaria-endemic areas is lower in MIS 2011 (55.2%) than in MIS 2007 (68.9%). Regional comparison shows that Tigray households increased the most in ownership of at least one net per household (53.7% in 2007 goes up to 65.8% in 2011). Figure2 depicts that Oromia had the lowest achievement in net ownership (45.6% in 2007 and 44.3% in 2011).

Figure 2National and regional comparison between MIS 2007 and MIS 2011 by percentage of households with at least one net and more than one mosquito net in areas <2,000m (Ethiopia MIS 2011)

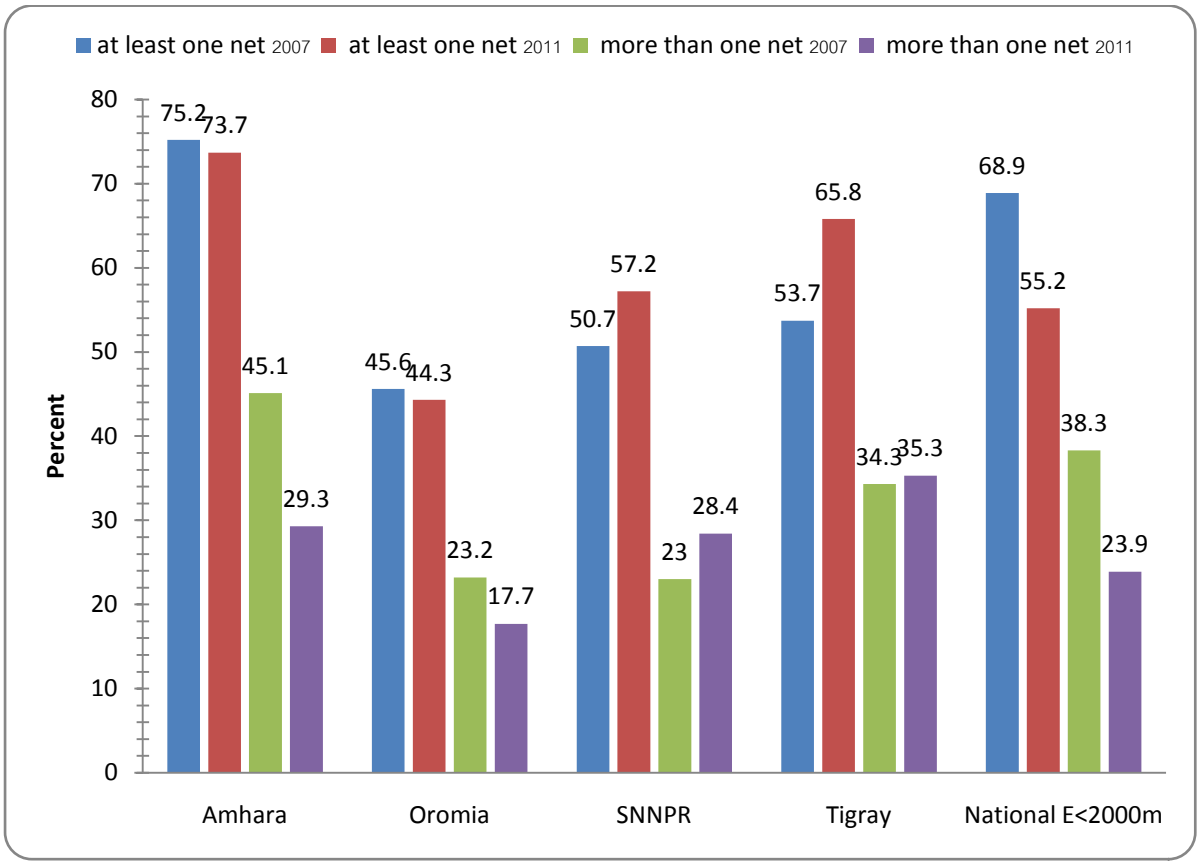
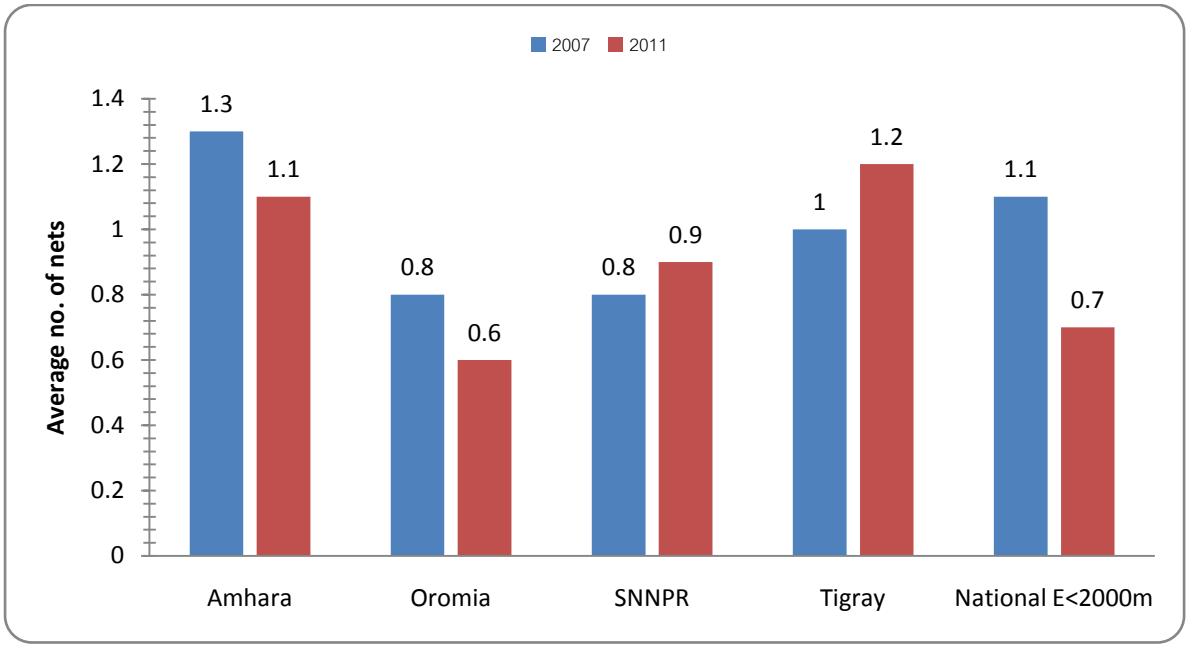


Figure 3 shows a decrease in the average number of nets per household at national level (1.1 in 2007 and 0.7 in 2011). However, in some regions the average number of nets per household has increased. The largest increase was in Tigray, followed by SNNPR.

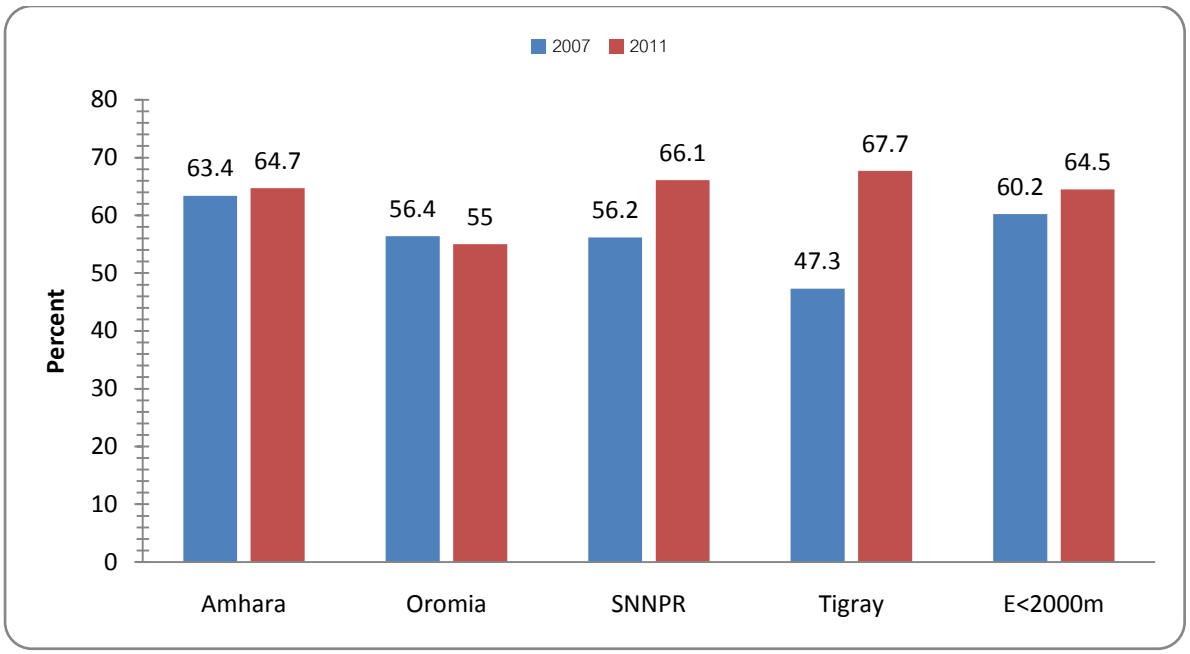
Figure 3National and regional comparison of average number of nets per household in areas <2,000m between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)



B. Insecticide-treated mosquito net use

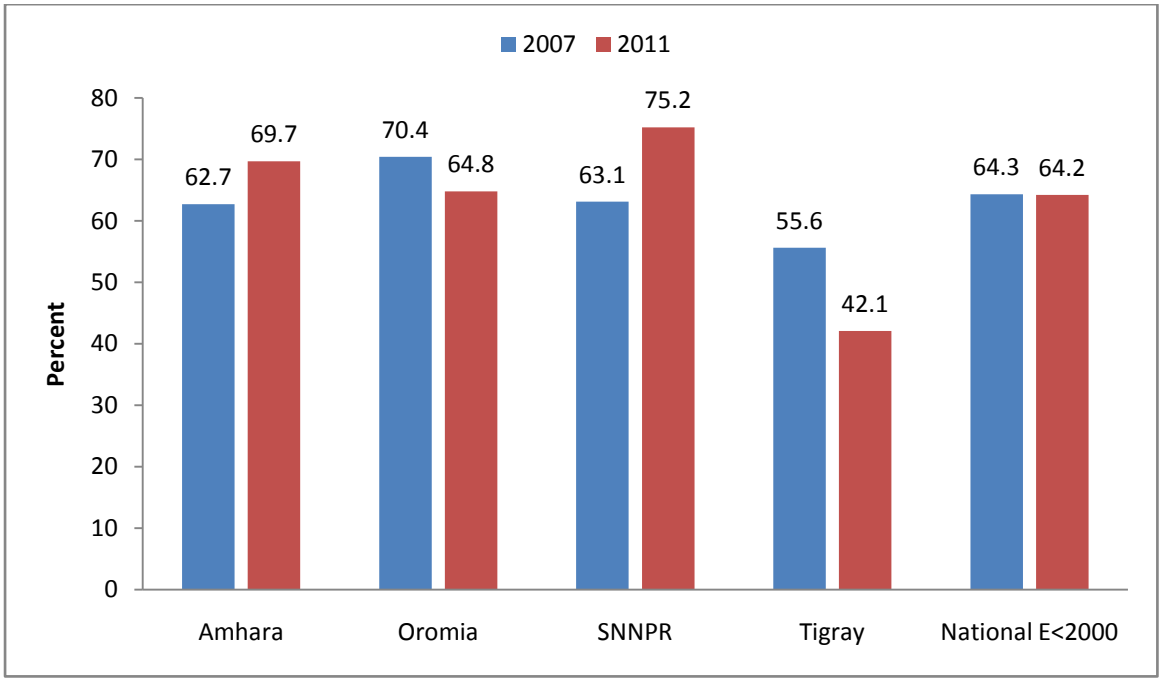
Nationally, progress has been observed in terms of net use among children U5 in households that owned nets. The percentage of children U5 who had slept under a mosquito net the night preceding the survey was 60.2% in 2007, increasing to 64.5% in 2011. Tigray demonstrated the highest increase, with 47.3% in 2007 and 67.7% in 2011. Oromia showed a decrease in net use by children U5 (Figure 4).

Figure 4National and regional comparison of percentage of children U5 who slept under a net in a household with at least one net in areas <2,000m between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)



National findings showed no improvement in net use among pregnant women in 2011 compared to 2007. However, a regional difference is observed in net use among pregnant women in households that own at least one net (Figure 5). SNNPR demonstrated the highest increment in net use among pregnant women—from 63.1% in 2007 to 75.2% in 2011.

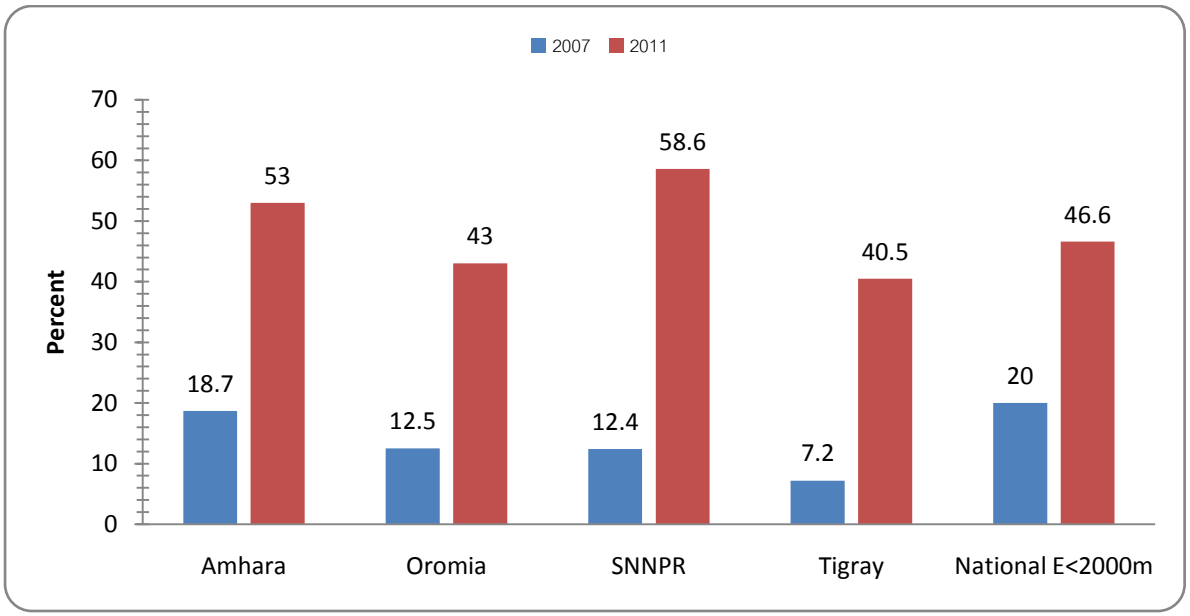
Figure 5Percentage of pregnant women who slept under a net the previous night in a household that has at least one net



C. Indoor residual spraying

Compared to the MIS 2007,the MIS 2011 demonstrated a significant increase with respect to IRS coverage. The percentage of households sprayed in the 12 months preceding the surveys were 20% in 2007 and 46.6% in 2011. In 2011, only 8.5% of households living >2,000m were covered with IRS, suggesting better targeting of IRS resources compared to LLINs within non-malarious areas. Figure 6 demonestrates the achivememts of all regional staes with respect to IRS.

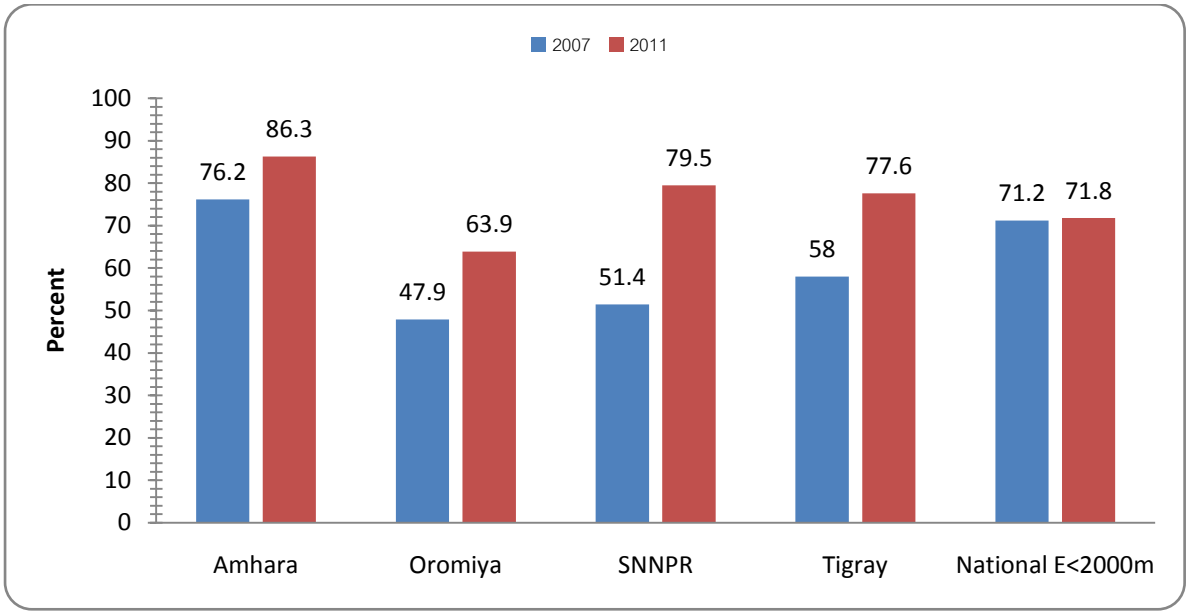
Figure 6National and regional comparison of percentage of households sprayed in the last 12 months in areas <2,000m between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)



D. Households protected by nets,LLINs, and/or IRS

The MIS 2011 demonstrated improvement in the percentage of households that are protected by at least one LLIN and/or IRS, compared to MIS 2007, as shown in Figure 7.

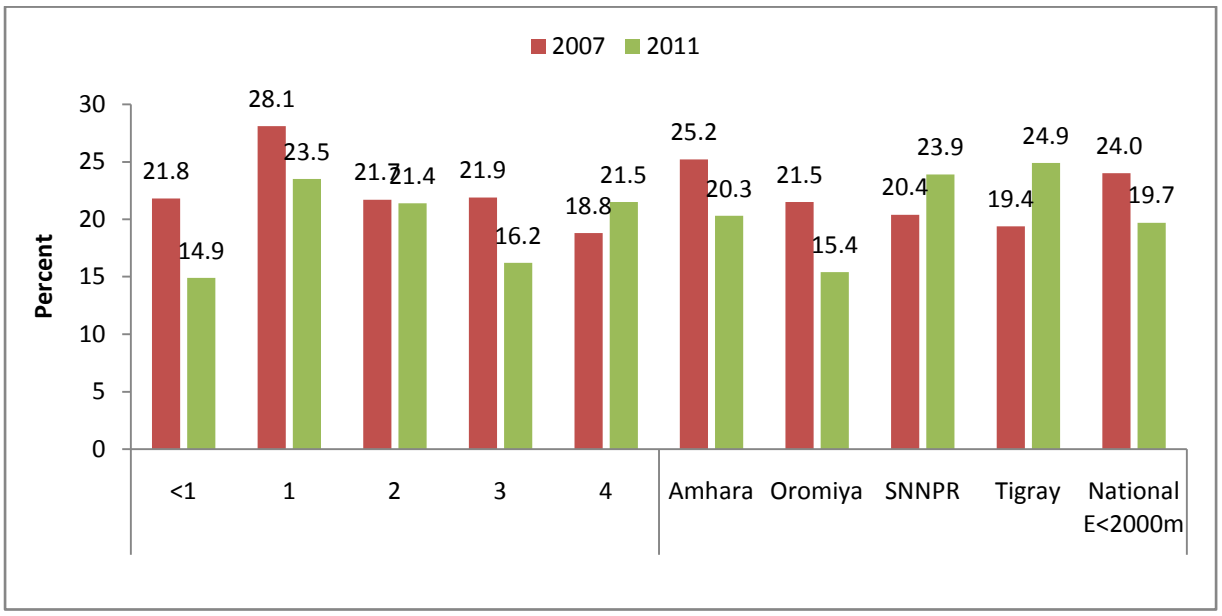
Figure 7National and regional comparison of percentage of overall protection, by IRS and/or LLIN, in areas <2,000m between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)



E. Prevalence and prompt treatment of fever

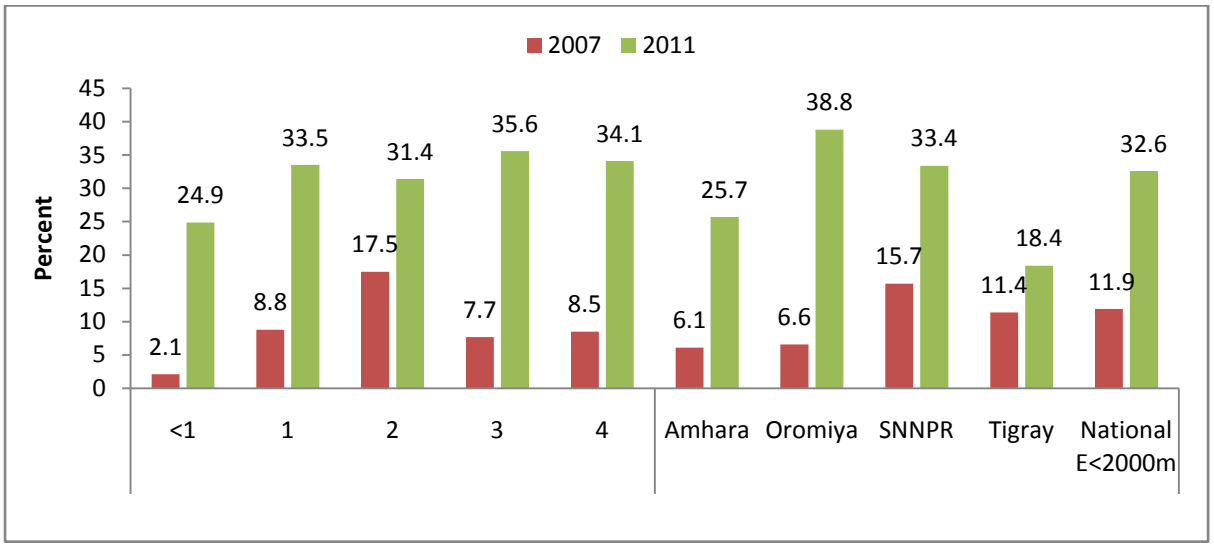
National fever prevalence among children U5 decreased from 24.0% in 2007 to 19.7% in 2011 (Figure 8). Declines were steepest among children less than one year of age (from 21.8% in 2007 to 14.9% in 2011).

Figure 8Percentage of children U5 with fever in the two weeks preceding the survey, by age category (A) and national and regional comparison (B), between MIS 2007 and MIS 2011 in areas <2,000m (Ethiopia MIS 2011)



The percentage of children under 5 years of age living <2000m who took anti-malaria drug within 24 hours of the onset of fever has showed significant increase in MIS 2011 compared to the MIS 2007 11.9% and 32.6%, respectively) (Figure 9). These findings likely indicate increased availability and access to quality malaria diagnostic and treatment services for children U5 with fevers at new health centers and health posts staffed with health extension workers and other providers since the 2007 MIS.

Figure 9Age category (A) and national and regional comparision (B) of children U5 with fever who took antimalaria drug between MIS 2007 and 2011 in areas < 2000m (Ethiopia MIS 2011)

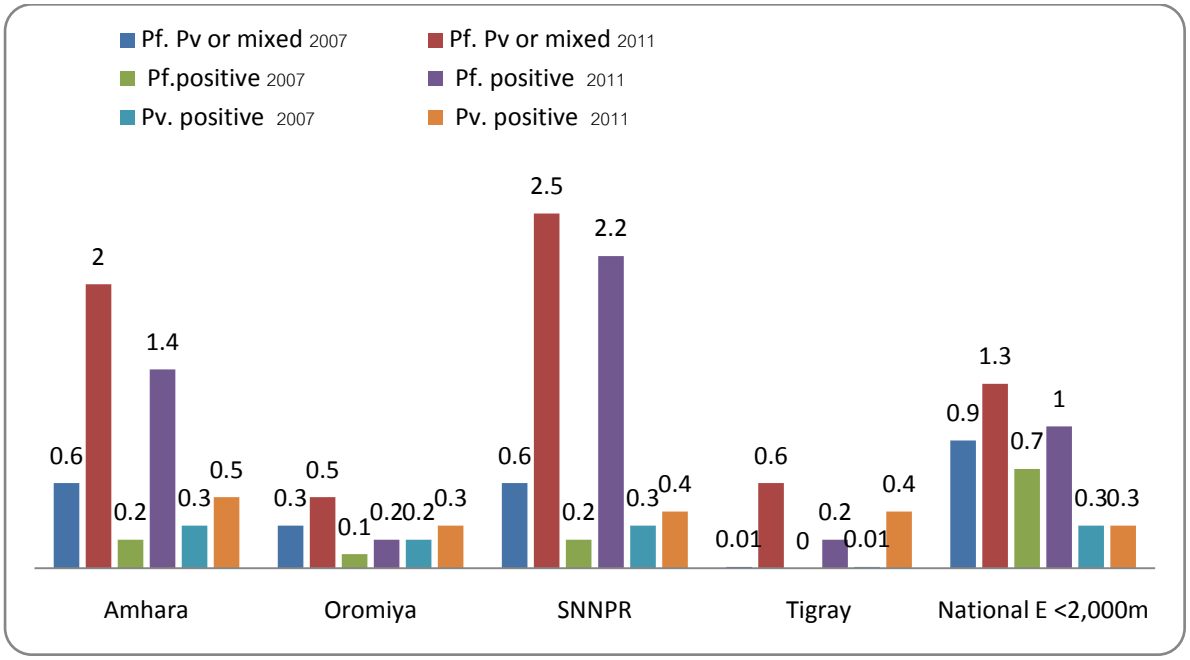


F. Malaria parasites

Compared to the MIS 2007 results, the MIS 2011 microscopic blood-smear test results for altitudes <2,000m showed a small increase in malaria prevalence, from 0.9% to 1.3%, respectively (Figure 10). There was very little malaria (0.1%) detected by microscopy at altitudes >2,000m, and the malaria detected there was almost exclusively found to be *P. vivax*.The 13-fold higher malaria prevalence detected by microscopy in areas <2,000m compared to areas >2,000m confirmed the long-standing FMOH practice of using altitude as a proxy for malaria risk and,therefore, as a basis for targeting malaria-related resource allocations.

One challenge in implementing the MIS 2011 was that mapping resources from CSA and others were inadequate for planning the survey, resulting in major misclassifications of EAs surveyed based upon their planned versus measured altitudes by PDA/GPS. Better maps (with accurate altitude measurements) are needed to properly classify rural areas of Ethiopia so that expensive resources including LLINs, IRS, and Coartem®are properly aligned and targeted to households living at altitudes <2,000m,which have substantially higher malaria prevalence (and probably higher malaria illness risk).

Figure 10National and regional comparison of malaria parasiteprevalence by percentage of slide positivity rate in areas <2,000m between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)



G. General malaria knowledge

Comparing 2007 and 2011 MIS results, the proportion of women living in malaria-endemic areas who knew that malaria is caused by mosquito bites increased from 41.1% to 71.2% (Figure 11). This knowledge had increased in every major region surveyed.

Figure 11National and regional comparison of percentage of women in areas <2,000m who reported mosquito bites as the cause of malaria between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)

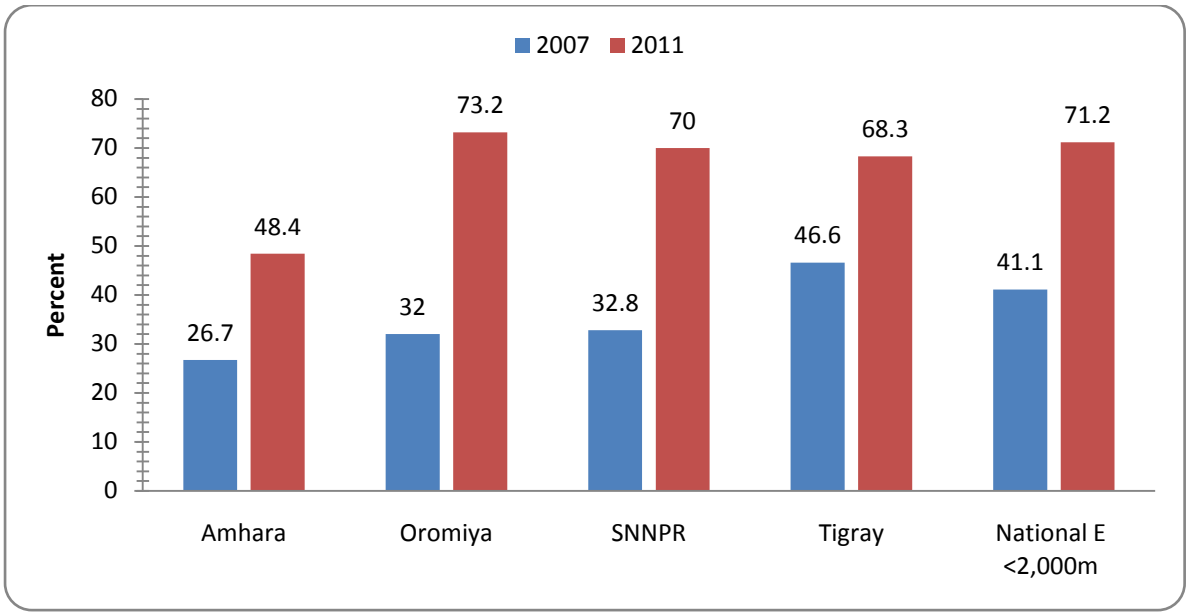
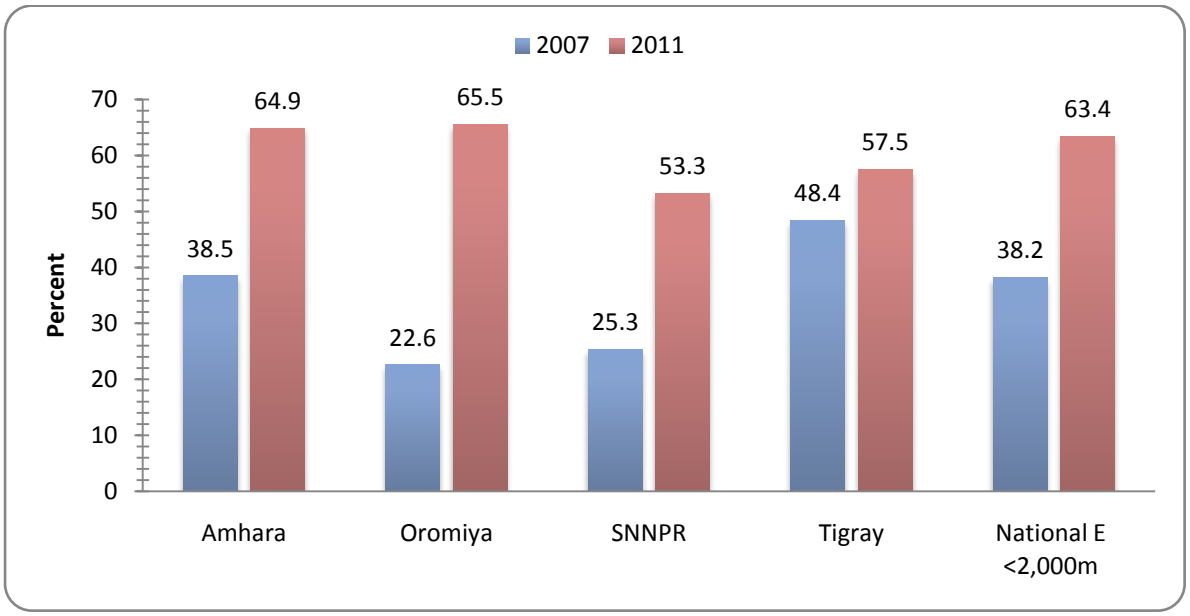


Figure 12 shows that the proportion of women living in malaria-endemic areas who knew that malaria transmission could be prevented by mosquito nets increased nationally from 38.2% in MIS 2007 to 63.4% in MIS 2011.

Figure 12National and regional comparison of percentage of women in areas <2,000m who reported mosquito nets as a prevention method for malaria between MIS 2007 and MIS 2011 (Ethiopia MIS 2011)



CHAPTER 7. LESSONS LEARNED

Planning and execution of the MIS 2011survey in Ethiopia was facilitated by previous experience with PDA-based survey techniquesin MIS 2007. MIS 2011 was our second population-based survey covering all nine regions and two city administrations. Lessons learned in the first survey helped us to allocate sufficient lead time to prepare and to arrange an improved organizational setup of the survey, which enabled us to complete the survey on schedule.Planning started in April 2011, and field work was completed between October and early December 2011. The major challenges and lessons learned during the survey period are listed below.

A. Sampling frame issues

The absence of a complete digital database for EAs andapparent misclassifications of EAs by altitude (when compared to empirical GPS measurements on the ground) resulted in inclusion ofnon-eligible EAs in the sampling frame and misrepresentation of the Somali region. According to the census GPS data for the 440 EAs selected, 8 EAs contained no households <2,500m (and were excluded) and a further 20 EAs included households beyond the altitudinal limit (<2,500m).To avoid the implications of the high-altitude EAs on the MIS 2011results,the 8 non-eligible EAs were excluded from the final analysis. This action was similar to problems during the first MIS in 2007.

This sampling frame issue could underestimate program performance, since altitude is strongly related to malaria prevention and control performance indicators. Completing and updating the digital database of EAs is crucial for planning and targeting the most-at-risk population.

In short, Ethiopia is a mountainous country with many areas poised on the 2,000m cut-off typically used for identifying malaria-endemic and epidemic-prone areas. Beyond the survey, this problem has malaria program implications—altitude appears to be strongly related to malaria indicators, so maps with accurate altitudes are essential to help target malaria resources to the most-at-risk population. Future surveys will need to carefully consider approaches to more effectively stratify at-risk populations.

B. Personal digital assistant issues

Workers faced two major problems with PDAs during the survey:

i)File storage limitation

Sometimes after initialization of the survey, teamleaders observed the error message “IO exception error and back up error created”in their monitor. The root cause for the error isthat the SD-MMCcard is formatted using the FAT file system and can only store a limited number of files or folders in the main root directory.The solution isto store the questionnaire and GPS filesin a subfolder or to temporarily save the content of the SD-MMC card in a laptop.Then the card is reformatted using another file system like FAT32 or NTFS and the volume labeled as SD-MMC card (for supervisors with laptops). Then the files are transferred back to the SD-MMC card. In the survey, the problem was solved by creating a subfolder under the root directory and transferring the questionnaires’ datainto the newly

created subfolder; apparently this maximizes the storage capacity of the SD-MMC card. A detailed quick manual was developed and circulated to all supervisors.Field enumerators and teamleaders were supported by means of phone communications and during field visits.

ii) Short battery life ofPDAs

PDAs thathad ordinary batteries and performance in the field was not as good as the ones with extended battery life. The enumerators were supported to use some mechanisms to accommodate this limitation such as recharging the PDA while travelling in survey vehicles andhaving a reserve/backup charged battery/PDA assigned toteam leaders.

C. Training issues

i)Classsize

In order to break classes into a reasonable size, laboratory technicianswere split into four groups, namelyanemia, RDT, DBS, andblood film training rooms. Interviewer training was kept as one big class to ensure standardization of the interviewing and data capture procedures using PDAs.

ii) Holidays around the training period

Great attention was given to major holidays overlapping with the scheduled training period. The timing of the training of trainers (TOT) was right after the Ethiopian New Year, and another major holiday was between TOT and final training.

iii) Rehearsal

Learning from the MIS2007, teams were established from the early stages of the training.Teams rehearsed throughout the learning process using sufficient EAs allocated for this purpose. Some teams were able to identify poor performing enumerators and take remedial actions.

D. Challenges addressedduring survey implementation

i) Communication

Team leaders communicatedby cellphone with supervisors and the MIS coordinator. This helped in coordinating the survey as well as in providing rapid responses to requests by the survey teams. Shortage of labsupplies and reagents during the survey were resolved by communicating with the team leaders. Good communication was possible in the early morning and evening when the survey team returned to areas where they spent the night.

Weak network coverage limited communication between the coordinator and some team leaders in following the daily progress of the survey. Transfer of money through banks was also affected due to poor network coverage in some places.

ii) Supportive supervision

Supervisors were oriented to their objectives and job descriptions during the TOT workshop. A standard supervision checklist was prepared and distributed to supervisors before they were deployed to the field. Supervisors provided immediate feedback to teams in PDA management, questionnaire filling, and quality of lab specimen. Upon returning from the first supervision visit, supervisors shared their experiences in the MIS2011 weekly meeting, and the lessons learned from that first supervision were applied in subsequent visits.

During the supervision, defective PDAs and SD-MMC cards were maintained without losing information collected. In some places, heavy rain and damaged bridges and roads limited optimal access to the survey team by supervisors.The institutions and individuals involved in the supervision are listed in Appendix C.

Other challenges, such as shortages of vehicles and lab supplies,minor programming errors in questionnaires, and conflict among some survey team members, were encountered and resolved.

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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 purposeofenumeratinghousingunitsandpopulationwithoutomissionand duplication. An EA in rural areas usually consists of 150–200 households; 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)or 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 effectisthe 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 4.

First stage sampling of primary sampling units

Thelistcontainingallvillages(kebeles)andtheircorrespondingaltitudewas initially categorized into “below 2,000m” and “between 2,000m and 2,500m” in altitude. The list was then

matched with the list of EAs obtained from the Central Statistics Agency (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, athird source of information from the World Health Organization (WHO) was utilized. Thus, unmatched EAs were verified with the third data source and their altitudes identified. Making use of these two altitude-basedframes,thepopulation-basedframeoftheCSAwasstratifiedintothe above-mentionedtwoaltitudecategories.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 onthetotalnumberofclustersineachdomain,thetotalnumberofclusters requiredtoachievethenecessarysamplesizewasusedtodeterminethe appropriate sampling interval for systematic random selection from the list of EAs.

All EAs obtained from the CSAwere digitized by the geographic information system(GIS) and cartography mapping work directorate. By tracing the 90m-resolution satellite imagery obtained from WHO to the digitized EA maps,it was possible to identify which EAs fell into the desired categories (below the mean altitude of 2,000m and between 2,000m and 2,500m).

FiveofeightzonesoftheSomaliRegionwereexcludedduetoincompleteEA mapping and relative insecurity of the region during the planning phase of the survey.

Second stage sampling of households

A random sample of households within each cluster was carried out in the field using personal digital assistants (PDAs). All households within an EA were enumerated and mapped using PDAs fitted with global positioning system (GPS) 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.

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 from whichthe 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 (PSU) was distorted from true PPS selection by the needs for oversampling in some domains (e.g., in Amhara, Oromia, SNNP, and Tigray, as well the combined Afar/Somali regional states and Benishangul-

Gumuz/Gambella regional states), 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.

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:**

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

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] sampleEA in the h[th] stratum.

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

y_{hi} is the sample totalof the particular characteristics for EAiin stratum h

$\hat{Y}_h$ estimate of total of the particular characteristics for 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:

$$\widehat{\mathrm{R}}_{\mathrm{h}} = \frac{\widehat{\mathrm{Y}}_{\mathrm{h}}}{\widehat{\mathrm{X}}_{\mathrm{h}}}, \widehat{\mathrm{R}}_{\mathrm{h}} = \frac{\widehat{\mathrm{Y}}}{\widehat{\mathrm{X}}},$$

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

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:

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

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

$$\boldsymbol{V(\widehat{Y}) = \sum_{h} Var(\widehat{Y}_h)}$$

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

And the variance of domain ratio estimate is given by:

$$\boldsymbol{Var(\widehat{R}_h) = \frac{1}{\widehat{X}_h^2}\left[Var(\widehat{Y}_h) + \widehat{R}_h^2 Var(\widehat{X}_h) - 2\widehat{R}_h C\,ov(\widehat{Y}_h, \widehat{X}_h)\right]}$$

In which, $\boldsymbol{C\,ov(\widehat{Y}_h, \widehat{X}_h) = \frac{n_h}{n_h - 1}\left[\sum_{i=1}^{n_h} \widehat{Y}_{hi}\widehat{X}_{hi} - \frac{\widehat{\widehat{Y}}_h \widehat{X}_h}{n_h}\right]}$

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 werecalculated by adopting formulas given for totals.

Appendix C. Design effect of key indicators

LLIN ownership

LLIN utilization by children under-five

LLIN utilization by pregnant women

IRS coverage

Percentage of children U5with fever

Percentage of children U5who sought treatment

Percentage of children U5receiving an antimalarial

Appendix D. Survey personnel

2011 MIS management

Jimee Hwang	CDC-Atlanta
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Sinayehu G/Silassie	ICAP

Field work teams

S.N.	*Region*	*Name*	*Title*	*Role in MIS -2011*
1	SNNPR	Temesgen Birhanu Desta	Health officer	Team leader
2	SNNPR	Wondimu Wossene Haile	Nurse	Interviewer
3	SNNPR	Bereket Beyene Gebere	Nurse	Interviewer
4	SNNPR	Legesse Haile Shume	Nurse	Interviewer
5	SNNPR	Mesfin Adraro Adasho	Nurse	Interviewer
6	SNNPR	Kedir Hussien Ali	Lab technician	Specimen processor and analyzer
7	SNNPR	Habib Tilinti Bonsamo	Lab technician	Specimen processor and analyzer
8	SNNPR	Aklilu Kachito keto	Lab technician	Specimen processor and analyzer
9	SNNPR	Yabito H/Mariam Zeleke	Lab technician	Specimen processor and analyzer
10	SNNPR	Hailu Sefefe Desalegn	Health officer	Supervisor
11	SNNPR	Fitsum Dangure Tontone	Health officer	Team leader
12	SNNPR	Mekite Awoke Tona	Nurse	Interviewer
13	SNNPR	Mussie Belete Kakiso	Nurse	Interviewer
14	SNNPR	Elias Eyamo Kare	Nurse	Interviewer
15	SNNPR	Genet Kitaw Kasegn	Nurse	Interviewer
16	SNNPR	Zerihun Girma	Lab technician	Specimen processor and analyzer
17	SNNPR	Abyot W/Yesus Bkula	Lab technician	Specimen processor and analyzer
18	SNNPR	Meseret Nemero Megen	Lab technician	Specimen processor and analyzer

S.N.	Region	Name	Title	Role in MIS -2011
19	SNNPR	Misgana Amelo Adisu	Lab technician	Specimen processor and analyzer
20	SNNPR	Asgedech Kebede Akoye	Health officer	Supervisor
21	SNNPR	Eferem Birhanu Anito	Health officer	Team leader
22	SNNPR	Tessema Yosef Jabamo	Nurse	Interviewer
23	SNNPR	Tekle Wanna Eche	Nurse	Interviewer
24	SNNPR	Shonde Jagiso oke	Nurse	Interviewer
25	SNNPR	Belete Bezabih Babore	Nurse	Interviewer
26	SNNPR	Akalu Kebede Deboch	Labtechnologist	Specimen processor and analyzer
27	SNNPR	Tebiku Daniel Tirago	Lab technologist	Specimen processor and analyzer
28	SNNPR	Amanuel Thomas G/Yesus	Lab technologist	Specimen processor and analyzer
29	SNNPR	Tigabu Beyene Handiso	Lab technologist	Specimen processor and analyzer
30	SNNPR	Belayenhe G/Kirstos Kerse	Health officer	Team leader
31	SNNPR	Kedir Zeki Biza	Nurse	Interviewer
32	SNNPR	Elias Radi umer	Nurse	Interviewer
33	SNNPR	Tefarege Denbu Ketema	Nurse	Interviewer
34	SNNPR	Debebe Sisay Zeleke	Nurse	Interviewer
35	SNNPR	Mohammedsadik Abdusemed	Lab technician	Specimen processor and analyzer
36	SNNPR	Tessema Argaw Butaga	Lab technician	Specimen processor and analyzer
37	SNNPR	Amduka Etala Ulgaga	Lab technician	Specimen processor and analyzer
38	SNNPR	Tamirat Sisay Sitota	Lab technician	Specimen processor and analyzer
39	SNNPR	Aklilu DefaruWordofa	Health officer	Supervisor
40	SNNPR	Rameto Abo Eregena	Health officer	Team leader
41	SNNPR	Sentayehu Gobeze Abebe	Nurse	Interviewer
42	SNNPR	Zerfu Zemba Zara	Nurse	Interviewer
43	SNNPR	Matewos Boshe Boragn	Nurse	Interviewer
44	SNNPR	Melese Menta Alabo	Nurse	Interviewer
45	SNNPR	Nebiat Seid Mohammed	Lab technician	Specimen processor and analyzer
46	SNNPR	Tujare Tunga Tuma	Lab technician	Specimen processor and analyzer
47	SNNPR	Orzama Bala Balta	Lab technician	Specimen processor and analyzer
48	SNNPR	Mengesha Alaba Anbore	Lab technician	Specimen processor and analyzer
49	SNNPR	Asfaw Alemu	Health officer	Team leader
50	SNNPR	Mehirtu Obse Cheffo	Nurse	Interviewer
51	SNNPR	Abrham Tesfaye Kolba	Nurse	Interviewer
52	SNNPR	Desta Dartumo Ertiro	Nurse	Interviewer
53	SNNPR	Kidane W/Girogis Asfaw	Lab technician	Specimen processor and analyzer
54	SNNPR	Tamene Goshu Gorgiso	Lab technician	Specimen processor and analyzer
55	SNNPR	Genene Gemedalya	Lab technician	Specimen processor and analyzer
56	Amhara	Jerusalem Azene Alamerew	Health officer	Supervisor
57	Amhara	Nakachew Mekonnen Alamirew	Health officer	Team leader
58	Amhara	Dilnesa Melesse Worku	Nurse	Interviewer
59	Amhara	Melekie Feleke Alemu	Nurse	Interviewer
60	Amhara	Yihenew Birhanu Abera	Nurse	Interviewer
61	Amhara	Takele Addisu Weyila	Nurse	Interviewer
62	Amhara	Yihalem Awoke Limenhe	Lab technician	Specimen processor and analyzer

S.N.	Region	Name	Title	Role in MIS -2011
63	Amhara	Eyasu Abebe W/Mariyam	Lab technician	Specimen processor and analyzer
64	Amhara	Senay Alemayehu Guadie	Lab technician	Specimen processor and analyzer
65	Amhara	Belesti Getaneh Tegegne	Labtechnologist	Specimen processor and analyzer
66	Amhara	Eneyew Adane Amare	Health officer	Team leader
67	Amhara	Lakachew Getenete Workineh	Nurse	Interviewer
68	Amhara	Abrham Jembere Bitew	Nurse	Interviewer
69	Amhara	Worku Fentie Derso	Nurse	Interviewer
70	Amhara	Abayenew Melash Ayalew	Nurse	Interviewer
71	Amhara	Berhanu Zerihun Dubale	Lab technician	Specimen processor and analyzer
72	Amhara	Yeshiwas Fentie Bezabhe	Lab technician	Specimen processor and analyzer
73	Amhara	Getachew Mengistu Agegnehu	Lab technician	Specimen processor and analyzer
74	Amhara	Gizat Abinet Malede	Lab technician	Specimen processor and analyzer
75	Amhara	Begosew Muluneh Tamir	Health officer	Team leader
76	Amhara	Fikadu Mekuria Ayana	Nurse	Interviewer
77	Amhara	Fentaw Setotaw Asefaw	Nurse	Interviewer
78	Amhara	Abiye Kassahun Akal	Nurse	Interviewer
79	Amhara	Dessalegne Girma Tefera	Lab technician	Specimen processor and analyzer
80	Amhara	Alebel Kebede Dessie	Lab technologist	Specimen processor and analyzer
81	Amhara	Epherem Mitku Ambelu	Lab technician	Specimen processor and analyzer
82	Amhara	Worku Mulatu Workie	Health officer	Supervisor
83	Amhara	Amare Lemma Zerfu	Health officer	Team leader
84	Amhara	Shemeles Tarekegne Mengistu	Nurse	Interviewer
85	Amhara	Endaleke Kifle Aklilu	Nurse	Interviewer
86	Amhara	Habtamu Ayalew Mekonnen	Nurse	Interviewer
87	Amhara	Gashaw Agngehue Worknehe	Nurse	Interviewer
88	Amhara	Eseye TeferaZewdu	Lab technician	Specimen processor and analyzer
89	Amhara	Sisay Molla Belete	Lab technician	Specimen processor and analyzer
90	Amhara	Tamyalew Getahun Yayeh	Lab technician	Specimen processor and analyzer
91	Amhara	Mesfin Dawd	Lab technician	Specimen processor and analyzer
92	Amhara	Askenaw Demessie Chekol	Health officer	Supervisor
93	Amhara	Getachew TsehayeMulaw	Health officer	Team leader
94	Amhara	Jemberu Zelalem Addis	Nurse	Interviewer
95	Amhara	Gashaw Sinete Ayalew	Nurse	Interviewer
96	Amhara	Amare Chekune Altaseb	Nurse	Interviewer
97	Amhara	Abebe Awolu Siraj	Nurse	Interviewer
98	Amhara	Desalegne Mulualem Tadesse	Lab technician	Specimen processor and analyzer
99	Amhara	Awoke Lewtie Cherie	Lab technician	Specimen processor and analyzer
100	Amhara	Marye Engdayehu Addisu	Lab technologist	Specimen processor and analyzer
101	Amhara	Girma Tsedalu Shumye	Lab technician	Specimen processor and analyzer
102	Amhara	Abebe Sisay Tadesse	Health officer	Supervisor
103	Amhara	Ayalew Melesse Abebe	Health officer	Team leader
104	Amhara	Mohammed Seid Assen	Nurse	Interviewer

S.N.	Region	Name	Title	Role in MIS -2011
105	Amhara	Yimam Seid Muhie	Nurse	Interviewer
106	Amhara	Habtamu Kibret Temesgen	Nurse	Interviewer
107	Amhara	Eshetu Mamo Zegeye	Nurse	Interviewer
108	Amhara	Mahider Delelegne Demisse	Lab technician	Specimen processor and analyzer
109	Amhara	Abubeker Kassaw Beshir	Labtechnologist	Specimen processor and analyzer
110	Amhara	Assefa Ayalew Gizaw	Lab technician	Specimen processor and analyzer
111	Amhara	Assaye G/Silasie Gebreye	Lab technologist	Specimen processor and analyzer
112	Amhara	Asmamaw Limeneh Ayenew	Health officer	Supervisor
113	Amhara	Mohammed Hussien Jemal	Health officer	Team leader
114	Amhara	Demesiw Mekonnen Abebe	Nurse	Interviewer
115	Amhara	Bizuneh Bekele Bonesa	Nurse	Interviewer
116	Amhara	Mulugeta Shenkut Habtewold	Nurse	Interviewer
117	Amhara	Gessese Yimer Demeke	Nurse	Interviewer
118	Amhara	Esuendale Hailu Gashe	Lab technician	Specimen processor and analyzer
119	Amhara	Mekdes Wolde Lege	Lab technician	Specimen processor and analyzer
120	Amhara	Gezahegn Kifle Tafese	Lab technician	Specimen processor and analyzer
121	Amhara	Mekuria Desta Mogesse	Lab technologist	Specimen processor and analyzer
122	Oromia	Tadele H/Mariam Tura	Health officer	Team leader
123	Oromia	Debela Worku Gurmu	Nurse	Interviewer
124	Oromia	Kasim Hussien Ogeto	Nurse	Interviewer
125	Oromia	Teferi Bekele Dadi	Nurse	Interviewer
126	Oromia	Belayenhe Tadesse Gisso	Nurse	Interviewer
127	Oromia	Solomon H/Mariam Ameneshewa	Lab technician	Specimen processor and analyzer
128	Oromia	Getachew Teshome Molla	Labtechnician	Specimen processor and analyzer
129	Oromia	Akalu Worku Yigletu	Lab technician	Specimen processor and analyzer
130	Oromia	Ahmed Bori Milki	Lab technician	Specimen processor and analyzer
131	Oromia	Alemayehu Haile Negewo	Health officer	Team leader
132	Oromia	Jemal Sahlu Kaftie	Nurse	Interviewer
133	Oromia	Mustefa Kedir Hussien	Nurse	Interviewer
134	Oromia	Habib Dekamo Kabeto	Nurse	Interviewer
135	Oromia	Mesfin Abebe W/Amanuel	Nurse	Interviewer
136	Oromia	Terefe Tessfaye Ayele	Lab technician	Specimen processor and analyzer
137	Oromia	Abdurhaman Hussen Umer	Lab technician	Specimen processor and analyzer
138	Oromia	Misgana Gorfu Siyamereng	Lab technologist	Specimen processor and analyzer
139	Oromia	Tesfaye Seyoum Adugna	Lab technologist	Specimen processor and analyzer
140	Oromia	Abrham Dagne Gelagle	Health officer	Team leader
141	Oromia	Azage Ayalew Belew	Nurse	Interviewer
142	Oromia	Hotesa Ermias Ano	Nurse	Interviewer
143	Oromia	Ali Shekure	Nurse	Interviewer
144	Oromia	Girma Negusse Birhane	Nurse	Interviewer
145	Oromia	Tibebu Tesfaye Alemu	Lab technician	Specimen processor and analyzer
146	Oromia	Firehun Bezabih Haile wold	Lab technician	Specimen processor and analyzer
147	Oromia	Eferem Regessa	Lab technician	Specimen processor and analyzer
148	Oromia	Kella Boba	Lab technician	Specimen processor and analyzer

S.N.	Region	Name	Title	Role in MIS -2011
149	Oromia	Shukri Mussa Goro	Health officer	Team leader
150	Oromia	Fekadu Lemma Tekle	Nurse	Interviewer
151	Oromia	Mekonnen Eshetu	Nurse	Interviewer
152	Oromia	Adnan Abdi Yuyyo	Nurse	Interviewer
153	Oromia	Solomon Markos Yimer	Nurse	Interviewer
154	Oromia	TilahunTeklu G/Medhin	Lab technologist	Specimen processor and analyzer
155	Oromia	Negusse TekabeWubeshet	Lab technician	Specimen processor and analyzer
156	Oromia	Heyder Ahmed Habib	Lab technician	Specimen processor and analyzer
157	Oromia	Benyam Wondemu Beyene	Lab technician	Specimen processor and analyzer
158	Oromia	Yonas Kebede Aga	Health officer	Supervisor
159	Oromia	Hirpasa Amina Teramu	Health officer	Team leader
160	Oromia	Mesele Kassahun Ijigu	Nurse	Interviewer
161	Oromia	Bote Nugusu Sambu	Nurse	Interviewer
162	Oromia	Misikir Epherem Gizaw	Nurse	Interviewer
163	Oromia	Tolecha Gude Tulu	Nurse	Interviewer
164	Oromia	Fekadu Wodajo Biru	Lab technician	Specimen processor and analyzer
165	Oromia	Chala Shumi Hailu	Lab technologist	Specimen processor and analyzer
166	Oromia	Fasika Mekonnen W/Giorgis	Lab technician	Specimen processor and analyzer
167	Oromia	Zelalem Bekele	Lab technician	Specimen processor and analyzer
168	Oromia	Kedir Ahmed Hassen	Health officer	Team leader
169	Oromia	Mekonnen Gamora Dechassa	Nurse	Interviewer
170	Oromia	Million Dima W/Senbet	Lab technologist	Specimen processor and analyzer
171	Oromia	Ayalew Demere H/Meskel	Lab technologist	Specimen processor and analyzer
172	Oromia	Tessema Gudeta Kumsa	Nurse	Interviewer
173	Oromia	Endalem Gemeda Aga	Lab technologist	Specimen processor and analyzer
174	Oromia	Simo Dina	Nurse	Interviewer
175	Oromia	Amente Oluma Mandio	Lab technician	Specimen processor and analyzer
176	Oromia	Debela Etana Kusa	Nurse	Interviewer
177	Oromia	Sara Gule Wondimu	Health officer	Team leader
178	Oromia	Isa Shurefa Dula	Nurse	Interviewer
179	Oromia	Mensur BedruNuru	Nurse	Interviewer
180	Oromia	Bekele Desse Kefeni	Nurse	Interviewer
181	Oromia	Abdurhaman Hussen Umer	Nurse	Interviewer
182	Oromia	Abudujebar Mohammed Ahmed	Lab technologist	Specimen processor and analyzer
183	Oromia	Efa Dingete olhika	Lab technologist	Specimen processor and analyzer
184	Oromia	Tagel Tesfaye Ayele	Lab technologist	Specimen processor and analyzer
185	Oromia	Abdulhak Abduljebel	Lab technologist	Specimen processor and analyzer
186	Oromia	Tesfaye Kitaba Gita	Health officer	Team leader
187	Oromia	Samson Degefu Abera	Nurse	Interviewer
188	Oromia	Desta Tafesse W/Yohanis	Nurse	Interviewer
189	Oromia	Buzayehew Tariku Bayisa	Nurse	Interviewer
190	Oromia	Mohammed	Nurse	Interviewer
191	Oromia	Desalegne Mulualem Tadesse	Lab technologist	Specimen processor and analyzer

S.N.	Region	Name	Title	Role in MIS -2011
192	Oromia	Amente Oluma Mandio	Lab technician	Specimen processor and analyzer
193	Oromia	Bilise Tolosa Buta	Lab technician	Specimen processor and analyzer
194	Oromia	Degene Almayehu Tiki	Lab technician	Specimen processor and analyzer
195	Oromia	Sagni ChaluJira	Health officer	Team leader
196	Oromia	Ayele Berhanu G/Hiwot	Lab technician	Interviewer
197	Oromia	Abush Yitena Teganu	Lab technician	Interviewer
198	Oromia	Fantu Tafesse Tereda	Lab technologist	Specimen processor and analyzer
199	Oromia	Habib Borja	Lab technologist	Specimen processor and analyzer
200	Oromia	Jemal Mohammed Tusha	Lab technologist	Specimen processor and analyzer
201	Oromia	Jemal Alemu	Lab technologist	Specimen processor and analyzer
202	Oromia	Chemeda Bodana Kelbesa	Lab technician	Specimen processor and analyzer
203	Oromia	Yohannes Terekbe Teka	Lab technologist	Specimen processor and analyzer
204	Oromia	Shiferaw Kebede Erena	Health officer	Team leader
205	Oromia	Abebe Bedassa Kitila	Nurse	Interviewer
206	Oromia	Gelane Benti Jaleta	Nurse	Interviewer
207	Oromia	Zelalem Mulegeta Gemechu	Nurse	Interviewer
208	Oromia	Neway Dinkayehu Eba	Nurse	Interviewer
209	Oromia	Kelifa Adem Dinsa	Lab technician	Specimen processor and analyzer
210	Oromia	Teshale Uregesa Sharbe	Lab technician	Specimen processor and analyzer
211	Oromia	Adisalem Berhanu Karorsa	Lab technician	Specimen processor and analyzer
212	Oromia	Girma Bayisa Angasu	Lab technician	Specimen processor and analyzer
213	Deredawa	Sami Abdurhaman Marda	Health officer	Supervisor
214	Deredawa	Abdulhamid Ahmed Hassen	Health officer	Team leader
215	Deredawa	Tariku Melaku Belay	Nurse	Interviewer
216	Deredawa	Basazinew Fantahun Mintesnot	Nurse	Interviewer
217	Deredawa	Abezash Atsbeha Meresa	Nurse	Interviewer
218	Deredawa	Teresa Hirpasa Gelgela	Nurse	Interviewer
219	Deredawa	Heyder Ali Ahmed	Lab technician	Specimen processor and analyzer
220	Deredawa	Yohannes TilahunBoru	Lab technician	Specimen processor and analyzer
221	Deredawa	Teklu Degefu Regassa	Lab technician	Specimen processor and analyzer
222	Deredawa	Dereje Feleke Wolde	Lab technologist	Specimen processor and analyzer
223	Benshangul	Tegegne Yadessa Bezay	Health officer	Team leader
224	Benshangul	Beyene Jara Tufa	Nurse	Interviewer
225	Benshangul	Abdulhakim Mohammed Almerdi	Nurse	Interviewer
226	Benshangul	Dugassa Gutu Dibaba	Nurse	Interviewer
227	Benshangul	Yesuf Emran Endris	Nurse	Interviewer
228	Benshangul	Mohammed Siraj Yesuf	Lab technician	Specimen processor and analyzer
229	Benshangul	Getachew Tsegaye Ahmed	Lab technologist	Specimen processor and analyzer
230	Benshangul	Getaneh Wondie Kumlign	Lab technologist	Specimen processor and analyzer
231	Benshangul	Samrawit Biniam Zeleke	Lab technician	Specimen processor and analyzer
232	Afar	Temesgen Abebe Negatu	Health officer	Supervisor
233	Afar	Mohammed Omer Dawed	Health officer	Team leader
234	Afar	Abubeker Jemal Mohammed	Nurse	Interviewer

S.N.	Region	Name	Title	Role in MIS -2011
235	Afar	Shimeles Amare Demeke	Nurse	Interviewer
236	Afar	Jemal Mohammed Ismael	Nurse	Interviewer
237	Afar	Amin Abdukadir Ahmed	Nurse	Interviewer
238	Afar	Gashaw G/Mariam Demssie	Lab technician	Specimen processor and analyzer
239	Afar	Jemal Ali Mussa	Lab technician	Specimen processor and analyzer
240	Afar	Mulugeta Arega Hailu	Lab technician	Specimen processor and analyzer
241	Afar	Temesgen Ali Endris	Lab technologist	Specimen processor and analyzer
242	Afar	Temesgen Legesse Gutema	Health officer	Team leader
243	Afar	Mohammed Awol Oudbeda	Nurse	Interviewer
244	Afar	Ali Mussa Nur	Nurse	Interviewer
245	Afar	Mohammed Foka Ali	Nurse	Interviewer
246	Afar	Ali Abasawa Musa	Nurse	Interviewer
247	Afar	Asnakech Girma Gemeda	Lab technologist	Specimen processor and analyzer
248	Afar	Haileselassie G/Meskel Hailu	Lab technologist	Specimen processor and analyzer
249	Afar	Wubeshet Mitiku Belew	Lab technician	Specimen processor and analyzer
250	Afar	Mebratu Kahassay Adhanom	Lab technologist	Specimen processor and analyzer
251	Somali	Abdishkur Abdulahi	Health officer	Supervisor
252	Somali	Sekenye Abdurasak Warsame	Health officer	Team leader
253	Somali	Mohammed Mohammud	Nurse	Interviewer
254	Somali	Bahar Mohmmed	Nurse	Interviewer
255	Somali	Aden Mogow	Nurse	Interviewer
256	Somali	Saada Ibrahim	Nurse	Interviewer
257	Somali	Mohammud Mohammed	Lab technician	Specimen processor and analyzer
258	Somali	Abdi Ousman	Lab technician	Specimen processor and analyzer
259	Somali	Alem Eshetu	Lab technician	Specimen processor and analyzer
260	Somali	Esmael Hassen	Lab technician	Specimen processor and analyzer
261	Gambella	Mohammed Aman Tusu	Health officer	Supervisor
262	Gambella	Tariku Frissa Tola	Health officer	Team leader
263	Gambella	Tesfaye Zerhiun Fanta	Nurse	Interviewer
264	Gambella	Nebiyat Amanuel Kebede	Nurse	Interviewer
265	Gambella	Lual Amero Uchala	Nurse	Interviewer
266	Gambella	Thomas Tut Chol	Nurse	Interviewer
267	Gambella	Top Wal Yuel	Lab technician	Specimen processor and analyzer
268	Gambella	Karemon Ojulu Bach	Lab technician	Specimen processor and analyzer
269	Gambella	Lezhialem Almaw Ewnete	Lab technologist	Specimen processor and analyzer
270	Gambella	Opodi Ochan Oman	Lab technician	Specimen processor and analyzer
271	Tigray	Girmay Desta Araya	Health officer	Team leader
272	Tigray	Kashu Tsegay Reda	Nurse	Interviewer
273	Tigray	Mehari Haile Berhe	Nurse	Interviewer
274	Tigray	Tesfaye Nigussie Gebru	Nurse	Interviewer
275	Tigray	Abiy Belay Ambaye	Lab technologist	Specimen processor and analyzer
276	Tigray	Halefom Ekuar Hiluf	Lab technologist	Specimen processor and analyzer
277	Tigray	Teklit G/Meskel Ambaye	Lab technologist	Specimen processor and analyzer

S.N.	*Region*	*Name*	*Title*	*Role in MIS -2011*
278	Tigray	Teame Tikue Hagos	Health officer	Team leader
279	Tigray	Biru Gesseswe Kahassu	Nurse	Interviewer
280	Tigray	Teshale Berehe Layu	Nurse	Interviewer
281	Tigray	Teklu Berehe Setegne	Nurse	Interviewer
282	Tigray	G/Tsadik G/Kirtos G/Egzihabere	Lab technologist	Specimen processor and analyzer
283	Tigray	Equbay G/Egzihabeher Gebru	Lab technologist	Specimen processor and analyzer
284	Tigray	Goitom Geberegerges Abera	Lab technologist	Specimen processor and analyzer

Appendix E.Expenditure

The National Malaria Indicator Survey (2011 MIS) expenditure summary is presented below. The total expenditure for the project amounts to USD 1,129,810 contributed by PMI/USAID 55%, MACEPA 17%, FMOH/EHNRI 13%, UNICEF 7%, TCC 6%, and WHO 2%.

Majority of the expenditure for the survey was related to training and actual survey cost (82.42%) which includes per diem and accommodation for the survey team, communication costs, vehicle rental, and vehicle running costs.

Summary of 2011 MIS expenditures:

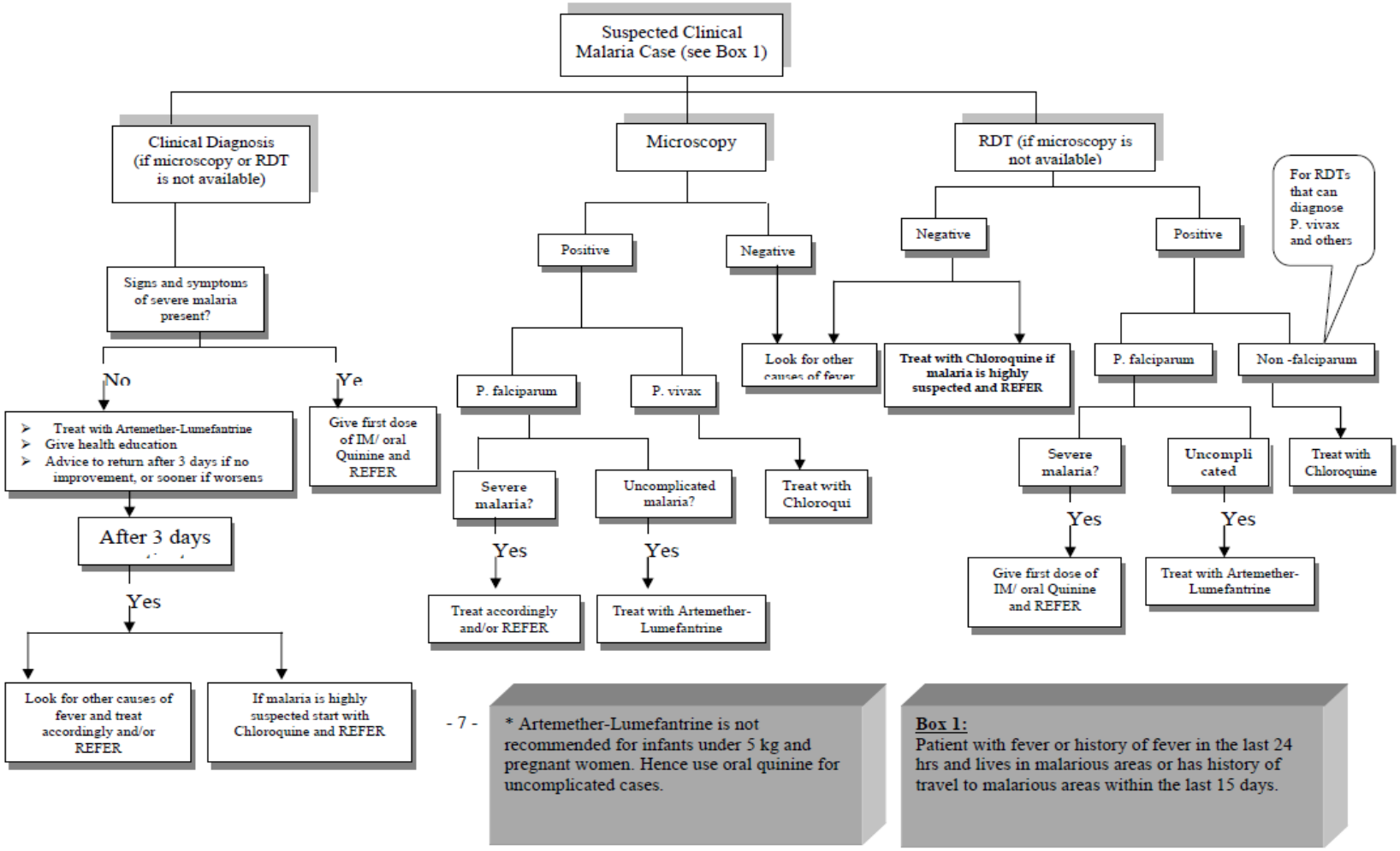
Category	Details	Expenditure USD	Percentage
Survey field and Training expenditures	Per diem and accommodation (for survey supervisors, enumerators, lab technicians and guides), communications, vehicle rental, fuel and other vehicle running costs	931,227	82.42%
Supplies	Medical supplies and other stationary materials	83,232	7.37%
Equipments	Micro plate reader	11,926	1.05%
Personnel	Salary and benefits for MIS coordinators	54,314	4.81%
Dissemination	Printing of reports, per diem and hall rental*	45,302	4.01%
Other expenses	Radio message	3,809	0.34%
Total		1,129,810	100%

**Dissemination workshop is not conducted at the preparation of this report.*

Expenses and staff time for the technical and logistics support from partners involved in the survey were covered by individual institutions.

Appendix F. Treatment algorism

Fig. 1 Flow Chart for Diagnosis and Treatment of Malaria



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* Artemether-Lumefantrine is not recommended for infants under 5 kg and pregnant women. Hence use oral quinine for uncomplicated cases.

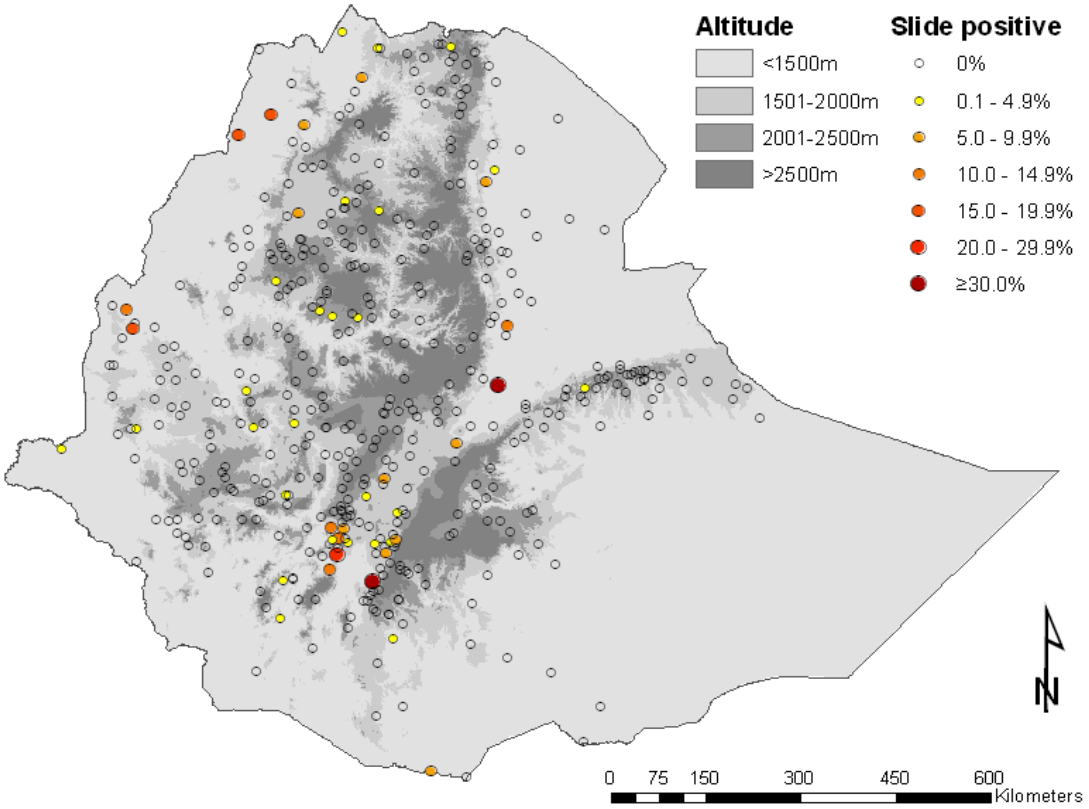
Box 1:
Patient with fever or history of fever in the last 24 hrs and lives in malarious areas or has history of travel to malarious areas within the last 15 days.

Appendix G. Number of analyzed enumeration areas (EAs) per region

Region	Number of sampled EAs	Number of analyzed EAs
Addis Ababa	2	2
Afar	21	21
Amhara	101	100
Benishangul-Gumuz	15	15
Dire Dawa	2	2
Gambella	5	5
Harari	2	2
Oromia	162	156
SNNPR	89	88
Somali	14	14
Tigray	27	27
Total	440	432

**Regional data are valid for Amhara, Oromia, SNNPR, Tigray, and Somali/Afar.Data for other regions are not significant because of small sample sizes, and should be used with great caution.

Annex 1. Map depicting slide prevalence by altitude



Annex 2. Questionnaires

Ethiopia 2011 Malaria Indicator Survey

Household Questionnaire

Federal Ministry of Health

Ethiopian Health and Nutrition Institute

Malaria Indicator Survey Working Group

June 2011

MALARIA INDICATOR SURVEY
MODEL HOUSEHOLD QUESTIONNAIRE
[Ethiopia]
[Ministry of Health]

READ INFORMED CONSENT FOR HOUSEHOLD QUESTIONNAIRE

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

IDENTIFICATION[1]

PLACE NAME _____	
NAME OF HOUSEHOLD HEAD __	
ENUMERATION AREA NUMBER	
HOUSEHOLD NUMBER	
REGIONAL STATE	
ZONE	
DISTRICT	

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE	_____	_____	_____	DAY MONTH YEAR 2 0
INTERVIEWER'S NAME	_____	_____	_____	NAME
RESULT*	_____	_____	_____	RESULT
NEXT VISIT: DATE	_____	_____		
TIME	_____	_____		TOTAL NO. OF VISITS

INTERVIEWER VISITS

*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 populations; "small cities" are places with between 50,000 and 1 million population; the remaining urban sample points are "towns."

HOUSEHOLD 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)	(10)
			M F	YES NO	YESNO	IN YEARS	IN MONTHS		YES NO/DK
01			12	1 2	12			01	12
02			12	1 2	12			02	12
03			12	1 2	12			03	12
04			12	1 2	12			04	12
05			12	1 2	12			05	12
06			12	1 2	12			06	12
07			12	1 2	12			07	12
08			12	1 2	12			08	12
09			12	1 2	12			09	12

10			12	1 2	12			10	12

* 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

Include travel history in the prior month, add question on where they traveled [lowlands [kola], midlands [wean dega], highland [dega]]

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)		(8)	(9)	(10)
			M F	YES NO	YES NO	IN YEARS	IN MONTHS		YES NO/DK
11			12	1 2	1 2			11	1 2
12			12	1 2	1 2			12	1 2
13			12	1 2	1 2			13	1 2
14			12	1 2	1 2			14	1 2
15			12	1 2	1 2			15	1 2
16			12	1 2	1 2			16	1 2

17			12	1 2	1 2			17	1 2
18			12	1 2	1 2			18	1 2
19			12	1 2	1 2			19	1 2
20			12	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)	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
11	What kind of toilet facility do 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?	ELECTRICITY YES 1 NO 2	
	A radio?	RADIO 1 2	
	A television?	TELEVISION 1 2	
	A telephone?	TELEPHONE 1 2	
	A refrigerator?	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 abode 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	WINDOWS RECORD OBSERVATION	YES NO ANY WINDOW.....12 TOTAL NO OF WINDOWS	

14d	TYPE OF WINDOWS RECORD OBSERVATION.	YES NO ANY WINDOW.....12 WINDOWS WITH GLASS..... 12 WINDOWS WITH SCREENS...1 2 WINDOWS WITH CURTAINS OR SHUTTERS.....12	
9b	How many separate rooms are in this household? INCLUDE ALL ROOMS, INCLUDING KITCHEN, TOILET, SLEEPING ROOMS, SALON, etc.	NUMBER OF ROOMS L	
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	How many of the following animals / birds does your household own? IF NONE, ENTER '00' IF MORE THAN 95, ENTER '95' IF UNKNOWN, ENTER '98' Cattle? Goats? Sheep? Pigs? Chickens? Dogs? Cats?	CATTLE GOATS SHEEP PIGS CHICKENS DOGS CATS	
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 <u>against mosquitoes</u>?	YES.....1 NO.....2 DON'T KNOW.....8	— —1 5D
15B	How many months ago was the house sprayed <u>against mosquitoes</u>? IF LESS THAN ONE MONTH, RECORD '00' MONTHS AGO.	MONTHS AGO.....	
15C	Who sprayed the house <u>against mosquitoes</u>?	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	— —16

		DON'T KNOW.....8	
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 ⌜ ⌞ | ▒ |	

18	ASK RESPONDENT TO SHOW YOU THE NET(S) IN THE HOUSEHOLD. IF MORE THAN THREE NETS, USE ADDITIONAL QUESTIONNAIRE(S).	NET #1 OBSERVED 1 NOT OBSERVED 2	NET #2 OBSERVED 1 NOT OBSERVED 2	NET #3 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 95	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 Interceptor..... 14 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 Interceptor..... 14 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 Interceptor..... 14 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.(skip to 21)..... 2 NOT SURE..... 8	YES .....1 NO.(skip to 21).....2 NOT SURE..... .8	YES .....1 NO.(skip to 21).....2 NOT SURE..... 8
	How much did you pay for the net when it was purchased?	< 50 Birr .....1 50 – 100 Birr..... 2 > 100 Birr 3 NOT SURE..... 8	< 50 Birr .....1 50 – 100 Birr..... 2 > 100 Birr 3 NOT SURE..... 8	< 50 Birr .....1 50 – 100 Birr..... 2 > 100 Birr 3 NOT SURE..... 8

	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 SURE8	YES ....1 NO ....2 (SKIP TO 26) NOT SURE....................8
25	Why did no-one sleep under this mosquito net last night?	NO MALARIA 1 NO NUISANCE/INSECTS 2 NO SPACE FOR NET 3 IRRITATION 4 SUFFOCATION / TOO HOT 5 DIFFICULT HANGING NET 6 SHAPE 7 ABSENCE FROM HOME 8 OTHER______________ 9 DON'T KNOW 10	NO MALARIA 1 NO NUISANCE/INSECTS 2 NO SPACE FOR NET 3 IRRITATION 4 SUFFOCATION / TOO HOT 5 DIFFICULT HANGING NET 6 SHAPE 7 ABSENCE FROM HOME 8 OTHER______________ 9 DON'T KNOW 10	NO MALARIA 1 NO NUISANCE/INSECTS 2 NO SPACE FOR NET 3 IRRITATION 4 SUFFOCATION / TOO HOT 5 DIFFICULT HANGING NET 6 SHAPE 7 ABSENCE FROM HOME 8 OTHER______________ 9 DON'T KNOW 10

"Permanent" is a factory treated net that does not require any further treatment.

9c	When your bednet is torn or gets a hole, how likely are you to mend it ot to have a tailor mend it? READ THE RESPONSE OPTIONS TO THE PARTICIPANT AND ASK HIM OR HERTO CHOOSE THE BEST RESPONSE	VERY LIKLEY, I mend all holes in my net 1 SOMEWHAT LIKELY. I sometimes mend holes in my net 2 SOMEWHAT UNLIKELY, I rarely mend on holes in my net 3 VERY UNLIKLEY, I never mend holes in my net 4	
9d	How often do you wash your net(s)? DO NOT READ THE RESPONSE OPTIONS	When it gets dirty 1 1 time a year 2 2 – 3 times a year 3 4 – 5 times a year 4 6 or more times a year 5	
15	Will insecticide treated nets still be effective against mosquitoes if you wash them	YES..... 1 NO..... 2 DON'T KNOW..... 8	
15A	If there are not enough nets for everyone in a household, who should be given priority when deciding who can sleep under a net? DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)	ELDERLY PEOPLE 1 HEAD OF HOUSEHOLD 2 YOUNG CHILDREN 3 PREGNANT WOMEN 4 PEOPLE WHO CONTRIBUTE THE MOST MONEY TO THE HOUSEHOLD 5 PERSON WHO OBTAINED / BOUGHT THE NET 6 OTHER (specify)_____ 7 DON'T KNOW 8	_ →15D

HAEMOGLOBIN/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 <5 YEARS AND ALL AGES IN EVERY FOURTH HOUSEHOLD				CONSENT STATEMENT FOR CHILDREN UNDER FIVE (BORN IN 2002 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? 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

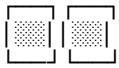
[1]For fieldwork beginning in 2011, the year should be 2006.

TICK HERE IF CONTINUATION SHEET USED☐

READ INFORMED CONSENT/ ASSENT FOR MALARIA PREVALENCE AND ANEMIA TESTS

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)	HAEMOGLOBIN LEVEL (G/DL) [ONLY FOR CHILDREN 6 – 59 MONTHS]	RESULT 1 MEASURED 2 NOT PRESENT 3 REFUSED 4 OTHER	ANEAMIA TREATMENT FOR HG 5-8G/DL	RDT RESULT	TREATMENT	BLOODSLIDE 1 DONE 2 NOT PRESENT 3 REFUSED 4 OTHER	DRIED BLOOD SPOT 1 DONE 2 NOT PRESENT 3 REFUSED 4 OTHER	BARCODE ID
(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)
			CoArtem..............1 Iron....................2 Albendazole.........3	Negative...............1 Invalid.................2 PV/PM?PO............3 PF.......................4 PF or mixed...........5 Not Done...............6 Refused..................7	CoArtem.................1 Chloroquine.............2 Quinine...................3 No treatment............4			A B
			CoArtem..............1 Iron....................2 Albendazole.........3	Negative...............1 Invalid.................2 PV/PM?PO............3 PF.......................4 PF or mixed...........5 Not Done...............6 Refused..................7	CoArtem.................1 Chloroquine.............2 Quinine...................3 No treatment............4			A B
			CoArtem..............1 Iron....................2 Albendazole.........3	Negative...............1 Invalid.................2 PV/PM?PO............3 PF.......................4 PF or mixed...........5 Not Done...............6 Refused..................7	CoArtem.................1 Chloroquine.............2 Quinine...................3 No treatment............4			A B
			CoArtem..............1 Iron....................2 Albendazole.........3	Negative...............1 Invalid.................2 PV/PM?PO............3 PF.......................4 PF or mixed...........5 Not Done...............6 Refused..................7	CoArtem.................1 Chloroquine.............2 Quinine...................3 No treatment............4			A B
			CoArtem..............1 Iron....................2 Albendazole.........3	Negative...............1 Invalid.................2 PV/PM?PO............3 PF.......................4 PF or mixed...........5 Not Done...............6 Refused..................7	CoArtem.................1 Chloroquine.............2 Quinine...................3 No treatment............4			A B
			CoArtem..............1 Iron....................2 Albendazole.........3	Negative...............1 Invalid.................2 PV/PM?PO............3 PF.......................4 PF or mixed...........5 Not Done...............6 Refused..................7	CoArtem.................1 Chloroquine.............2 Quinine...................3 No treatment............4			A B

41	CHECK 34: NUMBER OF CHILDREN WITH HAEMOGLOBIN LEVEL BELOW 5 G/DL ONE OR MORE NONE  ↓↓ GIVE EACH PARENT/ADULT RESPONSIBLE FOR THE CHILD THE RESULT OF THE HAEMOGLOBIN MEASUREMENT, REFER, ARRANGE TRANSPORT, AND END THE INTERVIEW.	GIVE EACH PARENT/ADULT RESPONSIBLE FOR THE CHILD THE RESULT OF THE HAEMOGLOBIN MEASUREMENT AND END THE HOUSEHOLD AND CONTINUE WITH 36.[1]
42	We detected a low level of haemoglobin 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 haemoglobin in the blood of [NAME OF CHILD(REN)] may be given to the doctor?	

NAME OF CHILD WITH HAEMOGLOBIN BELOW 5 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 5g/dl, read statement in Q.42 to each parent/adult responsible for a child who is below the cut-off point..

Malaria Indicator Survey

Women's Questionnaire

Federal Ministry of Health

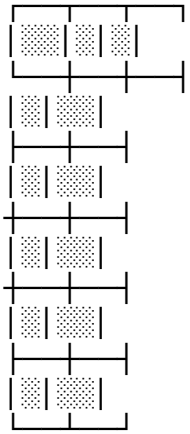
Ethiopian Health and Nutrition Institute

Malaria Indicator Survey Working Group

June 2011

MALARIA INDICATOR SURVEY
WOMEN'S QUESTIONNAIRE
[Ethiopia
[Ministry of Health]

IDENTIFICATION[1]

PLACE NAME _____ NAME OF HOUSEHOLD HEAD _ CLUSTER NUMBER HOUSEHOLD NUMBER REGION ZONE DISTRICT (NAME AND LINE NUMBER OF WOMAN ___	

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE	_____	_____	_____	DAY MONTH YEAR 2 0
INTERVIEWER'S NAME	_____	_____	_____	NAME
RESULT*	_____	_____	_____	RESULT
NEXT VISIT: DATE	_____	_____		
TIME	_____	_____		TOTAL NO. OF VISITS

*RESULT CODES:

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

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

Read the informed consent for women's questionnaire to all eligible women between 15 and 49 identified in the household listing.

RESPONDENT AGREES TO BE INTERVIEWED 1 RESPONDENT DOES NOT AGREE TO BE INTERVIEWED 2

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	→10 8
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 ☐		→10 9

[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 REQUIREDLANGUAGE___ 4 (SPECIFY LANGUAGE) BLIND/VISUALLY IMPAIRED…….. 5 2	
109	COUNTRY-SPECIFIC QUESTION ON RELIGION.	ORTHODOX CATHOLIC PROTESTANT MUSLIM TRADITIONAL OTHER _____(specify)	
110	COUNTRY-SPECIFIC QUESTION ON ETHNICITY.	AFFAR AMHARA GURAGIE OROMO SIDAMO SOMALI TIGRAWAY WELAITA OTHER_____(specify)	

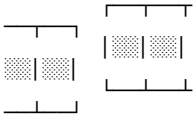
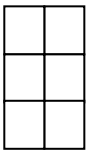
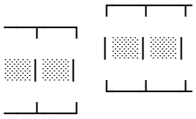
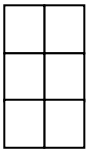
[1]Each card should have four simple sentences appropriate to the country (e.g., “Parents love their children”, “Farming is hard work”, “The child is reading a book”, “Children work hard at school”). Cards should be prepared for every language in which respondents are likely to be literate.

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 TWO OR MORE BIRTHS Was this child born in the last five years? IF NO, CIRCLE '00.' How many of these children were born in the last five years?	NONE.....00 TOTAL IN LAST FIVE YEARS ▒▒	→345

211 Now I would like to record the names of all your births, whether still alive or not, starting with the first one you had.
RECORD NAMES OF ALL THE BIRTHS IN 210. 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 DEAD: How old was (NAME) when he/she died? IF '1 YR', PROBE: How many months old was (NAME)? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN 2 YEARS; OR YEARS.	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 ↓ (NEXT BIRTH)	DAYS1 MONTHS2 YEARS3	
02	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES 1 NO 2 ↓ (GO TO 219)	AGE IN YEARS	YES 1 NO 2 ↓ (GO TO 220)	DAYS 1 MONTHS 2 YEARS 3	YES 1 NO 2
03	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES 1 NO 2 ↓ (GO TO 219)	AGE IN YEARS	YES 1 NO 2 ↓ (GO TO 220)	DAYS 1 MONTHS 2 YEARS 3	YES 1 NO 2
04	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES 1 NO 2 ↓ (GO TO 219)	AGE IN YEARS	YES 1 NO 2 ↓ (GO TO 220)	DAYS 1 MONTHS 2 YEARS 3	YES 1 NO 2
05	SING 1 MULT 2	BOY 1 GIRL 2	MONTH YEAR	YES 1 NO 2 ↓ (GO TO 219)	AGE IN YEARS	YES 1 NO 2 ↓ (GO TO 220)	DAYS 1 MONTHS 2 YEARS 3	YES 1 NO 2

06	SING 1 MULT 2	BOY 1 GIRL 2	MONTH  YEAR 	YES 1 NO 2 ↓ (GO TO 219)	AGE IN YEARS 	YES 1 NO 2 ↓ (GO TO 220)	DAYS 1 MONTHS 2 YEARS 3 	YES 1 NO 2
07	SING 1 MULT 2	BOY 1 GIRL 2	MONTH  YEAR 	YES 1 NO 2 ↓ (GO TO 219)	AGE IN YEARS 	YES 1 NO 2 ↓ (GO TO 220)	DAYS 1 MONTHS 2 YEARS 3 	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 2006[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 2006[1] OR LATER / NO BIRTHS IN 2006 OR LATER		→345

[1]For fieldwork beginning in 2011, the year should be 2006.

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 DON'T KNOW 3	
	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?	CAUSES OF MALARIA SLEEPING UNDER NET / LLIN USE NET / LLIN EVERY NIGHT	

	Probe, but do not provide answers. Multiple answers possible. Possible answers include:	GIVE PRIORITY TO CHILDREN <5 YRS OF AGE AND PREGNANT WOMEN HANG YOUR NET SO IT CAN BE TUCKED WASHING NETS MENDING / REPAIRING NETS SEEK TREATMENT FOR FEVER SEEK TREATMENT FOR FEVER WITHIN 24 HOURS FREE TREATMENT OF MALARIA IMPORTANCE OF SPRAYING NOT PLASTERING WALLS AFTER SPRAYING ENVIRONMENTAL SANITATION ACTIVITIES OTHER (SPECIFY) ..... DON'T KNOW	
	HOW FAR IS IT TO THE NEAREST HEALTH FACILITY? Write '00' if less than 1 kilometer If more than 95 kilometers, write '95' Circle '98' if 'Don't Know'	KILOMETERS |__|__| DON'T KNOW 98	
	If you were to go to this facility, how would you most likely go there?	CAR / MOTORCYCLE 1 PUBLIC TRANSPORT (BUS / TAXI) 2 ANIMAL / ANIMAL CART 3 WALKING 4 BICYCLE 5 BOAT 6 OTHER_____ 7 DON'T KNOW 8	

SECTION 3AB. FEVER IN CHILDREN

311	ENTER IN THE TABLE THE LINE NUMBER AND NAME OF EACH LIVING CHILD BORN IN 2006[1] OR LATER. (IF THERE ARE MORE THAN 2 LIVING CHILDREN BORN IN 2006[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)
316A	How many days after the fever began did you first seek advice or treatment for (NAME)?	DAYS ▒▒	DAYS ▒▒

	IF THE SAME DAY, RECORD '00'.		

[1] For fieldwork beginning in 2011, the year should be 2006, 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) get finger or heel pricked by health provider <u>in the last two week?</u>	YES 1 NO 2 (SKIP 344) DON'T KNOW 8	YES .....1 NO .....2 (SKIP 344) DON'T KNOW 8
318	Was a diagnostic blood test for malaria performed	YES 1 NO 2 DON'T KNOW 8	YES 1 NO 2 DON'T KNOW 8
318	Did health provider communicate the result of the blood test?	YES 1 POSITIVE: P falciparum 2 POSITIVE: P vivax 3 NEGATIVE4 NO 5 (SKIP 344) DON'T KNOW 8	YES 1 POSITIVE: P falciparum 2 POSITIVE: P vivax 3 NEGATIVE4 NO 5 (SKIP 344) DON'T KNOW 8
320	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

321	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
322	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)
322A	CHECK 319: COARTEM ('A') GIVEN?	CODE 'A' CODE 'A' NOT CIRCLED CIRCLED (SKIP TO 324)	CODE 'A' CODE 'A' NOT CIRCLED CIRCLED (SKIP TO 324)
323	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 Coartem 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 Coartem 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 COARTEM?	YES 1 NO 2 If NO, Skip to 324	YES 1 NO 2 If NO, Skip to 324
	What did the drug's packaging look like?	LARGE WHITE BLISTERS 1 SMALL BOX 2 INDIVIDUAL, LOOSE PILLS 3 NOT SURE8	LARGE WHITE BLISTERS 1 SMALL BOX 2 INDIVIDUAL, LOOSE PILLS 3 NOT SURE8
	How much did you pay for the COARTEM?	< 10 Birr 1 10 – 19 Birr 2 > 20 3 NOT SURE8	< 10 Birr 1 10 – 19 Birr 2 > 20 3 NOT SURE8
324	CHECK 319: WHICH MEDICINES?	CODE 'B' CODE 'B' CIRCLED NOT CIRCLED (SKIP TO 328)	CODE 'B' CODE 'B' CIRCLED NOT CIRCLED (SKIP TO 328)
325	How long after the fever started did (NAME) first take chloroquine?	SAME DAY0 NEXT DAY1 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 DAY0 NEXT DAY1 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' CODE'D' CIRCLED NOT CIRCLED ☐ ☐ (SKIP TO 336)	CODE 'D' CODE 'D' CIRCLED 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' CODE'E' CIRCLED NOT CIRCLED ☐ ☐ (SKIP TO 340)	CODE 'E' CODE 'E' CIRCLED 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 SOURCE. IF MORE THAN ONE SOURCE MENTIONED, ASK: Where did you get the (NAME OF OTHER ANTIMALARIAL) 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 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
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: _____

FEDERAL DEMOCRATIC
REPUBLIC OF ETHIOPIA
MINISTRY OF HEALTH