ETHIOPIA NATIONAL MALARIA INDICATOR SURVEY 2015 *Technical Summary*

Federal Democratic Republic of Ethiopia
Ministry of Health

Ethiopian Public Health Institute
Addis Ababa, Ethiopia

1. Introduction

Background

In Ethiopia, approximately 60 percent of the population lives in areas at risk of malaria.[1] In its second five-year National Strategic Plan for Malaria Prevention, Control and Elimination (NSP 2011–2015), the National Malaria Control Program (NMCP) formulated a goal to reduce morbidity and mortality due to malaria through scaling up and sustaining the coverage of key malaria interventions. In this plan, areas below 2,000m above sea level (ASL) were generally classified as malarious and considered eligible for intervention.

The 2015 Ethiopia National Malaria Indicator Survey (EMIS) was conducted with the aim of assessing the status of progress in achieving this goal. The 2015 EMIS is the third malaria indicator survey held in Ethiopia after the 2007 and 2011 surveys. Similar to the previous surveys, the 2015 EMIS applied the Roll Back Malaria (RBM) Monitoring and Evaluation Reference Group guidelines for its design, data collection analysis, and interpretation.

The field data collection was conducted from September 30 to December 10, 2015, to cover a total of 13,875 households. All women ages 15 to 49 in the selected households were eligible for individual interviews that covered questions about prevention of malaria, treatment of childhood fever, and their knowledge of malaria prevention. In addition, the survey included testing for anemia among children ages 6 to 59 months and malaria among all age groups using a finger- or heel-prick blood sample.

In-country stakeholders, led by the Ethiopian Public Health Institute (EPHI), contributed to the implementation of the EMIS. The stakeholders included the Federal Ministry of Health (FMOH)/NMCP; the Central Statistical Agency; the Malaria Control and Elimination Partnership in Africa (MACEPA), a program at PATH; the President's Malaria Initiative (PMI), the United Nations Children's Fund (UNICEF), ICAP-Ethiopia, the World Health Organization (WHO), the Addis Continental Institute of Public Health (ACIPH), and Malaria Consortium. Regional health bureaus provided the personnel for conducting all field work.

Objective of the survey

The main goal of the 2015 EMIS was to measure the progress toward achieving the goals and objectives of the NSP 2011–2015. Specifically, the survey measured access to, and coverage and use of the core malaria control interventions; prevalence of malaria-related fever, malaria parasitemia, and anemia among children under five years of age; malaria parasitemia among all age groups; and knowledge, attitude, and practices of women of reproductive age (15–49 years) vis-à-vis malaria and methods for prevention and control.

Methodology

The 2015 EMIS was a cross-sectional study performed during peak malaria transmission season in Ethiopia. The survey was conducted in malarious areas located between 2,000m and 2,500m ASL. The sample design provided estimates for malarious areas of the country as a whole, areas below 2000m ASL, areas between 2,000m and 2,500m ASL, urban and rural malarious areas, and regional estimates for malarious areas.

The study used a two-stage cluster sampling approach. In order to obtain the sample size calculated, a sampling frame obtained from the Ethiopia Central Statistical Agency was used. The sampling frame was the list of enumeration areas (EAs) and digitized EA maps from the Central Statistical Agency. Consequently, 555 EAs and 13,875 households were selected. For the survey, a household

[1] Federal Ministry of Health (FMOH). *National Strategic Plan for Malaria Prevention, Control and Elimination in Ethiopia: 2014–2020*. FMOH; 2014.

questionnaire and a women's questionnaire were deployed. The household questionnaire collected data on household demographics, socioeconomic status, indoor residual spraying (IRS), long-lasting insecticide-treated net (LLIN) ownership and use, and prevalence of anemia and malaria. The women's questionnaire collected data on reproduction history, general malaria knowledge, and fever treatment-seeking behavior among children under five years of age. Both questionnaires were programmed into Samsung I9300 S3 Neo smartphones enabled with the global positioning system (GPS) for data collection.

Hemoglobin concentrations were measured from all children under five using a portable spectrophotometer (HemoCue®, Anglom, Sweden). For malaria testing, blood samples were collected from children under five in all 25 households selected for interview and for all age groups in 6 out of 25 households using the CareStart® malaria rapid diagnostic test (RDT) capable of detecting all *Plasmodium* species. Thick and thin blood smears were read by expert microscopists at EPHI, and second and third round microscopic slide readings were also conducted for quality control.

Ethical approval was obtained from the EPHI Scientific and Ethical Review Office (SERO), Centers for Disease Control and Prevention (CDC)/Atlanta, and MACEPA/PATH, and participants also gave consent and assent before interviews and blood sample collection.

Overall, 326 data collectors and team leaders and 35 supervisors were trained on survey methodology using smartphones and laboratory procedures. Prior to fieldwork, the questionnaires were pre-tested and adjusted accordingly and community sensitization activities were implemented. The field work was conducted by 36 teams and teams were visited by supervisors in the field at least twice during the survey period.

The data were electronically submitted from the field to the EPHI server and checked for data quality and reporting completeness. Data were cleaned and analyzed by the data working group.

Sample design

A total of 13,789 households and 54,768 people in 555 EAs were surveyed—about 84 percent of households in areas under 2,000m ASL and 16 percent in areas between 2,000m and 2,500m ASL. Of the total sampled households, 13,789 households were occupied at the time of the survey. Among these households, 13,354 completed the household questionnaire, yielding a response rate of 97 percent. In the 13,354 households surveyed, 11,492 out of 12,691 eligible women were interviewed, a response rate of 91 percent. The summary of main findings are presented in this report.

2. Malaria prevention

LLIN ownership and use

Of the 13,789 households surveyed, 64 percent of households in malarious areas (<2,000m ASL) owned at least one LLIN with regions ranging in coverage from 34 percent and 73 percent. For instance, Amhara and Tigray had the highest ownership at 73 percent, while Dire Dawa and Harari reported the lowest ownership (34 percent and 36 percent, respectively). All the mosquito nets found in households were LLINs (Figure 1).

Figure 2 shows the trend in LLIN ownership in 2007, 2011, and 2015 according to the EMIS results for those years. The percentage of households in malarious areas owning at least one LLIN was higher in 2015 (64 percent) than in 2011 (55 percent), but slightly lower than in 2007 (69 percent). Overall, 32 percent of households in malarious areas have attained universal LLIN coverage—defined as one LLIN per two people. Universal LLIN coverage is highest in Tigray (41 percent) and lowest in Dire Dawa (15 percent).

Figure 1. Percentage of households with at least one LLIN by region and wealth quintile

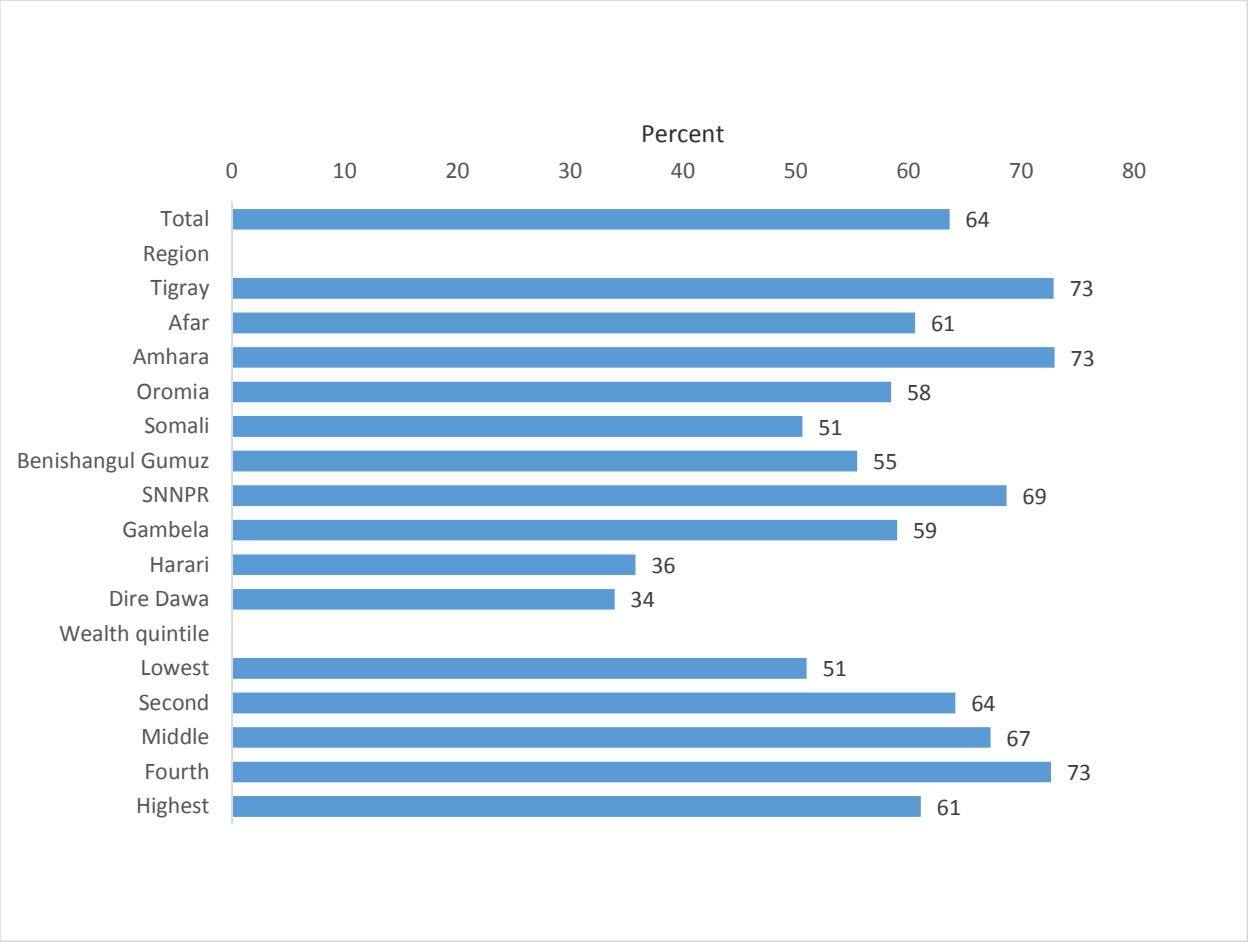
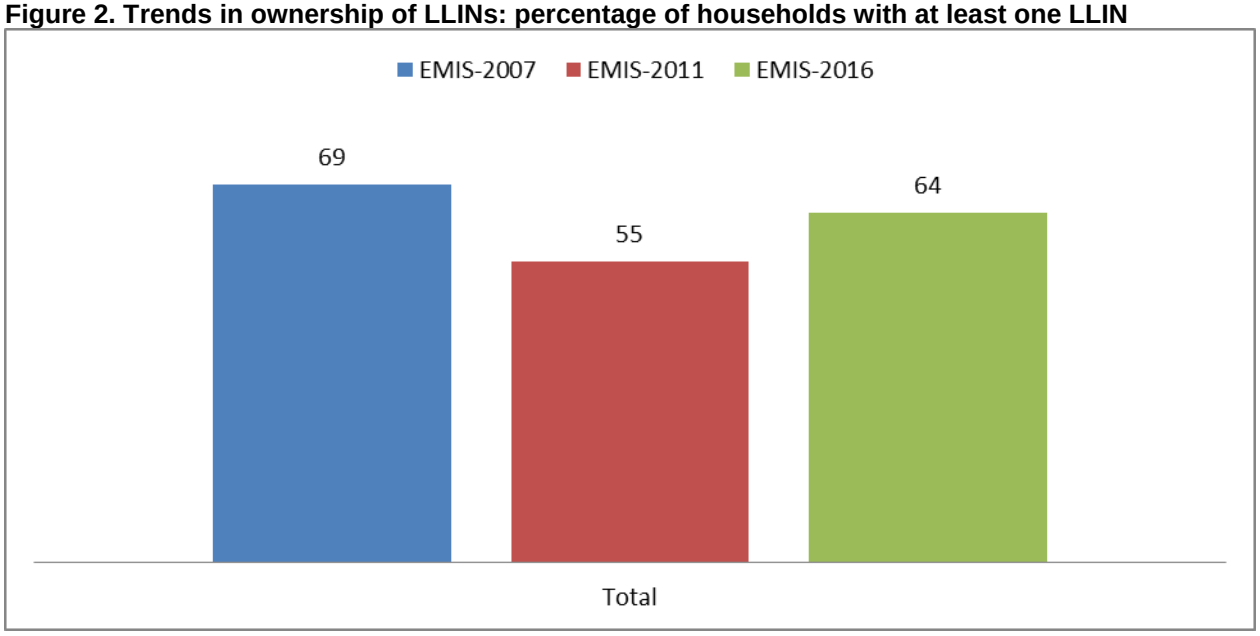
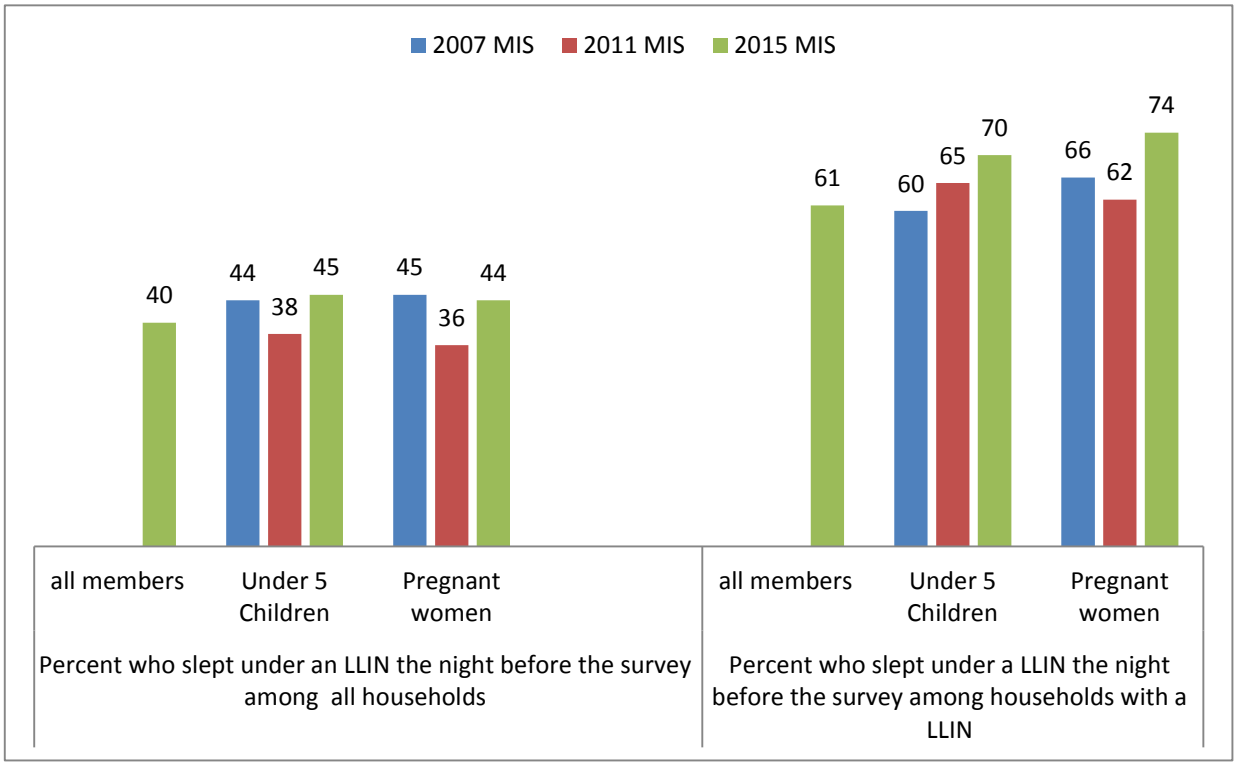


Figure 2. Trends in ownership of LLINs: percentage of households with at least one LLIN



In malarious areas, 44 percent of pregnant women and 45 percent of children under five years of age slept under an LLIN the night before the survey. However, in households owning at least one LLIN, use by children and pregnant women was 70 percent and 74 percent, respectively, highlighting the importance of access to interventions. A trend analysis across the three surveys (Figure 3) shows a slight increase in LLIN use among children under five and pregnant women (38 percent and 35 percent, respectively, in 2011 compared with 45 percent and 44 percent in 2015). Figure 3 also shows the use of LLINs among households with at least one net and that LLIN use both among children under five and pregnant women was highest in 2015 compared to the results in 2007 and 2011.

Figure 3. Trends in use of LLINs (Ethiopia 2007, 2011, and 2015)



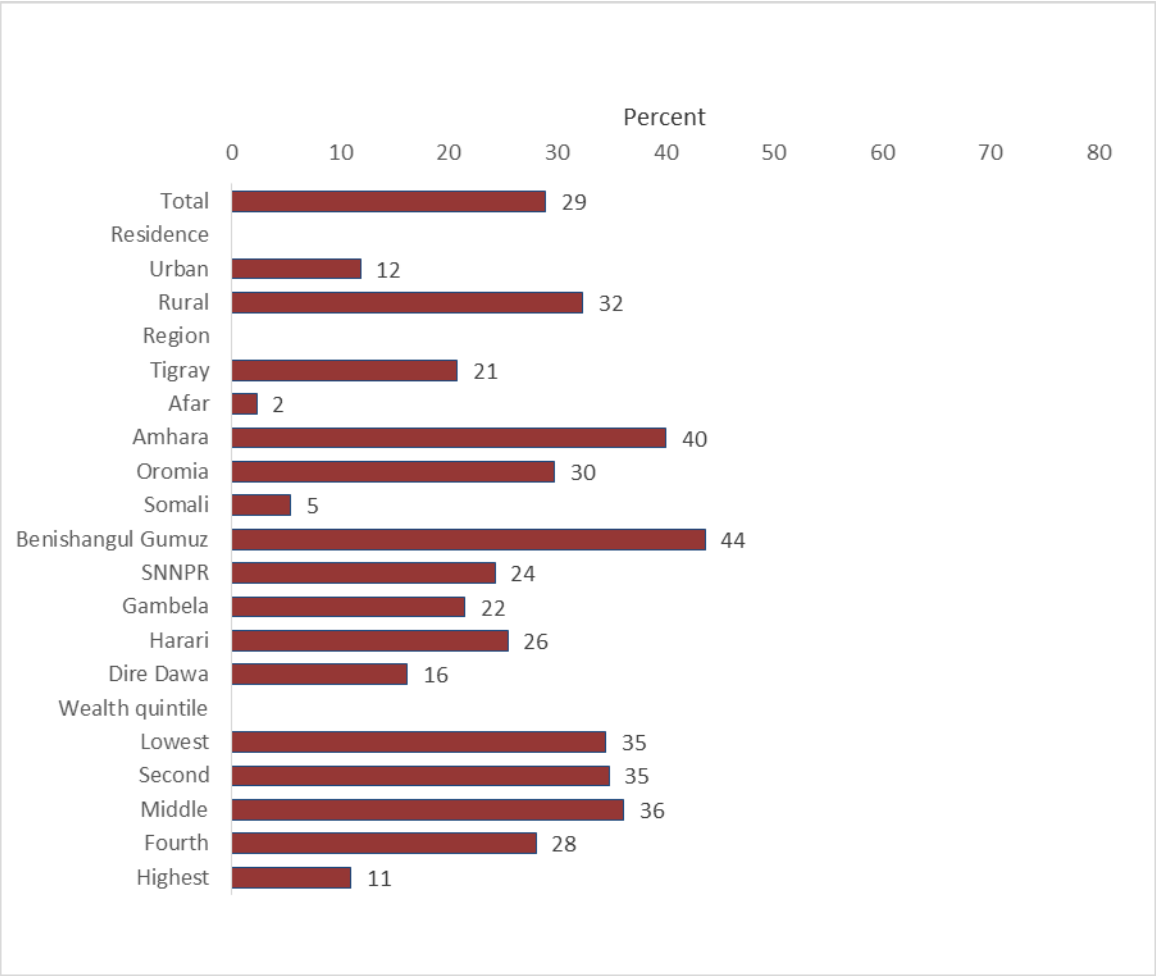
IRS coverage

With regard to IRS, 29 percent of all households in malarious areas were sprayed in the 12 months preceding the survey. Across regions (Figure 4), more households in Benshangul Gumuz (44 percent) and Amhara (40 percent) had been sprayed compared with households in Afar (16 percent) and Somali (5 percent). IRS coverage has declined from 47 percent in 2011, however it is to be noted that IRS is more focused and targeted in high transmission areas and few highland fringe epidemic-prone areas per the new strategic plan (NSP 2014–2020).

However, the percentage of households sprayed is expected to be very high, if a specific study is made in IRS-targeted malarious areas where the new strategic plan focuses. IRS is limited to specific targeted areas, representing 29% of the total at risk-population. This is documented as the limitation of the current survey.

Overall, 71 percent of households are protected either by owning an LLIN or having received IRS.

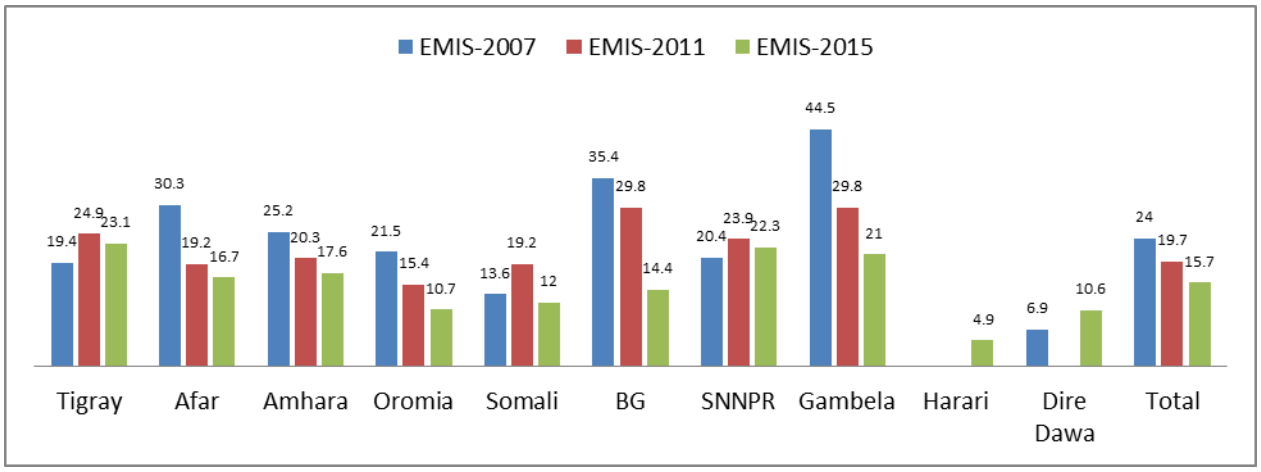
Figure 4. Indoor residual spraying status (Ethiopia 2015)



3. Case management

Overall, 16 percent of children under five years of age had fever during the two weeks preceding the survey, with notable regional variations. Figure 5 shows that fever prevalence among children under five has declined over the years.

Figure 5. Trend of fever prevalence among children under five years of age (Ethiopia 2007, 2011, and 2015)



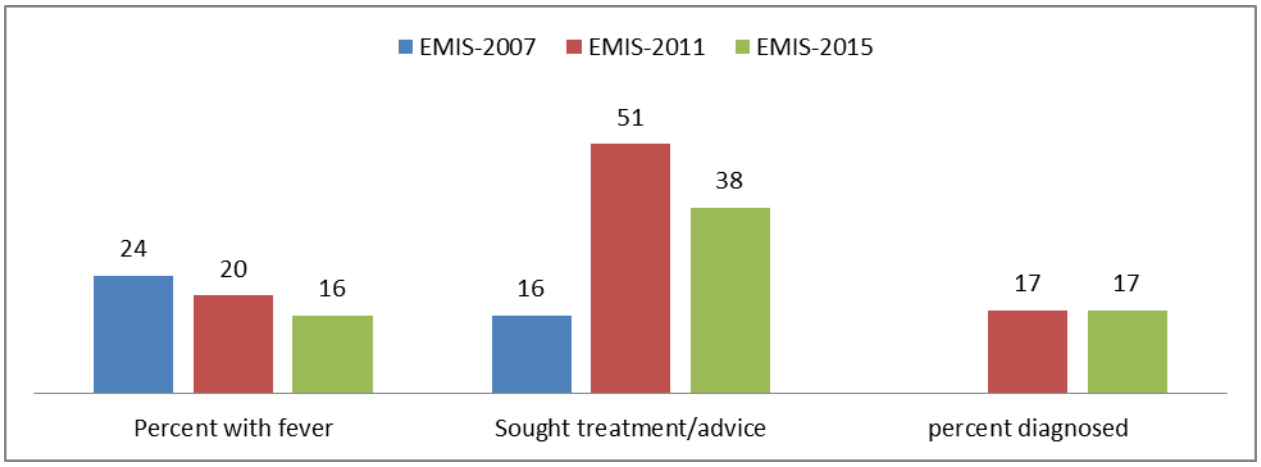
Treatment was sought for 38% of children with fever, either through the public or the private health sector. The proportion of children who were taken for treatment was highest in Harari (76 percent) and lowest in Tigray (32 percent).

Among children under five with fever in the two weeks preceding the survey, 17 percent had a heel or finger prick for testing.

Among children with fever who took an antimalarial medicine, 89 percent took artemether-lumefantrine, 1 percent took quinine, and 4 percent took chloroquine.

There was a slight decline in proportion with fever and those who sought treatment in 2007, 2011, and 2015 (Figure 6).

Figure 6. Fever prevalence and management among children under five (Ethiopia 2007, 2011, and 2015)



Prevalence of malaria

Overall, malaria prevalence in Ethiopia is very low. Malaria prevalence was estimated among all age groups living in malarious areas and areas >2,000m and ≤2,500m ASL by both microscopy and RDT.

Malaria prevalence was 0.5 percent and 1.2 percent by microscopy and RDT, respectively. By region, Gambella (6 percent) and Benshangul Gumuz (3 percent) reported the highest prevalence by microscopy (Figure 7). Malaria prevalence in areas >2,000m and ≤2,500m ASL was less than 0.1 percent.

Figure 7. Trends of malaria prevalence among all age groups by microscopy (Ethiopia 2007, 2011, and 2015)

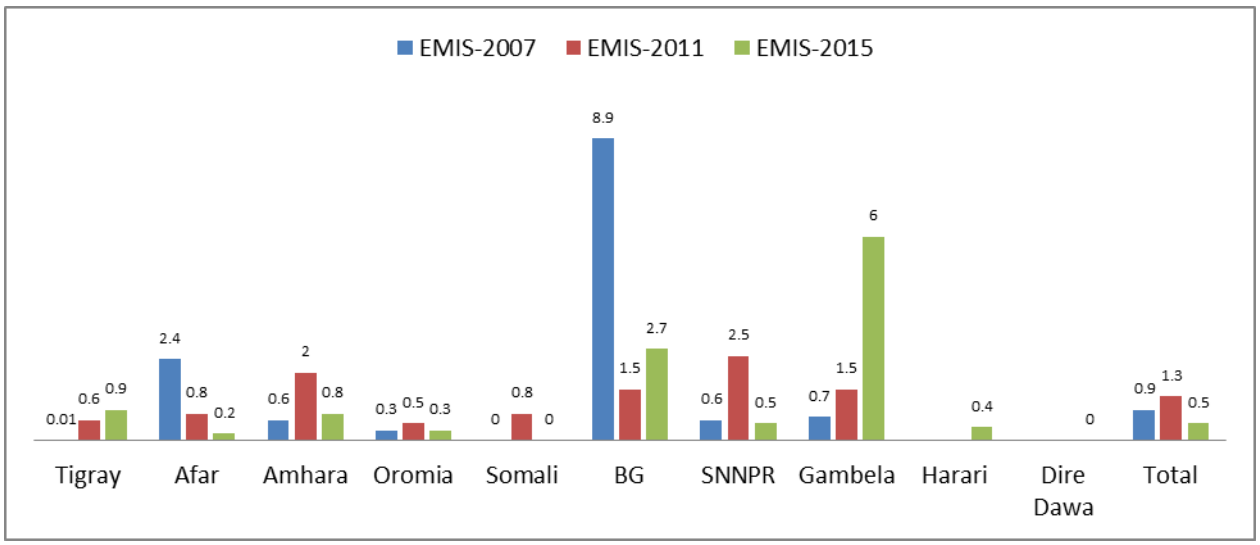
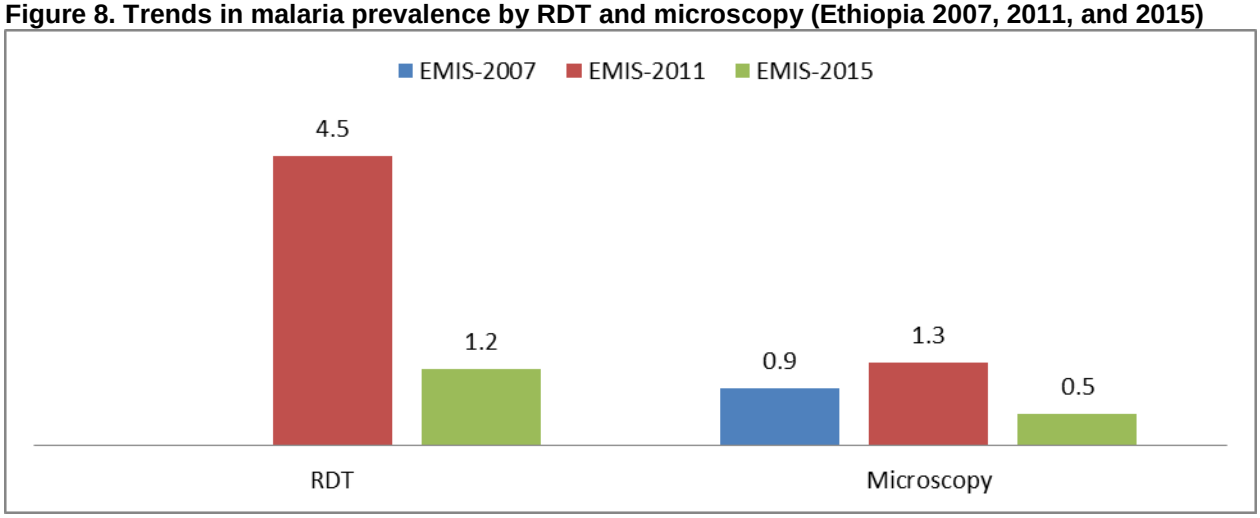


Figure 8 shows the trend in malaria parasite prevalence since 2007 by microscopy and RDT among all age groups. There was a reduction in malaria prevalence by microscopy in 2015 (0.5 percent) compared to the results in 2011 (1.3 percent). Similarly, when comparing the RDT results, malaria prevalence in 2015 (1.2 percent) was reduced compared to that of 2011 results (4.5 percent). It should be noted that the prevalence estimation needs to be interpreted cautiously; the EMIS, being a point survey, has a limitation of estimating acute diseases like malaria.

Figure 8. Trends in malaria prevalence by RDT and microscopy (Ethiopia 2007, 2011, and 2015)

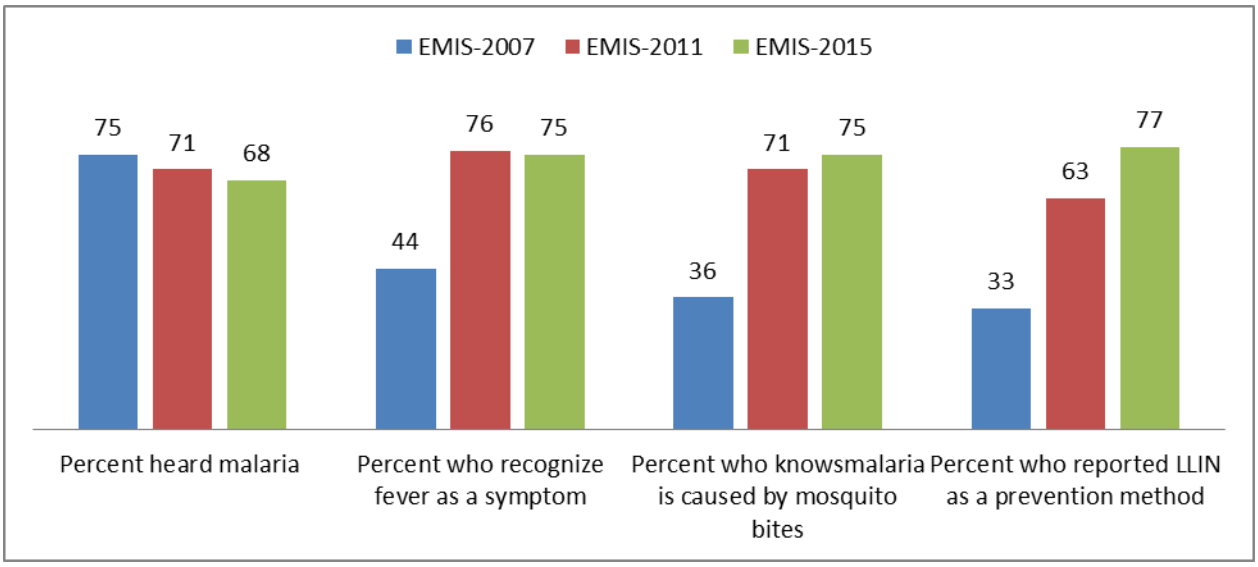


4. Women's malaria knowledge

The 2015 EMIS results indicate that 68 percent of women in malarious areas have heard about malaria. Of those who had heard about malaria, 75 percent were aware that mosquito bites may cause malaria and recognize fever is a symptom of the disease. Seventy-seven percent knew that sleeping under mosquito nets could prevent malaria. As indicated in Figure 9, though proportion of women

ages 15–49 years who had heard about malaria was similar across 2007, 2011, and 2015, the proportion who recognized fever as symptom of malaria, who knew malaria is caused by mosquito bites, and who reported LLINs as a prevention method had increased in 2015 compared to 2007 and 2011.

Figure 9. Trends in women's malaria knowledge and practice (Ethiopia 2007, 2011, and 2015)



5. Conclusion

The results of the 2015 EMIS showed improvement in the scale-up and sustained coverage and use of key malaria prevention and control interventions. The survey documented improved access to LLINs in Ethiopia, while highlighting gaps in utilization of some interventions in low transmission settings.

The results of the 2015 EMIS provide valuable information to specifically target activities to maintain recent gains and address identified gaps and challenges. The low prevalence observed in some areas of the country calls for specific, targeted interventions to achieve zero transmission, as described in the National Malaria Control and Elimination Guidelines.

Appendix. Programmatic Implications of MIS-2015 results

Programmatic implications of Malaria Indicator Survey 2015

September 01,2016

Based on the technical advisory committee(TAC) meeting held on 18 August 2016 at the FMOH, a decision was made to conduct an experts consultative meeting to discuss the programmatic implication of the current MIS-2015 results. The consultation was implemented with the support of MACEPA/PATH. As the MIS-215 report is in press during the meeting, the following minutes of the meeting conclusion and recommendations are annexed on the MIS-2015 report.

The list of experts participated are listed in the table below

Overall facilitators Mrs Hiwot Solomon FMOH 2. Mr. Ashenafi Assefa 3. Mr. Asefaw Getachew		
Group-1: Diagnosis & Treatment Facilitators: Dr Dereje Muluneh (UNICEF) Dr. Samuel Girma (USAID/PMI)	Group-2: Malaria Vector Control Facilitators: Mr Sheleme Chibsa Dr. Matthew Murphy(PMI/CDC)	Group-3: SBCC Facilitators: Mr Guda Alemayehu (USAID) Berhane Haileselassie(PATH /MACEPA)
Dr Kebede Etana (FMOH)	Achamyelesh Sisay (FMOH)	Gashu Fente (FMOH/UNICEF)
Dr Worku Bekele (WHO)	Dereje Dilu (FMOH)	Tilahun Kebede (FMOH)
Sindew Mekasha (EPHI)	Dr Adugna Woyessa(EPHI)	Wassihun Belay (WHO)
Asnakew Kebede (PATH/MACEPA)	Asefaw Getachew (PATH/MACEPA)	Samuel Hailu (FMOH)
Gezahegn Tesfaye (FMOH/PATH)	Meseret Assefa (GF)	Estifanos Bayabil (HDAMA)
Ashenafi Assefa (EPHI)	Alemayehu Getachew (ABT)	Bayissa Urgesa (JHCCP)

3. Malaria prevention

3.1 Conclusions

Sixty-nine percent of households owned an LLIN in 2007 compared with 64 percent reported in the 2015 but 55 percent for 2011. Household ownership of LLINs has improved compared to MIS 2011 but declined in relation to MIS 2007 and did not meet universal LLIN coverage.
34% of households in non-targeted areas (> 2000 m) reported owning at least one LLIN which has impact on overall LLIN distribution. Thirty-four percent of households owned LLINs in areas >2,000m and ≤2,500m above sea level where malaria prevalence in children under five is negligible.

A considerable number of survey supervisors reported that undistributed LLINs were observed in several woreda/ District health offices during data collection period for MIS 2015.

Net utilization rates among children under age 5 and pregnant women have not changed in MIS-2015 when compared with MIS 2007. However, the utilization rates are higher when compare with that of MIS-2011 results.. Forty percent of the household members slept under a net the night before the survey for this MIS-2015.
The percentage of households with IRS in the past 12 months was found to be 29 percent.

3.2 Recommendations

- MIS-2015 results indicated that though percentage of households with at least one LLIN is maintained and the program is behind its target of achieving 80% and above LLIN ownership.
- FMOH, partners and stakeholders should apply practical approaches to achieve universal net coverage in the targeted malaria risk areas.
- Needs an appropriate planning and implementing timely distribution of LLINs to household level.
- Due to altitude variability within villages and enumeration areas LLINs distribution is challenged. Therefore there is a need of additional targeting parameters.
- Access to LLINs at household level mainly determines use. In addition, community level awareness activities also determine LLIN utilization rates. Among those households in malarious areas owning at least one LLIN, the LLINs utilization rates have improved when compared with MIS-2007 and 2011 indicating improvements on community awareness.
- IRS is not a universal coverage intervention and strategy to calculate coverage should consider only IRS targeted EAs as denominators. IRS coverage has been found to be 29 % which is a positive achievement from the point of view of the total at risk population despite the denominator is not taken from the targeted population.
- IRS is limited to specific areas, the program targeted 29% of the total at risk-population.
- In addition, IRS re-plastering rate as an issues should be reflected in the report to investigate possible challenges of the intervention.
- Demand creation efforts should be considered using Social Behavioral Change for Communication to improve utilization of vector control services.
- In order to assess the LLINs that were not distributed during the time of data collection, FMOH and partners are planning to conducted rapid assessment of LLIN distribution to make sure LLINs are delivered to community in need.

4. Case Management

4.1 Conclusions

The trend in percentage of children under age 5 with fever in the two weeks preceding the survey is declining overtime. Possible reason could be the result of reducing malaria, pneumonia and other childhood illnesses.

Children with fever who sought advice or treatment declined compared to MIS 2011. In addition how long after the fever started advice or treatment was sought was not specified. Blood test for malaria was found low but with variation by urban to rural and region. Primarily health centers followed by private health facilities provide most of the treatment seeking or advice for fever.

4.2 Recommendations

Declining health seeking behavior in children should be investigated despite having HDA and HEWs at community level. Period for treatment or advice sought after the fever started should be specified.
Improve testing of febrile patients through advocacy, communication and social mobilization and supportive supervision for health extension workers and community members focusing on women in the reproductive age group .
Considering febrile cases as a data element in HMIS to monitor the situation.
Currently IMNCI algorithm does not recommend malaria testing for febrile neonates. Study malaria burden in neonates and under 2 months.
Even though health post are the primary point of care for malaria patients there is a shift to health center and needs further investigation on why the community prefers the health centers.

5. Malaria and Anemia prevalence

5.1 Conclusions

National malaria parasite prevalence for all age groups has been declined compared to MIS 2007 and 2011. Malaria prevalence is highest in the age group 35-39 years compared to other age groups. But in the Ethiopian context, MIS is not a good tool to measure malaria prevalence as the malaria burden is very low and seasonal. Malaria prevalence is higher in male and rural residents but no variation with economic status.

Malaria prevalence among children under 5 living in areas >2,000m and ≤2,500m above sea level was zero percent. This may indicate no or minimum local transmission.

Prevalence of malaria in children was found highest in Gambella and Benishangul Gumuz regions. Proportion of plasmodium species were plasmodium falciparum 87.9%, plasmodium vivax 8.7% and mixed 3.4%. Many reported cases are from Gambella and BenishangulGumuz regions.
Nationally, anaemia rate was found low and there is no significant difference among age groups. Relatively highest anaemia was reported in Somali and Dire Dawa where malaria prevalence is very low. In regions with highest malaria prevalence (Gambella and BenishangulGumuz) there is no difference in anaemia rate with remaining regions with low malaria prevalence. Therefore, anaemia rate in this study may not reflect effect of malaria.

5.2 Recommendations

MIS is not a good tool for Ethiopia to estimate malaria parasite prevalence and needs to be customized to local situation or look for better options.
MIS focuses on children under 5 years of age and women in the reproductive age group. The malaria burden in Ethiopia is relatively highest in adults and males. Therefore, consideration is required for the evidence generated. Separate study or approach is required to address special populations such as mobile population, “moferzemach” and the likes.

Malaria prevalence among children under five living in areas >2,000m and ≤2,500m above sea level is zero and needs to design intervention tailored for this stratification.

To reducing malaria parasite prevalence for Gambella and Benishangul Gumuz regions, it needs intensification of case management ICCM and IMNCI services.
Proportion of plasmodium species should also be analyzed by regions separately since the high prevalence in Gambella and Benishangul Gumuz regions are affecting the national picture. It is expected more proportion of vivax cases due to reducing malaria burden in the country.
Reconsider studying anaemia as an indicator of malaria in MIS studies.

6. General Malaria Knowledge

6.1Conclusions

In malarious areas, sixty-eight percent of women have heard about malaria and there is a minor reduction in percentage. The percentage is not satisfactory in the literate women and women living in Afar and Somali regions despite living in malarious areas. Possible reasons for declining women heard about malaria might be due to weakening in SBCC interventions mainly after the reform, declined in malaria burden and quality of questionnaire administration.
Percent who recognize fever as a symptom increased from 44 percent to 75percent in MIS 2015comparing with MIS 2007 but almost no change when compared with 2011.
Among women who had heard of malaria who recognize fever as symptom of malaria was maintained since 2011. Women who knows malaria is caused by mosquito bites and percent who reported LLINs as a preventive method was improved substantially but the denominator needs improvement.
Malaria knowledge data were not disaggregated by source of information.

6.2 Recommendations

SBCC activities and IEC/BCC should be strengthened at community level with coordinated and standardized SBCC materials. Demand creation activities to optimize utilization of available malaria prevention services. Due attention should be given to improve quality of questionnaire administration as there were language barriers among data collectors and study participants.

Implementation of national Health Promotion and Communication strategy and advocacy communication and social mobilization manual for malaria. Choice of channels to reach the rural community should be also reconsidered and source of information for malaria knowledge should be explained.

7. Lessons learned

7.3 Crosscutting issues

Malaria risk and stratification

MIS shows Gambella and Benishangul Gumuz regions had higher rate of malaria parasite prevalence. But it doesn't capture other hot spot areas in the western lowlands of the country as MIS-2015 gives only regional estimates. The MIS result does not differentiate low and moderate malaria risk areas. MIS result does not correlate with existing stratification and it is not proper tool for the current malaria stratification in Ethiopia.
It was recommended that malaria parasite prevalence may be estimated as per the stratification in the NSP rather than classifying areas below 2000m and between 2000m and 2500m asl.

Potential publications

- Organize team of experts who will be spearheaded by EPHI to identify topics for publications, for detail analysis of the data in the three MISs and utilize the biological samples collected to generate further evidence.

Investment in malaria

Investment in malaria prevention and control should be continued. Without investment the low malaria incidence can be reverted. Therefore investment is needed but not limited to the following

- To improve utilization while ensuring supply:
- To improve diagnostics and quality assurance
- To improve surveillance
- To improve case management at universities and affiliated universities
- Mapping for source of infection

MIS in the future

The future of MIS may be governed by the development of current surveillance systems and routine data collection and program monitoring. Yet there are indicators that can only be captured by a nationwide MIS tailored to the Ethiopian context. Evaluate approaches to establish malaria prevalence on a more frequent basis without MIS.MIS is excellent to measure coverage of intervention but not impact.