PROJECT TITLE:	Strengthening Malaria Monitoring and Evaluation Systems (SMMES) of Ethiopia Program
Prime Partner and Sub-partners:	Addis Continental Institute of Public Health and Tulane University
Cooperative Agreement Number:	AID-663-A-14-00004
Project Start / Completion Date:	April 1, 2014 – March 28, 2022
Work or Reporting Period:	October 1, 2019 – September 30, 2020
Document Version:	Version 1
Submission Date:	November 30, 2020

I. EXECUTIVE SUMMARY

Strengthening Malaria Monitoring and Evaluation (SMMES) of Ethiopian program is a five-year (April 1, 2014 – March 29, 2019) project, with a two-year extension till March 29, 2021 and a no-cost extension till March 28, 2022. The project is funded by the President's Malaria Initiative (PMI) program and implemented by Addis Continental Institute of Public Health (ACIPH), which is an independent private center of excellence for public health research and training in Africa, as a prime awardee and Tulane University in New Orleans, Louisiana, USA as a sub-awardee. The overall goal of the project is to strengthen the malaria SM&E system of Ethiopia by building the capacity of FMOH/EPHI and RHBs in malaria SM&E including conducting surveys and operational research by providing hands on trainings to health care workers and program mangers working on malaria.

The following are summary of major activities of the reporting period (October 1, 2019 – September 30, 2020) in accordance to the three aims of the project.

Admin related major activities include:

In the FY 20, the vacant M&E and surveillance officer positions were filled. Surveillance team leader also resigned and replacement was done. Due to COVID-19 pandemic, a temporary work arrangement was made and project staff were conducting project work from home. During the 'working from home' period, the project staff were conducting weekly zoom meeting to review weekly activities and look at the achievements and challenges.

Also, project staff continued to have monthly meeting, where each staff's monthly plan and activity was reviewed, discussions made on challenges and the next month plan developed.

Project related major activities include:

In this reporting year, project staffs jointly with regional, zonal health department and woreda health office experts provided 120 (51%) woreda level physical mentorship and 568 (178%) woreda level virtual mentorships out of the planned 236 physical and 320 virtual mentorships sessions respectively. With similar collaboration, SMMES surveillance officers also provided supportive supervision and mentorship to 199 PHCUs (42% of the planned 472). Both woreda and PHCU level physical mentorship wasn't achieved because of the COVID-19 pandemic. Expansion of support to 26 woredas of Arsi zone was completed at the beginning of 2nd quarter of project fiscal year and then, shortly after that (i.e. in March 2020), COVID-19 pandemic happened in our country which disrupted field activities for almost six months. contributing to the low physical visit to the woredas and PHCUs is, of the planned expansion of support to 38 new woredas we successfully expanded to 26 (68%) of those planned woredas. In the 3rd quarter fully and in the 4th

quarter partially, when we couldn't make physical field visits, we intensified virtual mentorships to compensate the under achievement of physical mentorship due to COVID-19.

Similarly, no review meeting was conducted in 3rd and 4th quarter of FY20 again because of the COVID-19 pandemic in the country as the country was in a state of emergency, which prohibit public gathering of more than four persons.

Three manuscripts were developed from the LLIN longevity study and shared with the co-authors for comment. We plan to submit for publication in the first quarter of FY 21.

Patient recruitment for safety and tolerability of primaquine for radical cure of Plasmodium vivax in Ethiopia evaluation is not completed. This is mainly due to changing of the G6PD testing kit from CareStart by Access Bio Inc. to the standard G6PD test kit by SD Biosensor as there was concern raised by WHO on Access Bio Inc. The new procurement order and shipment was a lengthy process due to the COVID-19 pandemic.

The baseline assessment of "The evaluation of targeted mass drug administration and reactive case detection on malaria transmission and elimination in Ethiopia" was successfully conducted at 48 kebeles of East Hararghe zone and a preliminary report of the baseline assessment was prepared and shared with researchers and NMCEP team. However, the initiation of the interventions was delayed due to COVID-19 pandemic, since we were unable to travel to the sites to initiate hiring of the surveillance officers and assistants and also the same G6PD testing kit procurement delay.

The 11th malaria research network symposium was successfully conducted in collaboration with Debre Markos University.

Technical assistance to the FMoH/NMCEP, EPHI and ORHB was provided as identified by the partners or by the project staff. These technical assistances include supporting national malaria program review and development of National Malaria Elimination Strategic Plan; 2021-2025, participating in joint supportive supervision, printing and distribution of national reporting formats and registration books, training module development for the malariology training, development of SOP and training material for the case and foci investigation training and also facilitating the trainings organized by the regional health bureau and NMCEP.

II. PROJECT OVERVIEW

Malaria remains a public health problem in Ethiopia, accounting for a significant amount of disability and life loss. According to the most recent FMoH annual review reports (Ethiopian Fiscal Year (EFY 2011), 904,495 malaria cases and 213 deaths were reported in 2018/19. The National

Malaria Control and Elimination Program (NMCEP) has set the goal of reducing the burden of malaria by 40% from baseline of 2016, maintain near zero malaria deaths (no more than 1 confirmed malaria death per 100,000 population at risk) in Ethiopia by 2020 and eliminate malaria from Ethiopia by 2030. The strategies put forward for achieving the above goals are: community empowerment and mobilization, early diagnosis and treatment, selective vector control, surveillance and epidemic control, as well as cross cutting strategies that include monitoring and evaluation and program management. However, for malaria control and elimination efforts to be sustainable, a cadre of well-trained Ethiopian scientists and surveillance experts are needed to monitor progress and activities toward malaria elimination. Particularly, there is a need to build effective collaboration, set up and expand effective surveillance systems, and increase capacity to monitor and evaluate (M&E) programs. These activities will allow for the collection of real-time data to monitor trends in malaria morbidity and mortality; this is consistent with the U.S. Presidents Malaria Initiative (PMI) goal of strengthening and maintaining malaria M&E activities.

The main goal of the Strengthening Malaria Monitoring and Evaluation Systems (SMMES) project is to strengthen technical, strategic, research and M&E capacity of the Government of Ethiopia's Malaria Control and Elimination Program (NMCEP) through hands on training of health care workers and scientists working on malaria in Ethiopia. This will help in achieving PMI's goal of 80% reduction in malaria-associated mortality by 2020.

ACIPH is a dynamic center of excellence for public health research and training. It provides technical services and conduct research and training in major health issues including malaria in Africa. The Institute has extensive experience working with national and international partners in M&E, research and training. Members of this team have successfully collaborated with NMCEP, Ethiopian Public Health Institute (EPHI), Regional Health Bureaus (RHBs), PMI and its partners on malaria activities in Ethiopia as part of the 2013 completed Associate Award (AA) to support epidemic detection in Oromia and the current SMMES project. The current team consists of scientists and public health experts from ACIPH and Tulane University and it is envisioned that this project will work to close the M&E and research gaps related to malaria control scale up in Ethiopia. Specifically, ACIPH works with

1. NMCEP, EPHI and RHBs to further develop surveillance capacity to continuously and comprehensively collect near real-time data to monitor trends in malaria morbidity and mortality;

2. PMI and other stakeholders to address key malaria operational and programmatic data to fill gaps in M&E systems e.g. the development of malaria baseline assessment tool and the development of comprehensive surveillance chart focusing on improving data quality; and
3. Partners to analyze and use existing (and in the future) national and sub-national data to implement evidence-based decision making. A key theme of this program description is sustainable local capacity building to ensure maximum sustainability and successful transfer of activities at the completion of the project.

In this extension project, ACIPH will continue its partnership with TU-SPHTM. Furthermore, ACIPH will work with other U.S. Government (USG) agencies with interests in malaria prevention and control activities such as the Department of Defense (DoD) and Peace Corps along with their respective implementing partners. The main focuses of the two-year extension project outlined in this document are:

a. Continue strengthening SM&E and Epidemic monitoring activities in the existing PMI supported 50 districts while strategically expanding similar support to 25 additional malaria elimination selected districts and their adjacent high malaria transmission districts.
b. Conduct OR on newly identified areas of programmatic interest.
c. Conduct and coordinate periodic malaria related surveys and evaluations as negotiated by PMI and the FMoH.
d. Provide M&E related technical assistance and capacity building to FMoH, RHBs, zonal health departments, and district health offices.

III. KEY ACCOMPLISHMENTS

A. Administrative Related Activities

The FY 2020 annual plan was prepared and submitted to the PMI Ethiopia team. The FY 20 quarterly reports with deliverables and invoices from our sub-partner Tulane University have been received on time and executed promptly. No other sub-agreement is active at the moment.

Financial audit of the project was conducted by external auditor. The auditor was selected from the list of auditing firms approved by the USAID and by reviewing the technical and financial proposals submitted by the competing firms. The audit report was submitted to USAID on time and the project management has responded to issues raised by the firm and USAID team. No major concern was raised from the audit and all the concerns were settled through discussion with the USAID team.

Regular update meetings were carried with the PMI team concerning the progress of the project and the implementation status of the interventions by the project. USAID partners meetings were attended by the chief of party representing the project. Furthermore, weekly project update was submitted to the PMI team.

The SMMES team at ACIPH continue conducting monthly meeting to look into the previous month's achievements, challenges and harmonization of the coming month field visit and other activities related to the project by the team members. Minute of the meetings are captured and documented with continuous follow up on the status of the action item developed during the meeting.

B. Project Related Activities

Aim 1: Provide malaria SM&E support to the National and region malaria prevention, control and elimination program

The major SM&E support by the project provided at woreda level are regularly implemented to strengthen the existing malaria surveillance system and program coordination in Oromia region. The project planned to work in 90 woredas in Oromia, Harari, Dire Dawa, and Afar in the current fiscal year. In addition to the existing 50 PMI-SMMES supported woredas in Oromia, the support was expanded to 26 malaria elimination selected woredas of Arsi zone which makes the total number of the supported woredas 76. The expansion to these 26 woredas of Arsi zone was completed in January 2020 and this makes the total number of elimination designated woredas getting support from SMMES project 68. Baseline assessment was conducted to Harari and Afar Regions and Dire Dawa City Administration health offices. However, we couldn't conduct the

training and initiate the support initially because of competing priority of regions and later on because of the travel and meeting restrictions due to the COVID-19 pandemic. Therefore, the project, currently is supporting a total of 76 woredas in Oromia only. The expansion of the support to Harari, Dire Dawa and two woredas in Afar will be done in the first quarter of FY 2021.

The means by which we provide the SM&E support to the zones, woredas and health facilities are: physical and virtual mentorships at woreda and PHCU level, woreda level review meetings, participating in partners' forum and ensuring availability of necessary M&E materials as appropriate at different levels with an intention of strengthening the existing surveillance system at all levels. The SMMES staff in collaboration with the zonal and woreda malaria, PHEM and HMIS focal persons were engaged in building the capacity of the health personnel engaged in malaria surveillance activities ranging from data recording to epidemic investigation and response during the mentorship and review meeting sessions. In the reporting period the above-mentioned activities are carried and are presented below in more detail.

Objective 1.1: Strengthen the malaria elimination surveillance (i.e. case reporting and case and foci investigation) implemented by the NMCEP in Oromia, Harari and Dire Dawa.

Activity 1.1.1: Closely work with NMCEP, RHBs, Zonal and Woreda health offices in implementing the malaria elimination surveillance in the PMI-SMMES supported elimination Woredas

Quality data collection and real-time transfer to higher level are crucial components of surveillance program. As Ethiopia moves from malaria control to malaria elimination, the surveillance system needs also develop to active case detection, reporting and case and foci investigation. Last year, the NMCEP, in collaboration with malaria partners has developed national case and foci investigation protocol and conducted training in malaria elimination woredas to initiate the case and foci investigation activities. PMI-SMMES being an active member of TAC, actively participated in the development of the protocol and also in the training conducted in Harari Region and West Hararghe, East Hararghe and Arsi zones in Oromia.

The PMI-SMMES staff along with RHBs, zonal and woreda health offices staff also conducted woreda level review meetings and provided supportive supervision/system mentorship to the woredas and selected health facilities within each woreda. During the review meetings and mentorships, special focus was given to data recording, analysis and use at the site of generation for continuous quality improvement of the program/service and data transfer from the lower level of health structure to the higher reporting level. Furthermore, the mentorship also looked into the progress of the case and foci investigation activities at each woreda and provided technical

assistance to the woreda and health facilities staff including the HEW, in carrying the activities according to the protocol.

REGULAR SUPPORTIVE SUPERVISION

Supportive supervisions/mentorships were conducted to assess quality of malaria related indicators reported through DHIS2 and PHEM and overall data management system using structured checklist. Data quality of malaria related indicators reported through the two reporting channels were assessed using Routine Data Quality Assessment(RDQA) tool. Supportive supervisions were conducted jointly with zonal, woreda and PHCU focal persons depending on the level of the health facility supervised with an aim of building capacity of woreda staff by providing on-site hands-on training/orientations, also to build capacity of on-site supervisors and to improve data utilization at facility level for continuous system/service improvement. The mentorship was also covered the status of case and foci investigation implementation at facility level and whether the investigations are being carried out according to the national protocol. After mentoring the specific facility oral as well as written feedback were provided to all responsible staff and based on the identified gaps action items were set. These activities are documented in the feedback folders provided to the woredas and health facilities by the SMMES project. Furthermore, stock status of anti-malaria drugs and commodities are also assessed and findings usually are communicated to concerned bodies (Woreda health office/ZHD/RHB). Some of the findings that need immediate intervention such as stock out of malaria related commodities, and increment in number of malaria case were immediately communicated to the next level. On job trainings/ orientation on malaria surveillance, data quality and data utilization were provided as needed mainly for newly recruited staffs and focal persons.

In this reporting year, project staffs jointly with regional, zonal health department and woreda health office experts provided 120 (51%) woreda level supportive supervisions/mentorship and 568 (178%) woreda level virtual mentorships out of the planned 236 physical and 320 virtual mentorships sessions respectively. With similar collaboration, SMMES surveillance officers provided supportive supervision and mentorship to 245 PHCUs (52% of the planned 472). The PHCU visit is just more than the planned two PHCUs per each visited woreda.

Both woreda and PHCU level supportive supervisions/mentorships were not conducted as per the plan due to engagement of the surveillance officers in the site expansion during the first and second quarters and the COVID-19 pandemic in the third and fourth quarters. Our tentative plan was to compensate the first and second quarters in the third and fourth quarters, had it not been the

COVID-19 pandemic. Furthermore, we manage to expand the support only to 26 woredas (65%) of the planned 40 woredas.

To compensate the under achievement of the physical mentorship sessions, the PMI-SMMES surveillance officers conduct virtual mentorship very frequently and surpass the panned number (see below).

Surveillance materials (registration books, analysis tools, reporting formats) are critical for sustaining strong surveillance system. The PMI-SMMES project distributed all the necessary materials to all supported sites for the whole year and hence face no shortage of M&E materials in any of PMI-SMMES supported sites.

VIRTUAL MENTORSHIPS

Virtual mentorships were conducted mainly on following implementation of action items set previously (either during physical or virtual mentorships sessions). In the reporting period, because of the COVID-19 Pandemic, virtual mentorship was used to follow the status of overall malaria surveillance service and data quality system of the woredas. In the third quarter of the reporting quarter, when travel to the sites were totally stopped, each supported woreda was communicated virtually every two weeks. This makes the virtual mentorship session conducted for the whole year to be 568 (178%) of the planned 320 for the year and of the total yearly performance, 343 (60%) were conducted in the third quarter. Findings of the virtual mentorships were communicated to onsite supervisors, zonal focal persons and concerned regional experts for their follow-up and also to speed up progress of the virtually identified action points. The major thematic areas of focus followed during virtual mentorships are indicated as follows.

Supportive Supervision: Most of the mentored woredas reported that they conducted integrated supportive supervision to the PHCUs In their catchment. In fact, their visit to the sites became more frequent as they were requested to make travel to sites and assess the COVID-19 response readiness of the health facilities under their catchment. The woreda focal persons were assessing the overall malaria surveillance activities and quality of the reported data at health facilities. They also provide oral as well as written feedbacks which were documented at the health facilities inside the folders provided by PMI-SMMES.

Malaria Surveillance Chart Utilization: The overall malaria surveillance chart update and utilization was found to be very good. Using the surveillance chart, unusual malaria case increments were detected in some woredas like Metehara, Fentalle, Bosat, Fedis, Mieso and Gumbi Bordode woredas. In each of the woredas where unusual malaria case increments were detected, the woreda focal persons investigated the reason for the increment by pin pointing

the specific hotspot kebele. The surveillance officers then, work with the focal persons in designing and implementing response. In all the sites where case increment reported, an irrigation scheme was identified to be the breeding site. Actions like distribution of LLINs, larval source management and SBCC activities were conducted.

Data Quality: All The PMI-SMMES supported woredas were using the national reporting formats, DHIS-2 and PHEM consistently and also the majority of the supported woredas have achieved the WHO recommended 80% completeness and timeliness. The sites achieving less were identified and the surveillance officers together with the zone and woreda staff conduct more intensive mentorship to the concerned staff. Feedback regarding to data quality were given to woredas by the zone and to PHCUs by the woreda focal persons. The feedback given was kept at the facility visited and will be used to assess the improvement during subsequent visits.

Antimalarial Commodity Status: Antimalarial stock status of woredas and health facilities were also followed during virtual mentorship. In addition to reporting any shortage to the responsible body, Zonal health office, RHB and EPSA hub, the PMI-SMMES surveillance officers work together with the woreda and zonal focal persons in re-distributing commodities to needed places, based on the quantity of the commodity available and the malaria case load at the site.

Malaria Test Uptake: It was speculated that one effect of the COVID-19 in the country is to give less attention to other health services. The malaria control and elimination program can be affected by at least two main reasons. 1) because of significant overlap between malaria and COVID-19 (e.g. fever, headache) the patient who has these symptoms, may not want to go to health facilities in fear of the social stigma attached to COVID-19. 2) the health facilities give attention only to COVID-19 and tend to neglect the other diseases, even doesn't give service to other health conditions. Because of these two and possibly other reasons, we suspect that there will be decrease in the malaria test uptake. The surveillance officers followed test uptake of woredas by looking at the most recent test uptake report and comparing it with last year's same season test uptake. We found that there was decrease in the test uptake in some woredas especially in quarter 3. We communicated the findings to the woredas and zones and we provide education to the community and health care providers with good effect seen in quarter 4.

WOREDA LEVEL REVIEW MEETINGS

Review meetings are platforms created to facilitate experience sharing among providers, discuss malaria surveillance data quality issues, identify challenges and set action item for addressing challenges in the presence of all parties. The review meetings are conducted after supportive supervisions to show current practice of malaria surveillance in terms of data quality and data management. Findings of the RDQAs conducted in the respective quarter were presented by the Woreda and PMI-SMMES staffs during the review meetings. Presentation are followed by a thorough discussion on the data quality of PHEM and DHIS 2/HMIS reports, performance of woreda health office and PHCUs in terms of malaria surveillance and data quality based on RDQA results. The discussion focused on identifying challenges to the data quality and at the end action items were developed jointly by all involved parties. The action plans are developed to strengthen the data management in general and the malaria surveillance data in particular and implementation of set action items were followed up by zonal & woreda focal persons, and SMMES staff. In addition to data quality, the most recent trend of malaria were also presented by zone focal persons in the review meetings. PMI-SMMES staff facilitated the meetings and also presented the knowledge sharing component which is dedicated for sharing new malaria related information.

Attendants of the review meeting include focal person from Zonal Health Department, Woreda Health Office Officials and malaria experts, PHCU director and health professional engaged in malaria surveillance including health extension workers.

A total of 80 woreda level review meetings were planned to be conducted this year, however, only 34 were conducted which makes the achievement 43%. This under achievement is due to the engagement of the PMI-SMMES staff engagement in support expansion to Arsi zone in the first and second quarters and the COVID-19 related state of emergency in the country restricting public gathering, in the third and fourth quarters.

Activity 1.1.2: Expand the surveillance support to other 40 Woredas in different regions

In the two more years of project extension, expansion of the surveillance support to 25 more districts were required. Expanding the support to Arsi zone, which is the third out of the three elimination zones in Oromia, was an initial plan to meet the target and the project has successfully expanded the support to 25 woredas of Arsi zone and Asella Town.

Using a structured baseline assessment tool developed by the project, a comprehensive baseline assessment was conducted in Afar, Harari regions and Dire Dawa City Administration health offices in October 2020 but due to overlapping of activities from both PMI-SMMES side and Dire Dawa City Administration and Harari regional health offices, we couldn't provide ToT and

cascading training to start the support. The baseline assessment findings were immediately communicated to both Dire Dawa City Administration and Harari regional health offices to help design intervention to overcome gaps identified during the assessment. SMMES project was in continuous conversation with experts from both offices to conduct SM&E training but the regions were busy to schedule the training. At the end of the 2nd quarter of the project fiscal year, COVID-19 pandemic happened and we couldn't resume the planned expansion to those regions. Therefore, the project expanded the support to only 26 (65%) woredas out of the planned 40 in FY20. The project will conduct a comprehensive SM&E training to Harari, Dire Dawa, and Afar regions and will expand the support in FY21. To initiate support in Arsi zone, 92 zonal and woreda malaria, PHEM and HMIS focal persons were provided with six days ToT training on malaria surveillance, monitoring and evaluation (SM&E) with more emphasis to data quality and case and foci investigation. Then this training is cascaded down to PHCUs and a total of 1,671 (1071 HEWs, 440 Health center staff and 160 woreda staff) were provided a one-day training on data quality and Focal Test and Treat (FTAT) by the ToT trained zonal and woreda focal persons and PMI-SMMES surveillance officers.

Activity 1.1.3: Implement the national malaria case and foci investigation protocol in one elimination woreda

As one of malaria elimination strategy, Ethiopian National Malaria Control and Elimination Program (NMCEP) has developed national case and foci investigation protocol and conducted training in malaria elimination and FTAT.

In line with the NMCEP plan, discussion was made with Oromia regional health bureau and West Hararghe zonal health department and Chiro woreda was selected to prepare the woreda as a case and foci investigation learning center. As per the NMCEP's Case and Foci Investigation recommendation, an investigation team composed of all necessary health workers was established at all Health Centers and Case and Foci investigation was initiated in WHO Week 9 of 2020. PMI-SMMES staff have been virtually conducting mentorship with Zonal and Woreda level focal persons and providing technical assistances on case and foci investigation to the woreda. The challenges faced and the actions taken to overcome the challenges were communicated regularly to NMCEP, ORHB, ZHO, WoHO and PMI-E team. Below is summary of the findings:

In Chiro woreda, since the start of FTAT activity (WHO week 9), a total of 14 malaria cases were confirmed out of which 11 were eligible malaria cases for investigation. The rest three were residents from outside of the woreda. Out of the 11 eligible 08 (73%) were investigated while the remaining three were left because they reside in a kebele far from the woreda and the staff from the woreda has

transportation problem to travel and did the case investigation. A total of 12 households, with a total of 63 members were found to be eligible to implement FTAT and all the 63 residents received the malaria test. Four secondary cases, all classified as locally acquired, were identified and treated according to the national guideline. The activity continued but identified no new index case in the woreda since WHO week 17 until the end of the reporting period.

SM&E materials distribution

Monitoring Evaluation/Surveillance materials (registration books, analysis tools, reporting formats) are critical for sustaining strong surveillance system. SMMES project, as part of the system mentorship , regularly check the availability of such materials, which are prepared and distributed through the government channel, and fill gaps if identified shortage. In the current fiscal year, the project provided PHEM and DHIS-2 reporting formats as gap filling and registration books for health center laboratory units and for health posts, and malaria surveillance charts, prepared by PMI-SMMES in collaboration with ORHB and other partners, to all supported sites, including the newly enrolled woredas in Arsi zone. The surveillance chart as reported in the previous reports is important innovation and tool, developed by the project and endorsed by the ORHB fully and by FMoH partially, which helps monitor essential malaria indicators and data quality status of the facilities.

Objective 1.2: Continue to strengthen the existing data collection and transfer system in the 10 supported non-elimination woredas in Oromia and Afar regions.

Activity 1.2.1: Ensure all supported non-elimination health facilities transfer real-time data to the next higher level

Quality data collection and real-time transfer to higher level is crucial for having strong surveillance program. The PMI -SMMES project continued to collaborate with FMoH and RHBs to strengthen the data collection system at all health facilities in 08 supported non-elimination woredas and health facilities under them in Oromia. The baseline assessment to expand support to two woredas in Afar were conducted but the actual support wasn't initiated because of competing priorities in the first and second quarter and because of the COVID-19 pandemic in the 3rd and 4th quarters. The plan is to provide the training and initiate the support in FY 2021.

The activities carried to strengthen the surveillance system at these sites are similar to those described above for the elimination woredas but with lesser intensity, i.e. supportive supervision/mentorship in collaboration with the woreda staff, quarterly RDQA, annual woreda level review meetings. All the eight woredas have reported malaria data using PHM and

HMIS/DHIS-2 according to the national reporting guideline. Furthermore, RDQA conducted in all the sites showed that the data quality is up to WHO standard of 80% and above.

Activity 1.2.2: Ensure that supported woredas have the capacity to self-sustain malaria surveillance system with minimal support from the project

No doubt that the ultimate goal of the project is to see quality malaria surveillance system in the supported woredas beyond the project life. In this regard, the project has been closely working with the zone and woreda staff in all activities. i.e. the project staff will always be accompanied by zone and woreda staff during mentorship, the woreda staff are responsible in preparation and presentation of RDQA findings during review meetings, etc. this we believe will strengthen the system by transferring the knowledge and skill of PMI-SMMES staff to the zone and woreda staff. The sustainability of the activities by the woreda with reduced frequency of visit by the PMI-SMMES staff was closely monitored through the quarterly virtual mentorship program, bi-annual physical mentorship and annual review meetings. This assessed the status of the woreda to sustain the activities with minimal PMI-SMMES support. Furthermore, during the bi-annual visit to the woredas, we analyzed RDQA findings quarterly to assess the data quality issue with less frequent visit by the project to the woreda. Based on the RDQA data, 49 of the 50 woredas have shown evidence that they have accomplished self-sustaining of the malaria surveillance activity (i.e. they have demonstrated progressive improvement of availability, timeliness and completeness of PHEM and HMIS/DHIS2 data surpassing the WHO target of 80% in all the above mentioned quality indicators when assessed on EFY 2012 Q2. considering the above mentioned input the virtual mentorship findings and the objective assessment of the data quality improvement as seen by the RDQA, we believe the 50 woredas supported are self-sustained.

Activity 1.2.3: organize a learning visit for non-SMMES supported Woreda staff to SMMES supported woreda

This activity is not implemented because of the security issue in the first and second quarters and COVID-19 situation in the country in quarter 3 and 4. Furthermore, we dropped this activity all together because of budget shortage to procure extractor to AHRI, which is essential for the tMDA/RCD study.

Aim 2: Conduct and coordinate malaria operational research, formative evaluations and special studies including surveys in collaboration with PMI and FMOH, EPHI, and RHBs

Objective 2.1: Design and conduct operational research related to malaria in selected priority areas

As indicated in the overall goal of the project, conducting operational research is one of the aims of the PMI-SMMES/ACIPH project. This year's planned and performed activities related to this aim are described below.

Activity 2.1.1: Manuscript development from the LLIN longevity study

In the reporting year, the comments gathered during the dissemination workshop were incorporated and the final report was submitted to all concerned including NMEP and PMI. The target set for the reporting year was to develop 03 manuscripts and all the three manuscripts were developed and one of them is shared to the co-investigators, comment gathered and is we are currently accommodating the comments and submit for publication. The remaining two manuscripts are under review by the chief of party before sharing it with the co-investigators and will be shared to the co-investigators soon. All the three manuscripts will be submitted for publication within the first quarter of FY 2021. The study finding was also communicated, through poster presentation, to the scientific community during annual meeting of ASTMH 2019.

Activity 2.1.2: Complete the safety and tolerability of primaquine for radical cure of Plasmodium vivax in Ethiopia evaluation

This is an observational study to see the safety and tolerability of primaquine administered for radical cure of P. vivax malaria without knowledge of G6PD status of the patents, according to the national malaria treatment guideline. The study was initiated at three malaria elimination woredas in Amhara, Oromia and SNNPR in May 2019 and the plan was to complete the data collection in one year. However, on doing the interim analysis on 300 study participants, in January 2020, we found that there was no single G6PD deficient case and since the secondary objectives stated in the study needs comparison between G6PD deficient and normal individuals and since the rollout of Primaquine, which was only to elimination woredas when we wrote the proposal, was expanded to non-elimination woredas as well, which gave us a chance to include sites known historically to have higher report of G6PD deficiency. Furthermore, WHO issued concern on Acess Bio inc. which is a supplier of the G6PD test kit we were using fir the study, hence, we are forced to change

the source of the kit to another firm. To address these two issues we decided to request protocol modification to include sites from non-elimination woredas where G6PD deficiency is said to be more and also to accommodate the change in the G6PD test kit issue. Unfortunately, the approval of the modification and the procurement process of the new G6PD test kit took more time than we anticipate because of the COVID-19 pandemic. Currently we have both the amendment approval and new test kit and started the expansion by providing training on the new kit. Interim analysis result is annexed (annex 1).

Activity 2.1.3: Initiate the evaluation of targeted mass drug administration and reactive case detection on malaria transmission and elimination in Ethiopia

This is a cluster randomized evaluation with three arms to compare the impact of targeted mass drug administration (tMDA), reactive case detection (RCD) implemented within 100m radius of the index case as intervention arms and the routine facility based passive case detection and treatment as control arm. the primary outcome to be measured is Annual Parasite Incidence (API) collected through routinely collected malaria data from health facilities and the secondary outcomes were measured by conducting two cross-sectional surveys at baseline and end line. The research team members are from FMoH, AHRI, PMI-SMMES/ACIPH project, PMI (Ethiopia, Atlanta) and other relevant partners from in-country and abroad.

The baseline assessment was successfully conducted at 48 kebeles of East Hararghe zone and a preliminary report of the baseline assessment was prepared and shared with researchers and NMCEP team. The report is annexed as annex 2. However, our plan to initiate the intervention immediately after the baseline assessment can't be materialized mainly because of the COVID-19 pandemic but also to some extent because of the delay in the procurement of the new G6PD test kit. We have plan to initiate the intervention in the first quarter of FY 2021.

Objective 2.2: Strengthen the malaria research network of Ethiopia

In Ethiopia low number of malaria research output, poor coordination of research and poor dissemination has been identified to be a chronic problem and the problem also identified as one gap during the stakeholders meeting conducted by the project in November, 2014. To address this chronic gap, PMI-E has supported the establishment of a research forum back in May 2010 for sharing research findings and cross breeding ideas among researchers. Members of the forum are local universities and different research teams. One of the activities carried by the forum is, organizing a conference where malaria research works were presented by different researchers. The venue of the conference rotates at different local Universities with aim to benefit under and

postgraduate students at the universities, who will have a chance to attend the presentation of different research papers. This also give members of the forum chance to visit and know about the various research activities conducted by different local universities. Furthermore, this approach will strengthen the link between Universities (researchers) and malaria prevention, control and elimination program. So far, eleven symposia were successfully hosted by local universities and EPHI. USAID/PMI-E (in the last five symposia through ACIPH/SMMES project) has supported all the past eleven conferences financially and technically.

Activity 2.2.1: Organize the 11th malaria research symposium

The PMI-SMMES/ACIPH project in collaboration with FMoH/EPHI, organized the 11th Symposium at Debre Markos University. The PMI-SMMES and TU in collaboration with EPHI and FMoH lead reviewing abstracts and selected papers presented at the forum, moderated sessions deemed necessary and participated in the preparation of proceeding of the meeting. This year's symposium was conducted colorfully and a total of 14 oral and 10 poster presentations from different local Universities and research institutes were presented. One hundred fifty faculty, student and malaria researches from different Universities and research institutes attended the symposium. As per the tradition, the second day afternoon was dedicated for business meeting, where we here activities from the sub-committees and finalize their terms of reference. Jigjiga University was selected to host the 12th malaria research symposium.

Activity 2.2.2: Regularly update the MRNE webpage within the EPHI website and support world malaria day scientific session

With the aim of strengthening the ownership of the network by EPHI, which in turn is a good move to sustain the network's activity beyond the PMI-SMMES project life, webpage was created within the EPHI website. The aim was to regularly update the webpage with news of the malaria research network of Ethiopia and also upload malaria related research works. In the reporting year, the EPHI team was very busy with the COVID-19 response in the country and couldn't upload articles on the webpage. As alternative temporary solution, we use the ACIPH website, SMMES web page. The other sub-activity under this activity was the support provided to organize regional review meeting or scientific session during the world malaria day celebration. In the current year, the celebration was cancelled because of the COVID-19 pandemic, hence no support was provided.

Objective 2.3: Provide assistance in developing and implementing special studies and surveys of national interest

As a pre-request for the global fund application, which was held in 2020, the NMCEP planned to conduct a "modified" malaria indicator survey (MIS) and established a technical advisory committee under the leadership of EPHI. The PMI-SMMES project as a member of the committee and an M&E implementing partner of PMI, has provided all the necessary supports, which are summarized below:

- Actively involved in the development of the protocol for quantitative LLIN coverage, utilization and treatment seeking behavior, which is led by EPHI.
- Provided logistics support in the development of the protocol
- Participated in the training of the data collectors
- Lead the development of protocol to qualitatively study the reason for low LLIN utilization in the country

The quantitative study led by EPHI was completed but the qualitative one can't be completed because of COVID-19 pandemic and we are currently having discussion with NMCEP to re-vitalize and do the study and is hoping to do it in the first quarter of FY 2021.

Aim 3: Provide selected technical assistance for malaria prevention and control interventions policy development and program coordination

Objective 3.1 Provide TA for malaria SM&E requested by NMCEP, EPHI and ORHB

Activity 3.1.1: Identify areas of TA

Before the development of our work plan, as the PMI-SMMES project always do, discussion was held with NMCEP, PMI and Oromia RHB, to identify areas of TA for the year and develop the work plan based on the need by these major stakeholders. Furthermore, by attending the different TAC, TWGs and regional partners' meeting, the project identified areas needed technical assistance and provide. The assistance can be provided by the project full time and part time staff, Tulane University staff and a consultant as needed.

In the current reporting period, the following activities were implemented under this objective.

Support the Malaria Program Review (MPR) activity

The MPR is primarily meant to help a country and its partners to set or reset its medium-term malaria agenda based on evidence. Ethiopia conducted the last MPR in 2017 to review the 2014-

2016 NMSP. This reporting year was time to conduct MPR to look into the achievement of the ending NMSP and gather evidence to be used in the development of the upcoming NMSP and write-up of the Global Fund grant application for 2020-2022. The decision to conduct the MPR was made in accordance with the strategic plan (MSP 2021-2025), the presence of various partners who had interest and commitment to support the endeavor, and the government's need to verify the significant achievement in malaria control and elimination in the country. The PMI-SMMES project was actively involved in desk review field validation and thematic desk review report write up of the MPR technically by assigning experts both from the project and the sub-recipient, Tulane University and financially by supporting logistics of field validation.

Support important evaluation planned by the NMCEP to support the NMSP development and Global fund application

The sub-activities under this activity were discussed under aim 2 above.

Support the development of National Malaria Strategic Plan (NMSP: 2021-2025)

The national Malaria Elimination Strategic Plan, 2021-2025 was developed through series of consultations and active involvement of stakeholders. PMI-SMMES project has actively participated in the development. For effective coordination of the NMSP development considering the covid-19 pandemic, a steering/coordinating committee involving national malaria program and key partners were formed and the team were discussing via virtual meetings to draft and finalize the plan. In the process, technical working groups (TWGs) with different relevant stakeholders as members were formed to draft part in their respective thematic areas. PMI-SMMES project staff were members of in the EPR-SMEOR (Epidemiology, epidemic preparedness and response, surveillance, monitoring and evaluation and operational research) and case management TWGs and actively participated in the development of the NMSP. Furthermore, our sub-partner, Tulane University has reviewed the draft NMSP and provided a valuable comment.

Objective 3.2: Strengthen the coordination of malaria control program in Oromia region

Oromia is the largest regional state both in population and land mass in Ethiopia with a projected population of 34,575,008 and an area of 353,006.81 km² (Adjusted population with CSA estimation Feb 2015). The region has 299 woredas distributed in 20 zones and has a geographic diversity from arid low land to fertile, vegetated land with high rainfall and cool mountainous areas. ORHB is mandated in leading all health-related activities in the region including the coordination of different partners' activities. As in the rest of the country, the prevalence of malaria is very much declining in Oromia. However, malaria is still one of the top 10 diseases in many

high malaria transmission areas of the region and remained to be a public health problem with an estimated population of 20 million at risk of infection. Since the population and the landmass of the region is substantially big with a number of public health problems including malaria, a number of local and international partners are implementing malaria prevention and control programs in the region and the coordination of the malaria control and prevention activities by these partners has an advantage of minimizing duplication of efforts and efficient utilization of resources.

PMI-SMMES project closely working with the ORHB malaria team, identified the need for coordination of the malaria prevention, control and elimination activity in the region. Cognizant of this, the PMI-SMMES project has seconded a staff to support the coordination of the malaria program in the region. In the current year the project will continue to support the staff salary, who will continue working with PMI-SMMES staff and ORHB malaria team to support the coordination of malaria program in the REGION.

The following are activities related to malaria program coordination in Oromia, that the seconded staff will closely follow.

Activity 3.2.1: Organize the quarterly partners' forum

The seconded staff continued organizing the partners' meeting on a quarterly basis with an intention to share experience, accomplishments, and implementation challenges encountered during each quarter. This forum is mainly intended to help partners align their work plan with the RHB's planned activities, communicate a summary of partners' report to the RHB officials on a quarterly basis with a primary intention of minimizing duplication of efforts and efficient utilization of resources. Furthermore, this forum was an experience sharing media, which strengthened collaboration and learning from each other and adapt best practices of one partner by another. In the reporting year, the first two meetings were organized by face to face meeting, while the last two were attempted to be conducted through virtual means, with a lot of internet connectivity problems.

Activity 3.2.2: Organize bi-annual joint supportive supervision

This initiative drew experts and/or responsible persons to come together for joint supervision and learn from each other's program in the field. In the reporting year, the seconded staff coordinated the bi-annual joint supervision successfully and the PMI-SMMES project provided technical and financial support. Furthermore, the project has supported two other supportive supervisions in the year to investigate possible reasons for the case increment seen in West Guji and West Shoa. During the visit to west Guji, the PMI-SMMES project presented the support provided up to now

in the presence of the ORHB malaria team leader and indicated the future direction of very little support by the project as the support provided to the woreda is almost 10 years.

Activity 3.2.3: Conduct Annual Review Meeting

Oromia Regional Health Bureau, traditionally organize annual malaria program review meetings in the presence of zonal heads, Communicable Disease Coordinators (CDC) and malaria focal persons. In the current fiscal year, because of the COVID-19 pandemic, the review meetings were organized by dividing the zones into cluster. The PMI-SMMES project provide technical as well as financial support to the elimination zone cluster, where East and West Harerghe and Arsi zones were included.

These review meetings were intended to review the status of malaria elimination activity at zonal and woreda level and plan malaria elimination activities. The review meeting facilitated sharing best practices and lessons learned, identifying challenges, and indicating the way forward to achieving malaria prevention, control and elimination goals.

Objective 3.3: Participate in different malaria national technical working groups (TWGs) and provide technical support on malaria M&E related topics as requested by the FMoH

Under the leadership of the FMoH's national malaria control and elimination program (NMCEP) team, there are case management, elimination and vector control TWGs. Since M&E is cross cutting, and need to be incorporated in all TWGs, the project staff actively participated in all TWGs and contributed especially in M&E related issues. The major activities of the TWGs in the reporting year was to contribute in the development of NMSP. As indicated above the project staff actively participated in the two TWGs. Furthermore, the project staff also actively participated in all national malaria technical advisory committee (TAC) meetings in the reporting year.

IV. Summary of Accomplishment Against Target

Objective	Activity planned for the quarter	Status	Remark
Aim 1: Provide malaria SM&E support to the National and region malaria prevention, control and elimination program			
Objective 1.1: Strengthen the malaria elimination surveillance (i.e. case reporting and case and foci investigation) implemented by the NMCEP in Oromia, Harari and Dire Dawa.			
Activity 1.1.1: Closely work with NMCEP, RHBs, Zonal and Woreda health offices in implementing the malaria elimination surveillance in the PMI-SMMES supported elimination Woredas	All facilities in supported woredas transfer real time data	Achieved	This is a continuous process. The aim is for all facilities to transfer real time data
	Conduct 236 woreda & 472 PHCU level supportive supervision visits.	Not achieved	120 Woreda health offices (51%) and 245 (52%) PHCUs were visited. The under achievements were due to engagement of the surveillance team in site expansion in the first two quarters and the COVID-19 pandemic in the third and fourth quarters.
	Organize 80 woreda level annual review meetings	Not achieved	34 review meetings were conducted (Achieved 43%). No review meeting was conducted in 3rd and 4th quarter of FY20 due to COVID-19 pandemic
	Conduct virtual mentorships	Achieved	A total of 568 (178%) virtual mentorships were conducted with aim to compensate the underachievement seen with the physical mentorship
Activity 1.1.2: Expand the surveillance support to other 40 Woredas in different regions	Number of new woredas baseline assessment conducted (40)	Achieved	A total of 43 woredas baseline assessments conducted (26 woredas of Arsi zone, 06 woredas of Dire Dawa City Administration, 02 woredas of Afar and 09 woredas of Harari regions).
	Number of zonal and woreda staff trained on malaria surveillance ToT to cascade the training to their respective health facilities (126)	Partially achieved	Conducted ToT to Arsi zonal and woreda staff, a total of 92 participants successfully attended the Training of Trainers (ToT). But the ToT was not conducted to Afar, Dire Dawa and Harari regions due to overlap of activities and COVID-19 pandemic
	Number of health care providers who receive onsite training/orientation on data quality (2,000)	Partially Achieved	A total of 1671 (83.6%) participants (1071 HEWs, 440 health center providers and 160 Woreda experts/focal persons) attended the cascading training
1.1.3: Implement the national malaria case and foci investigation protocol in one elimination woreda	Start case and foci investigation at one selected woreda as a learning center	Achieved	Chiro woreda was selected and case and foci investigation was started to prepare the woreda as a learning center for FTAT

	Percentage of case investigated and classified from the case notified (100%)	Partially Achieved	In Chiro woreda, since the start of FTAT activity (WHO week 9), a total of 14 malaria cases were confirmed out of which 11 were eligible for investigation and 08 (72.7%) investigated
	Number of program managers and health care providers trained on case and foci investigation (90)	Achieved	All HEWs, PHCU Directors and PHEM Focal Persons of all Health Centers in Chiro woreda, Chiro WoHo PHEM & Malaria Focal Persons, and HEP Coordinator were trained on case and foci investigation
	Percentage of foci investigated out of the classified as locally acquired malaria (100%)	Partially achieved	In all the 8 investigated cases, partial foci investigation in identifying the source of the infection and response was attempted. However, no complete format developed by the NMCEP on foci investigation and complete workout of the foci investigation wasn't carried
Objective 1.2: Continue to strengthen the existing data collection and transfer system in the 10 supported non-elimination woredas in Oromia and Afar regions.			
Activity 1.2.1: Ensure all supported non-elimination health facilities transfer real-time data to the next higher level	All facilities in supported woredas transfer real time data	Achieved	This is a continuous process. The aim is for all facilities to transfer real time data to the immediate higher level
Activity 1.2.2: Ensure that supported woredas have the capacity to self-sustain malaria surveillance system with minimal support from the project	50 woredas with self-sustained performance	Achieved	The 50 woredas have demonstrated self-sustained performance in malaria surveillance system as demonstrated by RDQA
Activity 1.2.3: organize a learning visit for non-SMMES supported Woreda staff to SMMES supported woreda	15 practical learning and experience sharing visits conducted by staff from PMI-SMMES unsupported to supported woredas/health facilities	Not achieved	Due to extensive expansion activities and COVID-19 pandemic, this activity was not conducted. This is one activity that we want to drop due to budget shortage as there is unplanned procurement of recruitment of equipment extractor for AHRI to conduct the tMDA/RCD lab work
Aim 2: Conduct and coordinate malaria operational research, formative evaluations and special studies including surveys in collaboration with PMI and FMOH, EPHI, and Regional Health Bureaus (RHBs).			
Objective 2.1: Design and conduct operational research, related to malaria in selected priority areas			
Activity 2.1.1: Manuscript development from the LLIN longevity study	LLIN durability study manuscripts developed # of manuscript developed	Achieved	Three manuscripts were developed and are circulating for comment by the co-authors

	Number of abstracts submitted to present at different symposia	Achieved	The finding of LLIN durability study was communicated at the annual American Society of Tropical Medicine and Hygiene (ASTMH) meeting as poster presentation.
Activity 2.1.2: Complete safety and tolerability of primaquine for radical cure for P. vivax evaluation	Recruitment of patient completed (Y or N)	Not Achieved	Recruitment stopped because we have to initiate a new procurement process for a new G6PD test as WHO issued concern on the firm producing the previous kit (CareStart)
	Data analysis and write-up of final report completed (Y or N)	Not Achieved	Patient recruitment wasn't completed because of the reason mentioned above
	Dissemination workshop organized (Y or N)	Not Achieved	Same reason as above
Activity 2.1.3: Initiate targeted mass drug administration and reactive case detection on malaria transmission and elimination in Ethiopia evaluation	Baseline survey conducted (Y or N)	Achieved	The baseline assessment was successfully conducted in 48 kebeles of East Hararghe zone and a preliminary report of the baseline assessment was prepared and shared with researchers and NMCEP team. The summary report is annexed with this report
	The evaluation interventions initiated (Y or N)	Not Achieved	The evaluation intervention was not initiated due to COVID-19 pandemic. The intervention will be initiated in FY 2021 first quarter.
Objective 2.2: Strengthen the malaria research network of Ethiopia			
Activity 2.2.1: Organize the 11th malaria research symposium	11th malaria research symposium	Achieved	The 11th MRNE symposium was conducted in collaboration with Debre Markos University, EPHI and FMoH
Activity 2.2.2; Establish the subcommittees as suggested during the 10th symposium meeting	Established the subcommittees	Achieved	Three subcommittees were established. The subcommittees are: - The scientific and grant writing subcommittee, - Membership and recognition subcommittee and - Documentation and communication subcommittee
Activity 2.2.3: Regularly update the MRNE webpage within EPHI Website and support the world malaria day scientific session	The MRNE webpage within EPHI website updated bi-annually	Not achieved	The EPHI team was pre-occupied by the COVID response and we were unable to update the webpage. However, we uploaded literatures on SMMES page under ACIPH's website.

	Support for world malaria day scientific session or review meeting provided	Not Achieved	The world malaria day was not celebrated due to COVID-19 pandemic
Activity 2.3: provide technical assistance necessary in developing and implementing special studies and surveys of national interest	Technical assistance provided to the NMCEP in developing "modified" MIS (Y or N)	Achieved	
	Technical assistance in implementation of the "modified" MIS provided (Y or N)	Achieved	
Aim 3: Provide selected technical assistance for malaria prevention and control interventions policy development and program coordination			
Objective 3.1: Provide TA for malaria SME requested by NMCEP, EPHI and ORHB			
Activity 3.1.1: Identify areas of TA	Areas of TA identified	Achieved	
Activity 3.1.2: Hire a seconded staff to EPHI to strengthen malaria team in the institute	Seconded staff hired (Y or N)	Not achieved	We developed JD for the seconded staff and shared with the EPHI director general and reminded him more often and we got no response
Activity 3.2.: Strengthen the coordination of malaria control program in Oromia region			
Activity 3.2.1: Organize quarterly partners' meetings/forum	Quarterly Partners' meeting conducted	Achieved	
Activity 3.2.2: Organize bi-annual joint SS lead by ORHB	Bi-annual joint Supportive Supervisions organized	Achieved	We provide technical and financial support to three joint supportive supervisions organized by ORHB
Activity 3.2.3: Conduct annual malaria program review meeting	One malaria program review meeting conducted	Achieved	Review meetings were conducted by making different clusters to avoid large gathering. We provide financial and technical support for elimination zones cluster review meeting
Activity 3.3: Participate in the different malaria national technical working groups (TWGs)	% of TWG meetings attended by project staff	Achieved	Staffs attended all TWG meetings held in the reporting year
	% of TAC meeting attended	Achieved	Staffs attended all TAC meetings held in the reporting year

Table 1: Summary of Accomplishments against target FY 2020

V. FINANCIAL SUMMARY

The expenditure is being monitored closely by the finance manager and the Chief of Party (CoP) looking at individual budget category as indicated on the cooperative agreement. Financial reports in forms of monthly expenditure with occasional advance request and the quarterly accrual reports were submitted on time. The overall expenditure vis-a-vis the total budget shows that the project is moving in the right direction as far as expenditure is concerned.

Annex 1: Primaquine safety and tolerability study interim result

The ***primary objective of the study*** is to Identify any adverse events and clinically relevant decreases in hemoglobin following the standard PQ administration for radical cure of *P. vivax,* without G6PD testing. As secondary objective, we planned to determine the prevalence of G6PD deficiency and the molecular variants of G6PD deficiency, the safety and tolerability and hemoglobin drop between G6PD deficient and normal patients, in sample of health facilities in Amhara, Oromia, and SSNPR, Ethiopia. The estimated sample size of the study was 880 patients and is disaggregated by the prevalence of G6PD deficiency levels- assuming 1% for Oromiya & Amhara (sample size of 774, 88% of the total sample and 7% for SNNPR (sample size of 106, 12% of the total sample). The study was initiated in June 2019 and about 300 patients recruited through February 2020. Assessment of partial data, those already collected from the study sites, (189 patients) using descriptive statistics revealed the following preliminary results:

Hillmen color chart follow-up for hemoglobinuria:

A median urine color score on day-0 was 3

A median urine color score on day-3 was 2

A median urine color score on day-7 & 13 were 1

Concentration of hemoglobin (Hgb)

A median concentration of 13.1 g/dL on day-0

A median concentration of 12.3 g/dL on day-3

A median concentration of 12.7 g/dL on day-7

A median concentration of 12 on day-13

Hemoglobin (Hgb) drop follow-up – patients with a drop of > 25% from the previous level and are asymptomatic are followed on daily basis or admitted and if demonstrated further drop, will be excluded from the study and referred. Those with symptoms of anemia, whatever the drop level may be, will be excluded from the study and referred. The data for those with >25% drop from the previous level and are asymptomatic were:

- Day 0 thru 3; Eight (8) patients were with a drop of greater than 25%.
- Day 3 thru 7; Five (5) patients were with a drop of > 25%.
- Day 7 thru 13 Zero (0) patients were with a drop of greater than 25%.

- Comparing Day 13 level with the baseline, 26 patients had >10% Hgb decrease on day 13 and were appointed for follow-up on day 27

None of the patients, with close follow up on daily basis because of a hemoglobin drop >25% but asymptomatic and those appointed to come on day 27 because of hemoglobin drop >10% from the baseline on day 13, showed further drop or become symptomatic to require referral.

Adverse Event Follow-up

No observed SAE so far

Four patients showed mild and 1 patient showed moderate AEs and managed at the enrollment site by the clinicians.

Adherence to Treatment

Generally, the adherence to treatment for those who remained in the follow up, was very good. Only two patients on day 3, two on day 7 and another two on day 13 found to have non-adherent to drug treatment by pill count.

Adherence to Care

About 84% (159/189 patients) completed the follow-up, 01 discontinued due to AE, 12 refused to continue in the study and 17 were lost to follow-up.

G6PD deficiency

There was no single G6PD deficient among the 300 patients enrolled. The study was on halt since February 2020 following the notice of concern from WHO on the quality of Access Bio qualitative diagnostic product (CareStart G6PD). The study will shift to use a quantitative diagnostic tool, Standard G6PD testing from SD Biosensor, following the procurement of the tool.

Initially the study was limited to facilities within elimination designated districts because the national malaria treatment guideline limited the administration of PQ for radical cure of *P.vivax* to elimination districts only. However, with the scale up of radical cure of *P. vivax* yo non elimination districts nationally, a revised protocol to include non-elimination districts was submitted and approved by EPHI IRB. We have plan to expand the study sites to areas with high prevalence of G6PD and high P.vivax. The study is expected to resume at the end of September 2020.

Annex 2: Baseline assessment findings of evaluation of tMDA, RCD and control on malaria annual parasite incidence

Background

As Ethiopia moves towards malaria elimination, different intervention strategies that are important to achieve elimination, need to be assessed and implemented. Cognizant of this, the PMI-SMMES/ACIPH team in collaboration with the NMCEP/FMoH, Armor Hansen Research Institute and other partners plan to conduct cluster randomized trial to evaluate the effect of targeted Mass Drug Administration (tMDA) and Reactive Case Detection (RCD). The Primary outcome of the evaluation is the change on annual parasite incidence (API) in the three arms after two-year implementation of the interventions. The evaluation will also conduct baseline and end line surveys to compare the secondary outcomes of the evaluation, like prevalence in the three arms. The evaluation protocol obtained ethical clearance from AHRI institutional review board (IRB) and the National Research Ethics Review Committee (NRERC). We conducted baseline assessment of the 48 study kebeles and this preliminary report aims to summarize the results of the assessment.

The baseline assessment was conducted in 48 randomly selected kebeles of East Hararge zone, in Oromia. Before conducting the survey, total census of the 48 kebeles households (HHs) were conducted. Following the census, 960 HHs (20 HHs from each kebele, as per the protocol) were randomly selected and 936 (97.5%) HHs were reached and interviewed. All consented household members were tested for malaria and those tested positive were treated by the health extension workers, according to the national malaria treatment guideline. DBS samples were also collected from consented participants for future study as stated in the protocol and approved by NRERC *(see figure 1).*

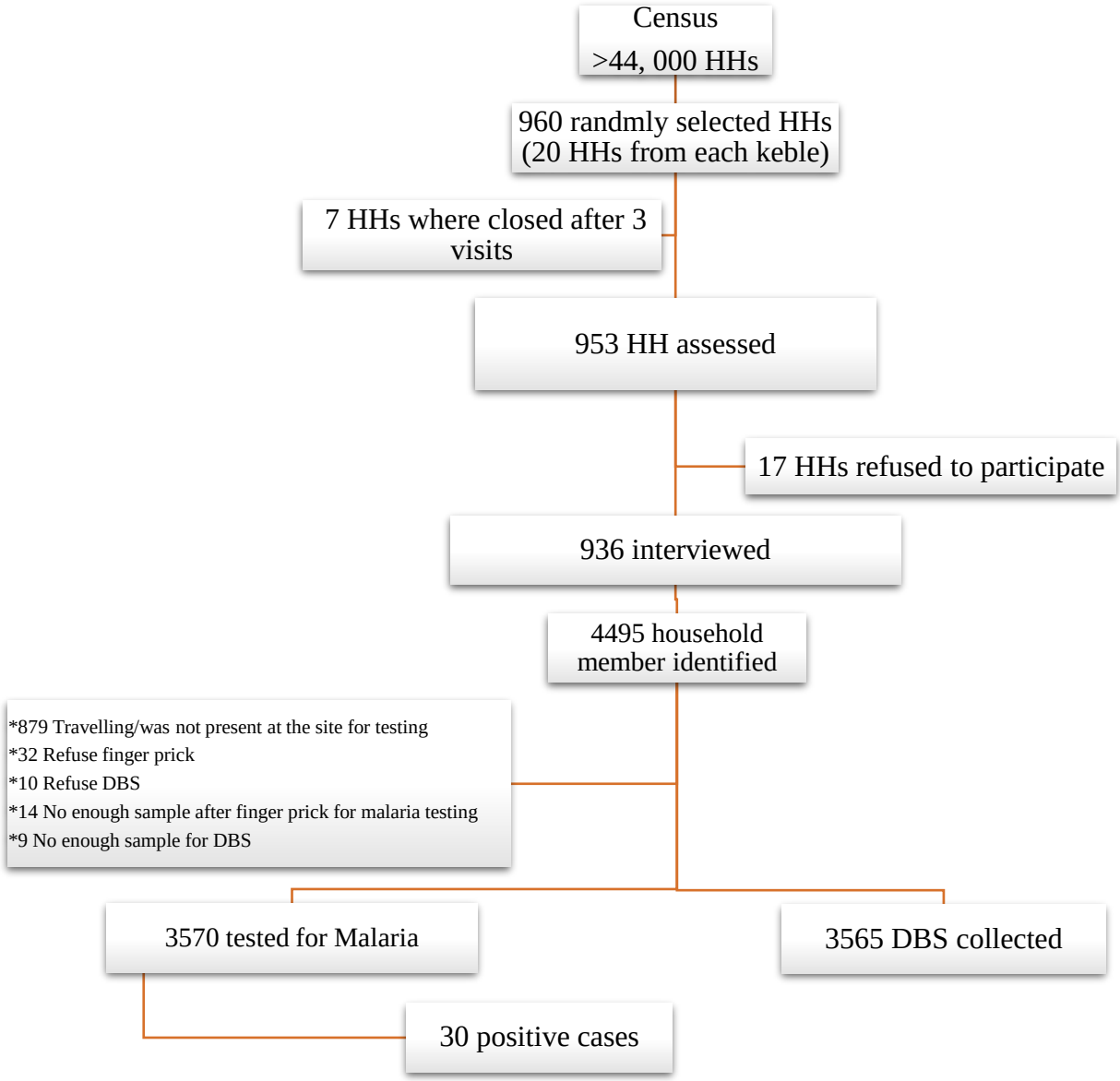

Figure 1: Summary chart showing the baseline assessment steps

Background characteristics of households

Close to 60% of the surveyed population has access to improved or protected drinking water but only 22% and 30% has access to electricity and toilet facility, respectively. Majority of the households, 87.4%, have only one room used for sleeping and 94.6%, use firewood/straw as cooking fuel. Just above half, 52.1% have telephone, which almost all is a handheld mobile phone. About 86% of the households own no or less than 2 hectares of land for farming and 82.1% own at least one type of farm animal like: cattle for dairy and meat product, goat, sheep, donkey, mule, horse, chicken, etc. the average size of the family is found to be 4.8 with SD of ±2.3 and the average net/household is found to be two. (see table 1).

Variables (m=936)		Frequency or mean	Percent or ±SD
Source of drinking water	Improved/protected source	545	58.2
	Unimproved/unprotected source	391	41.8
Electricity	Yes	204	21.8
	No	732	78.2
Toilet facility	Improve/Unimproved facility	277	29.6
	No facility/Bush/field	659	70.4
Availability of window	Yes	154	16.5
	No	782	83.5
Wall condition	Improved (Cement/brick)	909	97.1
	Natural/No wall	27	2.9
Flooring material	Improved (cement, vinyl, carpet)	53	5.7
	Natural (Earth, sand, dung, palm)	883	94.3
Room used for sleeping	One	818	87.4
	Two	115	12.3
	Three	3	0.3
Separate sleeping space	One	654	69.9
	Two	253	27.0
	Three	29	3.1
Cooking fuel	Electricity	7	0.7
	Kerosene	3	0.3
	Charcoal	12	1.3
	Firewood/straw	885	94.6
	Crop residue	24	2.6
	Other	5	0.5
Telephone/Mobile ownership	Yes	488	52.1
	No	448	47.9
Farming land ownership	No land	149	15.9
	<2 Hectares	654	69.9
	2-25 Hectares	120	12.8
	>25 Hectares	9	1.0
	Don’t know	4	0.4

Farm animal ownership	Yes	768	82.1
	No	168	17.9
Average family size		4.8	±2.3
Average net/household		2.0	±0.9

Table 2: Description of households' characteristics

Background characteristics of respondents

Looking at the head of the household characteristics, most household heads, (83.2%) are male. The age range of household heads is 15 - 102 years and, 5 (0.5%) are below the age of 18 years and 81 (8.7%) are above the age of 65 years. Five hundred thirteen (55%) of the household heads are between the age group 25–44 years. More than half (59.7%) of the household heads did not attend formal education and only 2.0% made it to higher education (see table 2).

Variables (n=936)		Frequency	Percent
Headship	Male	779	83.2
	Female	157	16.8
Age	15-19	23	2.5
	20-24	94	10.0
	25-29	124	13.2
	30-34	120	12.8
	35-39	142	15.2
	40-44	127	13.6
	45-49	63	6.7
	50-54	71	7.6
	55-59	35	3.7
	60-64	56	6.0
	65 and above	81	8.7
Education	No formal education	559	59.7
	Primary	304	32.5
	Secondary	54	5.8
	Higher	19	2.0

Table 3: Description of households' heads characteristics

The population pyramid shows a typical developing country pattern with a larger proportion of the population being in younger age groups for both sexes. (figure 2).

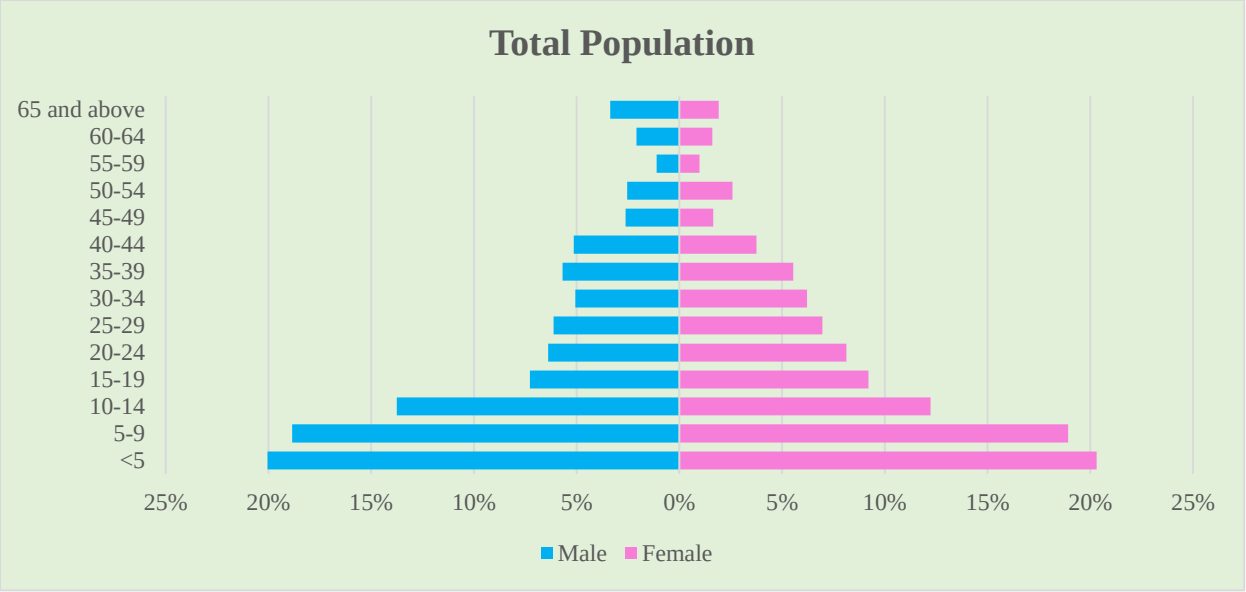

Figure 2: Population Pyramid of the study community

Malaria prevention, control and elimination interventions

Ethiopia, moving from malaria prevention and control to elimination is implementing different anti-malarial intervention strategies, based on the malaria stratum of the locality. Accordingly, for malaria free areas: surveillance, case management and SBCC; for low and moderate transmission areas: surveillance, case management, LLIN, SBCC, targeted IRS and larval control where applicable and for high transmission areas: all the interventions in full with larval control where applicable are implemented. In our baseline assessment we focused on LLIN and case management as the areas covered are in low and moderate transmission stratum. The findings for the two interventions are presented below.

Mosquito net ownership, utilization and status: the long-lasting insecticide-treated nets (LLINs) ownership in the study area was 68.3% while utilization was 46.3%. On average each household owns 2.0 (±0.9) net while average family size in the area is 4.8(±2.3). (see table 3)

Variables (n=936)		Frequency	percent
Mosquito net ownership	Yes	639	68.3
	No	297	31.7
Mosquito net utilization	Yes	278	46.8
	No	316	53.2
Average net/household		2.0	±0.9

Table 4: Mosquito net ownership and utilization

The total number of nets included in the study were 1302. About ninety eight percent (97.8%) of the households have received net in the last one year while, 1.2% of the households stated, the last time they receive a net is before three years. We observed 93.8 of the nets in the house and

classified the condition of the nets as: **a)** Good – no holes; **b)** Fair – no holes that fit a commonly used hand-held torch battery; **c)** poor – 1-4 holes that fit a commonly used hand-held torch battery; **d)** Unsafe – > 5 holes that fit a commonly used hand-held torch battery; **e)** Unused – still in the package. Accordingly, we find two-third of the observed nets to be in good while 2.5% of them were in unsafe condition. We observe 39.8% of the nets hanged in the sleeping place. 40.5% of the nets were used by any member of the household in the previous night (see table 4).

Variables (n=1302)		**Frequency**	**Percent**
Net reception	In the last one year	1273	97.8
	2-3 years	14	1.1
	More than 3 years	15	1.2
Net Observation	Observed	1221	93.8
	Not Observed	81	6.2
Net status	Good	861	70.5
	Fair	161	13.2
	Poor	66	5.4
	Unsafe	30	2.5
	Unused	103	8.4
Net was observed hanging for sleeping		162	39.8
Net used by any member in the previous night		173	40.5

Table 5: Description of net status in the households

Fever and treatment seeking behavior

Considering fever as main symptom of malaria, proper work up of febrile patients within 24 hours of onset of fever is essential to reduce morbidity and mortality of malaria. Cognizant of this, the NMSP 2017–2020 indicated case management, with proper investigation of fever to establish a parasitological diagnosis of malaria and administration of the correct treatment, as one of the interventions strategies to control and eliminate malaria. In this baseline assessment, we try to look at the prevalence of fever and Only 298 (7%) of the study population reported having fever in the past two weeks. Out of those who reported having fever, 78 (31%) sought treatment in any health facility and 70 (28%) of them received a finger prick for malaria test (Figure 3). The low percent of febrile cases (compared with the 16% reported in the MIS 2015) could be due to the data collection season, which is not in the high malaria transmission season, unlike that of the MIS 2015 data collection season.

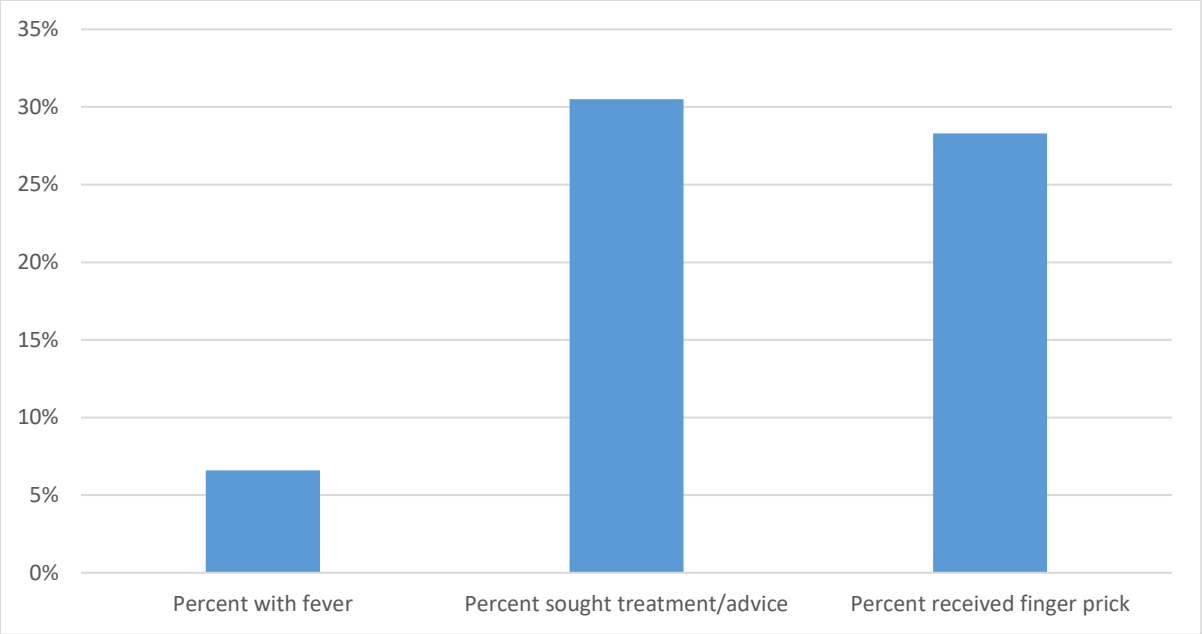

Figure 3: Fever and treatment seeking

Main source of advice or treatment sought was from government health centers in 53%, followed by private hospitals/clinics in 17% and government hospitals in 15% of cases. Surprisingly, 12% directly go to pharmacy to seek advice and treatment and only 8% of the cases seek advice or treatment from health posts (Figure 4).

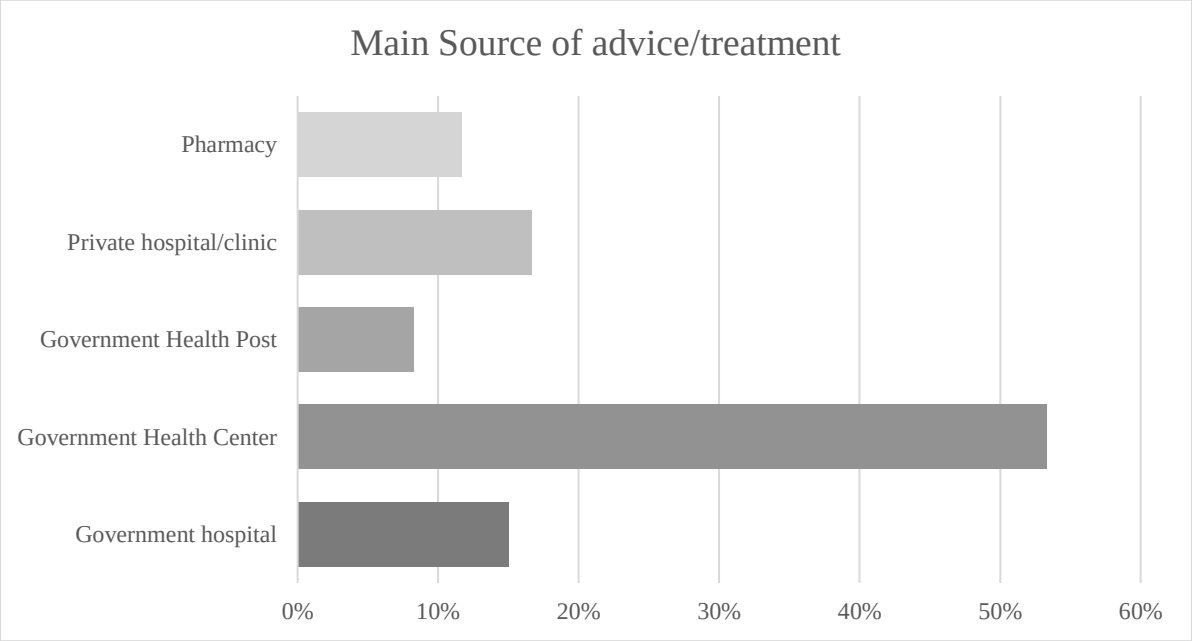

Figure 4: Source of advice/treatment seeking

RCD and tMDA Information, attitude and social norm

We anticipate a knowledge gap in RCD and tMDA interventions, as Ethiopia moves from malaria control to elimination recently. We have asked the respondent a set of question to assess how

informed they are about RCD and tMDA interventions. 21.2% of the respondents heard about testing and treating a person with no malaria symptoms, while 17.6% of the respondent heard treating a person with no malaria symptoms without testing. Main source of information for both RCD and tMDA is health workers, 81.1% and 76,9% respectively. Regarding perception of safety of RCD and tMDA interventions, we observe a huge difference between the two interventions/arms. 83.3% of respondents perceived RCD is safe while only 26.7% perceived tMDA is safe.

RCD and tMDA related information (n=936)	**Frequency (yes)**	**Percent**
Heard about Testing and Treating a person with no malaria symptoms	**198**	**21.2**
Source		
School	16	8.2
Media	53	27.0
Health worker	159	81.1
Heard about Treating a person with no malaria symptoms	**165**	**17.6**
Source:		
School	21	12.7
Media	51	30.9
Health worker	127	76.9
It is safe to be tested and treated if positive for malaria even if the person is not sick	780	83.3
It is safe to take treatment for malaria without being tested or feeling sick	250	26.7
Test and treat approach can help to get rid of malaria in the community	689	73.6
Mass treatment approach can help to get rid of malaria in the community	288	30.8

Table 5: Malaria interventions approaches information

We also asked a set of questions to assess attitude towards the RCD and tMDA treatment interventions and drug adherence. Overall attitude towards test and treat approach is more than 70%. While attitude towards direct treatment shows variation. The overall attitude towards drug adherence is very high.

Attitude questions (n=936)	**Frequency (yes)**	**Percent**

If you were diagnosed with malaria, do you think your household members/neighbors should be tested for malaria, even if they don't have symptom and treated only if positive?	740	79.1
If you were diagnosed with malaria, do you think your household members/neighbors should be treated for malaria without testing, even if they don't have symptom?	196	20.9
If someone from your household diagnosed with malaria, would you agree to be tested and treated if tested positive even if you have no symptom?	840	89.7
If someone from your household diagnosed with malaria, would you agree to be treated without testing even if you have no symptom?	182	19.4
If one of your closest neighbor(s) was diagnosed with malaria, would you agree to be tested for malaria and treated only if positive, even if you have no symptom?	382	40.8
If one of your closest neighbor(s) was diagnosed with malaria, would you agree to receive treatment for malaria without testing, even if you have no symptom?	874	93.4
Would you be willing to be tested for malaria even if you are not feeling sick, if it will prevent malaria from spreading to others?	815	87.1
Would you be willing to receive treatment without testing even if you are not feeling sick, if it will prevent malaria from spreading to others?	446	47.7
When you feel better do you sometimes stop taking your malaria medicine?	83	8.9
If you feel worse when you take the malaria medicine, do you stop taking it?	87	9.3
Do you feel hassled about completing your malaria medicine?	74	7.9

Table 6: Attitude towards treatment approaches and drug adherence

In assessing the social norms in the community surveyed, we prepare some questions and the majority of the respondents (93.2%) think, the community believe taking malaria drug is beneficial and traditional medicines practice in the area is low (21.5%). Majority of the respondents believe that the social norm is positive towards RCD and they think the community would take part.

Social norm assessment questions (n=936)	**Frequency (Yes)**	**Percent**
Most people in my community think taking drugs is beneficial	872	93.2
Most people in the community prefer traditional medicines to medicines from the health post or health facilities	201	21.5
Most people in my community think that malaria can be eliminated	763	81.5
Most people in my community WOULD be willing to take anti- malaria treatment, if available, without a malaria test and even if they have no malaria symptom	266	28.4

Most people in my community WOULD be willing to be tested for malaria, even if they have no symptom, and receive treatment if they tested positive.	792	84.6
The elders of my community want people to be tested for malaria, even if they have no symptom, and receive treatment only if they tested positive.	811	86.6
The elders of my community want people be treated for malaria without prior testing, even if they have no symptoms for malaria.	262	27.9
It is important to my family members and I to be tested for malaria even if we have no symptoms of malaria and receive treatment if tested positive.	813	86.9
It is important to my family members and I to take anti-malaria treatment without testing, even if we have no symptoms of malaria.	261	27.9

Table 7: Malaria treatment approaches social norm