This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The funding available to support the plan outlined here is pending finalization of the FY 2020 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.

U.S. PRESIDENT'S MALARIA INITIATIVE

ETHIOPIA

Malaria Operational Plan FY 2020

Suggested Citation: U.S. President's Malaria Initiative Ethiopia Malaria Operational Plan FY 2020. Retrieved from (www.pmi.gov)

TABLE OF CONTENTS

ABBREVIATIONS

ACIPH	Addis Continental Institute of Public Health
ACT	Artemisinin-based combination therapy
ANC	Antenatal care
AHRI	Armauer Hansen Research Institute
API	Annual parasite incidence
APTS	Accountable Pharmaceutical Transactions and Services
BMGF	Bill and Melinda Gates Foundation
C4H	Communication for Health
CDC	Centers for Disease Control and Prevention
CSA	Central Statistical Agency
CY	Calendar Year
DHIS-2	District Health Information System-2
DHS	Demographic Health Survey
DTC	Drug therapeutic committee
EFETP	Ethiopian Field Epidemiology Training Program
eHIS	Electronic Health Information System
EPHI	Ethiopian Public Health Institute
EPSA	Ethiopia Pharmaceutical Supply Agency
EQA	External quality assurance
EUV	End-user verification
FMOH	Ethiopian Federal Ministry of Health
FY	Fiscal year
GDP	Gross Domestic Product
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
G6PD	Glucose-6-phosphate dehydrogenase
HCMIS	Health Commodity Management Information System
HDA	Health development army
HDAMA	Health Development and Anti-Malaria Association
HEW	Health extension worker
HIS	Health Information System
HMIS	Health management information system
iCCM	Integrated community case management
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
MDG	Millennium Development Goals
M&E	Monitoring and evaluation
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey

MNCH	Maternal Neonatal and Child Health
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
NMSP	National Malaria Strategic Plan
ORHB	Oromia Regional Health Bureau
PBO	Piperonyl butoxide
PEPFAR	President's Emergency Plan for AIDS Relief
PHCU	Primary Health Care Unit
PHEM	Public Health Emergency Management
PMI	U.S. President's Malaria Initiative
PPMRm	Procurement, planning and monitoring report for malaria
QA	Quality assurance
RA	Resident Advisor
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
RHB	Regional Health Bureau
RRFs	Requisition Requesting Forms
SBC	Social and behavioral change
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SMC	Seasonal Malaria Chemoprevention
SM&E	Surveillance, monitoring, and evaluation
SNNPR	Southern Nation & Nationalities Peoples' Region
TPR	Test Positivity Rate
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

I. INTRODUCTION

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Ethiopia to end malaria. PMI has been a proud partner of Ethiopia since 2008, helping to decrease child death rates by 55 percent, from 123 per 1,000 live births in 2005 to 55 per 1,000 live births in 2019 (Mini-DHS 2019) through investments totaling almost $441.5 million.

The proposed PMI fiscal year (FY) 2020 budget for Ethiopia is $36 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Ethiopia for FY 2020. Developed in consultation with the Federal Ministry of Health (FMOH), National Malaria Control Program (NMCP) and key stakeholders, proposed activities reflect national and PMI strategies, draw on best-available data, and align with the country context and health system. Proposed PMI investments support and build on those made by the Government of Ethiopia as well as other donors and partners.

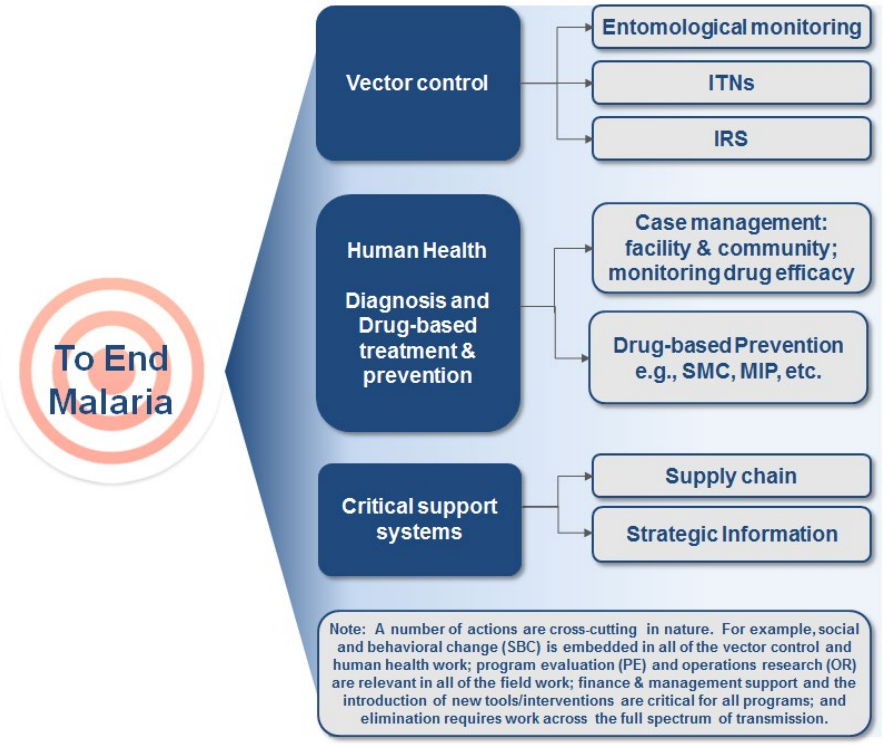
Ethiopia at a glance

- **Geography:** Ethiopia is located in the Horn of Africa bordering six countries: Eritrea, Djibouti, Somalia, Kenya, South Sudan and the Sudan. The country has an area of 1.1 million square kilometers with altitude ranging from 4,620 meters above sea level at Ras Dashen Mountain to 148 meters below sea level at the Danakil (Dallol) Depression. More than half of the country lies above 1,500 meters.
- **Climate:** Ethiopia is characterized by diverse climates which translate into diverse vegetation zones with average annual temperature of 23.1°C. According to the Koeppen Geiger climate classification system, Ethiopia has 10 climate types, including: the Hot Arid, Hot Semi-Arid, Tropical with distinct dry winter, Tropical Monsoon Rainy with short dry winter, Warm Temperate Rainy with dry winter, and Warm Temperate Rainy without distinct dry season. Coldest temperatures - about 5°C (November to January) over the highlands of Central, North, and Southeast. Warmest temperatures - about 37°C (March to May/June) in Northeast (Afar) and South-East Lowlands. Ethiopian weather is also influenced by tropical Indian Ocean conditions and global weather patterns, including El Niño and La Niña.
- **Population in 2019:** 96,007,000 (Central Statistical Agency, Population projection for Ethiopia 2007-2037. Addis Ababa, Ethiopia. Published July 2013).
- **Population at risk of malaria:** 60 percent (FMOH. National Malaria Strategic Plan: 2017-2020 Disease Prevention and Control, 2017).
- **Malaria incidence per 1000 population:** 18.6 (Annual Health Sector Performance Report, 2018).
- **Under-five mortality rate:** 55 per 1000 live births (Ethiopia mini-DHS 2019)

- **World Bank Income Classification & GDP:** Low income/ US $84.3 billion (https://data.worldbank.org/country/ethiopia).
- **Political system:** Ethiopia is a federal parliamentary republic. The federal republic is comprised of the federal government, nine autonomous regional states and two city administrations. Both the federal and regional governments are organized into three branches of government – legislative, executive, and judicial. (Prime Minister's Office, https://pmo.gov.et/government/).
- **Trafficking in Persons designations, 2016-2018:** Tier 2 (The Department of State's 2019 Trafficking in Persons Report, June 2019).
- **Malaria funding and program support partners include (but are not limited to):**
  - The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund)
  - U.S. President's Malaria Initiative (PMI)
  - The World Health Organization (WHO)
  - Malaria Consortium
  - UNICEF
- **PMI Support of National Malaria Control Strategy:** As per the National Malaria Strategic Plan (NMSP) 2017-2020, PMI's support in Ethiopia includes: vector control through indoor residual spraying (IRS) and long-lasting insecticide treated mosquito nets (ITNs), strengthening the quality of malaria diagnosis and treatment services; procurement of commodities to address national gaps, and community-based malaria social behavior change (SBC) activities. In addition, PMI strengthens the national and regional level capacity for surveillance along with district level support in low malaria burden areas in achieving subnational elimination, the capacity for developing and implementing operational, supply chain management systems, and the electronic Health Information System (eHIS) to improve evidence-based decision making. (See III. Overview of PMI's support of Ethiopia's Malaria Control Strategy for additional details).
- **PMI Investments:** Ethiopia began implementation as a PMI focus country in FY 2008. The proposed FY 2020 PMI budget for Ethiopia is $ 36 million; that brings the total PMI investment to nearly $477.5 million.

PMI organizes its activities and planning levels around the activities in Figure 1, in line with the national malaria strategy.

Figure 1. PMI's Approach to End Malaria



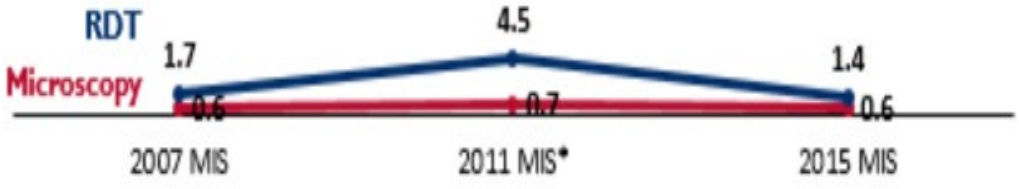
PMI's approach is both consistent with and contributes to USAID's Journey to Self-Reliance framework. Building and strengthening the capacity of Ethiopia's people and institutions – from the central level to communities – to effectively lead and implement evidence-based malaria control and elimination activities remains paramount to PMI. As denoted in Table 2 (the budget table), nearly all of PMI's planned support for FY 2020 in the areas of vector control, human health, supply chain and strategic information contains elements of capacity building and system strengthening. PMI/Ethiopia will continue to rely on and engage with local partners such as Health, Development and Antimalaria Association (HDAMA) to expand its social behavior change (SBC) activities, and the Armauer Hansen Research Institute (AHRI) and local universities for operational research and entomological surveillance activities. Finally, PMI/Ethiopia will continue to rely on private sector partnerships such as Addis Continental Institute of Public Health (ACIPH) and workplace activities to reach high-risk populations in implementing PMI supported activities.

To accelerate the Journey to Self-Reliance, PMI developed a programmatic inventory to assess the strengths and persistent challenges of Ethiopia's program (see Annex B). The activities proposed in this MOP are tailored to draw on these strengths and address the weaknesses, which will be monitored to evaluate the effectiveness of capacity building efforts. In addition, while PMI is cognizant that it will take time before Ethiopia is capable of fully financing its development priorities, PMI will work with other partners (e.g., the Global Fund) to jointly track Ethiopia's funding commitments across the malaria portfolio.

II. MALARIA SITUATION AND MALARIA CONTROL PROGRESS IN ETHIOPIA

In Ethiopia, malaria is highly seasonal, unstable with epidemic-prone transmission pattern in many parts of the country. *Plasmodium falciparum* (70 percent) and *P. vivax* (30 percent) are the major malaria parasites. *Anopheles arabiensis* is the primary malaria vector in Ethiopia, with *An. funestus*, *An. pharoensis*, and *An. nili* as secondary vectors. Peak malaria transmission occurs between September and December, after the main rainy season from June to August. In addition, some areas experience a second minor malaria transmission period from April to June, following a short rainy season from February to March. Since peak malaria transmission often coincides with the planting and harvesting season, the majority of malaria burden is among older children and working adults in rural agricultural areas, thus there is a resultant heavy economic burden in Ethiopia. Although historically Ethiopia has been prone to periodic widespread malaria epidemics, it has been largely absent since 2004 after the scale up of malaria control interventions.

Figure 2. Trends in Malaria Prevalence,
Percent of children age 6-59 months who tested positive for malaria by microscopy and RDT



*Prevalence for 2011 are for all ages

Figure 3. Trends in Prevalence of Low Hemoglobin,
Percent of children age 6-59 months with moderate to severe anemia (hemoglobin <8.0 g/dl)

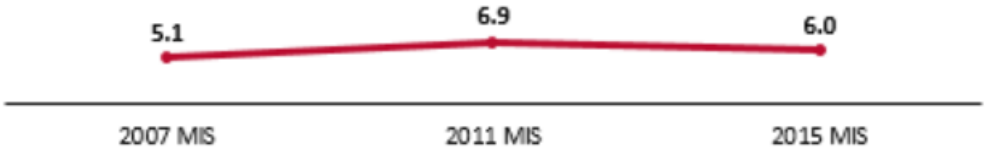


Figure 4. Malaria Parasite Prevalence Trends among All Ages by Region,

Percent of all ages who tested positive for malaria according to microscopy (2007, 2011, and 2015 MIS).

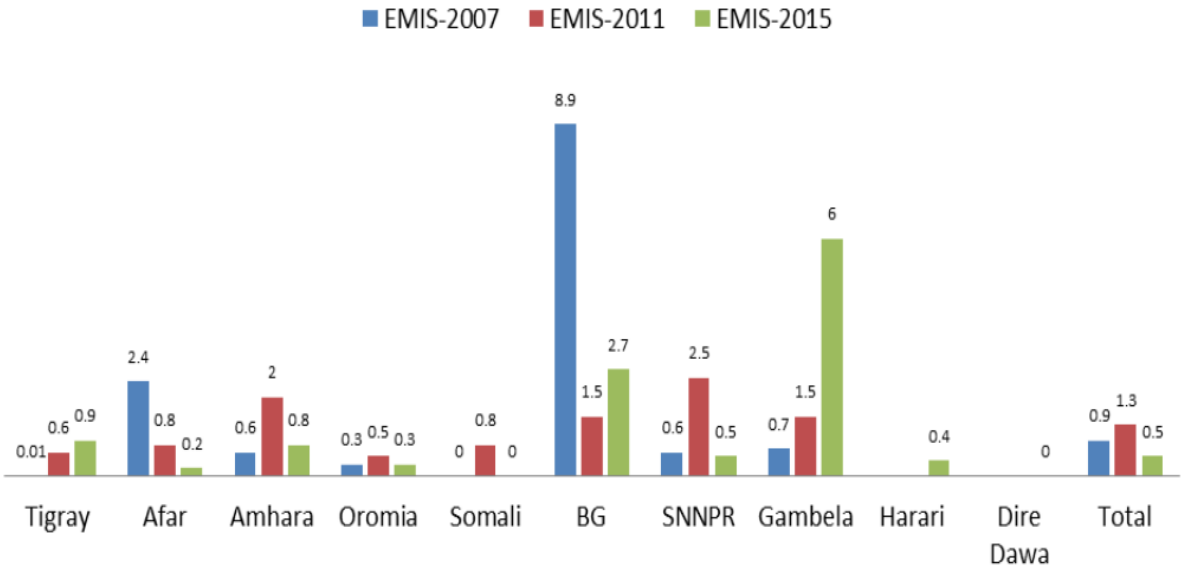


Figure 5. Key indicators for Malaria Prevention and Treatment Coverage and Impact Indicators from Demographic Health Surveys (DHS) and Malaria Indicator Surveys (MIS) from 2007-2015.

Indicator	2007 MIS	2011 MIS	2015 MIS
% Households with at least one ITN	65	55	64
% Households with at least one ITN for every two people	37	24	32
% Population with access to an ITN	n/a	n/a	49
% Population that slept under an ITN the previous night	n/a	25	40
% Children under five years of age who slept under an ITN the previous night	41	38	45
% Pregnant women who slept under an ITN the previous night	43	35	44
% Children under five years of age with fever in the last two weeks for whom advice or treatment was sought the same or next day	16	51	38**
% Children under five years of age with fever in the last two weeks who had a finger or heel stick	n/a	17	17
% Children receiving an ACT among children under five years of age with fever in the last two weeks who received any antimalarial drugs	n/a	29	89
Under-five mortality rate per 1,000 live births	123 (2005 DHS)	88 (2011 DHS)	67 (2016 DHS)
% Children under five years of age with parasitemia (by **microscopy,** if done)	0.6	0.7*	0.6
% Children under five years of age with parasitemia (by **RDT**, if done)	1.7	4.5*	1.4

Indicator	2007 MIS	2011 MIS	2015 MIS
% Children under five years of age with severe anemia (Hb<8gm/dl)	5.1	6.9	6.0

Note: Results presented for MIS surveys in Ethiopia are restricted to areas of elevation <2000 meters
*Prevalence for all ages
**Seeking care not limited to within 24 hours

Figure 6. Evolution of Key Malaria Indicators Reported through Routine Surveillance Systems

Indicator	2014	2015	2016	2017	2018
# Suspect malaria cases[1]	N/A	N/A	N/A	N/A	N/A
# Patients receiving diagnostic test for malaria[2]	N/A	5,679,932	6,378,352	6,246,949	6,115,025
Total # malaria cases[3] (confirmed and presumed)	2,627,182	2,174,707	2,320,135	1,755,748	1,206,891
# Confirmed cases[4]	2,210,298	1,867,059	2,033,310	1,530,739	989,182
# Presumed cases[5]	416,884	307,648	286,825	225,009	217,709
% Malaria cases confirmed[6]	84%	86%	88%	87%	82%
Test positivity rate (TPR)[7]	N/A	33%	32%	25%	16%
# of *P. falciparum* cases	1,415,150	1,188,627	1,325,409	1,059,847	883,886
# of *P. vivax* cases	795,148	678,432	707,901	470,892	105,296
Total # <5 malaria cases[8]	**324,203**	**338,874**	**N/A**	**N/A**	**N/A**
% Cases under 5[9]	12%	16%	N/A	N/A	N/A
Total # severe cases[10]					
Total # malaria deaths[11]	**213**	**662**	**510**	**356**	**158**
# Facilities reporting[12]	N/A	N/A	N/A	N/A	N/A
Data form completeness (%)[13]	N/A	N/A	98%	97%	N/A

Data sources and comments: Health and Health Related Indicators Reports 2006-2010 Ethiopian Calendar, Federal Ministry of Health, Ethiopia
Definitions:
1 Number of patients presenting with signs or symptoms considered to be possibly due to malaria (e.g., this could be the number of patients presenting with fever or history of fever in the previous 24 or 48 hours).
2 Number of patients receiving a diagnostic test for malaria (RDT or microscopy). All ages, outpatient, inpatient.
3 Total # cases: Total number of reported malaria cases. All ages, outpatient, inpatient, confirmed and unconfirmed cases.
4 # confirmed cases: Total diagnostically confirmed cases. All ages, outpatient, inpatient.
5 # presumed cases: Total clinical/presumed/unconfirmed cases. All ages, outpatient, inpatient.
6 Percent Malaria Cases confirmed: # confirmed cases (#4 above) / Total # cases (#3 above).
7 Test Positivity Rate (TPR): Number of confirmed cases (#4 above)/Number of patients receiving a diagnostic test for malaria (RDT or microscopy) (#2 above)
8 Total #<5 cases: Total number of <5 cases. Outpatient, inpatient, confirmed, and unconfirmed.
9 Total # <5 cases (#8 above) / Total # of cases (# 3 above).
10 As there may not be a standard definition across countries, please specify if there is such a variable available and the definition that is used; if "severe

malaria" is not used or collected but "hospitalized for malaria" is a standard in the country, please insert that label and the relevant data by year.
11 Total # Malaria Deaths Reported: All ages, outpatient, inpatient, confirmed, and unconfirmed.
12 Total # of health facilities reporting data into the HMIS/DHIS2 system for that year.
13 Data completeness: Number of monthly reports received from health facilities/Number of health facility reports expected (i.e., number of facilities expected to report multiplied by the number of months considered).

III. OVERVIEW OF PMI'S SUPPORT OF ETHIOPIA'S MALARIA CONTROL STRATEGY

The national malaria strategic plan goals and objectives for the 2017-2020 include:

Goals:

- By 2020, maintain near zero malaria deaths (no more than 1 confirmed malaria death per 100,000 population at risk) in Ethiopia.
- By 2020, reduce malaria cases by 40 percent from baseline of 2016.
- By 2030, eliminate malaria from Ethiopia.

Strategic Objectives:

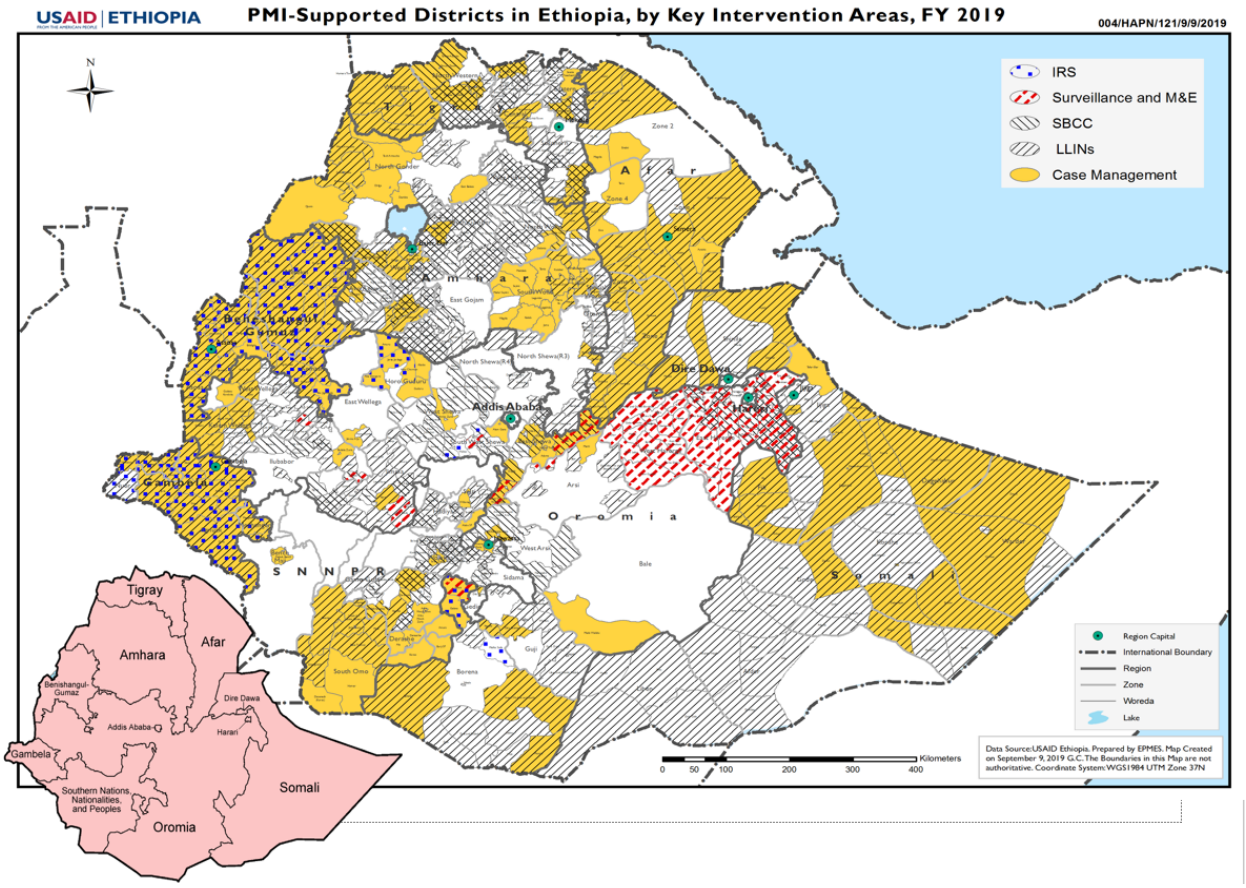
- By 2020, all households living in malaria endemic areas will have the knowledge, attitudes, and practice to adopt appropriate health-seeking behavior for malaria prevention and control.
- By 2017 and beyond, 100 percent of suspected malaria cases are diagnosed using RDTs or microscopy within 24 hours of fever onset.
- By 2017 and beyond, 100 percent of confirmed malaria cases are treated according to the national guidelines.
- By 2017 and beyond, ensure that the population at risk of malaria has universal access to one type of globally recommended vector control intervention.
- By 2020, malaria elimination program will be implemented in 239 districts.
- By 2020, 100 percent complete data and evidence will be generated at all levels within the nationally designated time periods to facilitate appropriate decision-making.

The Ethiopia NMCP's malaria elimination objectives include the elimination of malaria in selected low transmission areas by 2020 and the elimination of malaria from Ethiopia by 2030. Ethiopia has declared malaria elimination efforts in 239 selected districts, encompassing six different regions, starting in 2017. The criteria for enrolling districts for malaria elimination included selecting districts with low or moderate malaria transmission (annual parasite incidence (API) less than 5), availability of district level surveillance data, high coverage of vector control interventions, adequate access to treatment, limited cross-border population movement, and logistical feasibility. To achieve elimination targets, the Ethiopia FMOH will focus on engagement and governance at different levels by strengthening partnerships from the national to community level. A strong political commitment from the regional health bureaus (RHBs) will be expected in all aspects of malaria prevention and

control. Additional areas of focus in selected malaria elimination districts include maximizing health facility capabilities for active case detection and 100 percent case confirmation, community involvement and ownership, private sector roles and partnerships, investigating mass drug administration approaches, and improving surveillance systems for case detection and reporting. The Ethiopia FMOH has developed a malaria elimination technical document to guide the implementation of malaria elimination activities.

Global Fund resources are used to procure the majority of ITNs, ACTs, and RDTs; procure insecticides for IRS; and supports gap-filling for case management strengthening. PMI supports gap-filling for malaria commodities; provides coordination and technical assistance for supply chain management and surveillance, monitoring, and evaluation; supports technical assistance and operational support for IRS in Western Ethiopia with high rates of malaria burden; and supports malaria case management strengthening in selected facilities throughout Ethiopia.

Figure 7. PMI Intervention Support Map

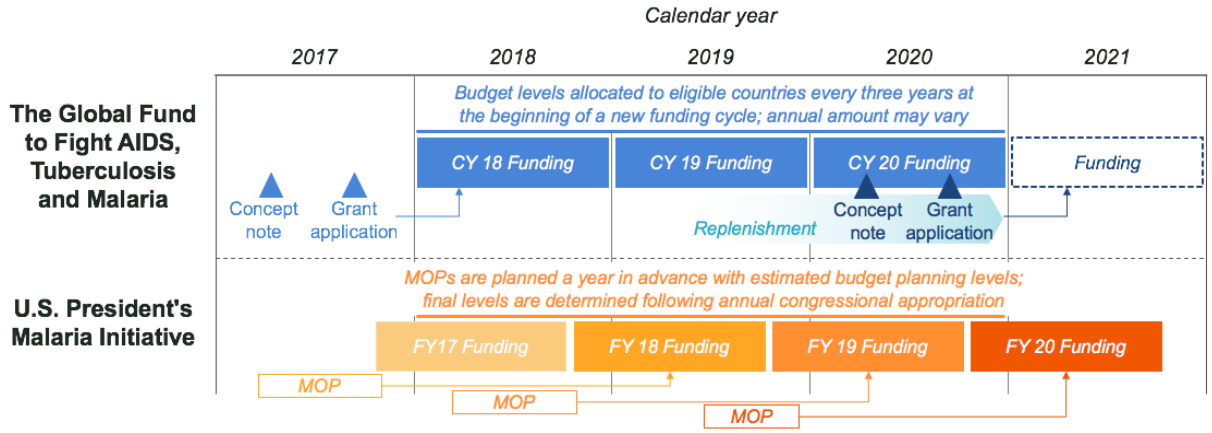


IV. PARTNER FUNDING LANDSCAPE

PMI emphasizes the importance of partner alignment on malaria control. With the recognition that each of the agencies emphasizes complementary funding support for the national malaria control effort in a given country, over the last year, PMI, Global Fund, and the Bill and Melinda Gates Foundation (BMGF) set out to harmonize financial, supply chain, and programmatic data, and this effort remains ongoing as of the time of this MOP. A harmonized financial taxonomy has been developed for PMI and Global Fund (i.e., mapping cost categories across organizations).

Figure 8 visualizes the annual cycle of PMI funding and the MOP implementation year. As the figure illustrates, any given FY MOP funds activities that take place during the next FY. For example, a FY18 MOP funds implementation during FY19. Whereas Global Fund funding (and often, other partners and host country governments) is based on a three-year grant cycle on a calendar year (CY) timeframe during which activities were implemented. Annual PMI country budget allocations depend largely on the U.S. Congress' total overall malaria funding appropriation to USAID in a given fiscal year, as well as other considerations (e.g. previous funding levels, activity and program pipelines, other donor contributions, known commodity needs/gaps, progress on ongoing PMI-supported activities, clear evidence of continued government commitment to malaria control).

Figure 8: PMI and Global Fund Funding Cycle Alignment



Footnote: In some cases, Global Fund's funding may come in partway through the calendar year. Funding levels in "Section IV - Partner Funding Landscape" and commodity procurement amounts listed in "Annex A - Intervention Specific Data" may differ given the lag between the year that funding was planned and the year when procurement orders were placed. Differences may be a reflection of timing and/or based on changes in commodity consumption levels at country level, changes in commodity costs, or other donor orders.

Figures 9 and 10 summarize contributions by external partners and host country government in calendar years 2018-20, with the goal of highlighting total country investments. For Ethiopia, data is available for PMI (FY 18) and Global Fund (CY 2018-20). As the Global Fund 2021-23 grant funding cycle is not yet underway at the time of this PMI FY20 MOP development, Global Fund country investments for the 2021 implementation period and beyond are not yet known. Note that the host country government invests substantial funding into the national-to-local infrastructure and service delivery for malaria and many other programs. However, there has not been a standardized method for attributing those investments to malaria specifically. Thus, it may not yet be possible in

the FY 2020 MOP cycle to attribute funding from the host country government. There may be similar challenges for other partners.

Figure 9. Annual Budget by Level 1 Category

Year[1]	Funder	Vector Control	Case Management	Drug-Based prevention[2]	Supply Chain[3]	Monitoring, Evaluation & Research	Other Cross-Cutting and Health Systems Strengthening	Total
FY17/ CY18	PMI	$24.7M	$6.0M	$0.3M	$1.1M	$1.4M	$3.6M	**$37.0M**
	Global Fund	$33.5M	$11.6M	-	-	$1.9M	$1.1M	**$48.1M**
	Total	**$58.1M**	**$17.7M**	**$0.3M**	**$1.1M**	**$3.3M**	**$4.7M**	**$85.1M**
FY18/ CY19	PMI	$20.7M	$6.4M	$0.3M	$2.3M	$2.7M	$3.7M	**$36.0M**
	Global Fund	$13.8M	$11.2M	-	-	$0.1M	$0.9M	**$26.1M**
	Total	**$34.5M**	**$17.6M**	**$0.3M**	**$2.3M**	**$2.8M**	**$4.6M**	**$62.1M**
FY19/ CY20	PMI	$19.3M	$8.3M	$.3M	$1.5M	$1.5M	$5.2M	**$36.0M**
	Global Fund	$22.6M	$12.9M	-	-	$.7M	$1.1M	**$37.3M**
	Total	**$41.8M**	**$21.1M**	**$0.3M**	**$1.5M**	**$2.2M**	**$6.3M**	**$73.3M**

[1.] Each year's figures represent the FY for PMI and one CY for GFATM that most closely align
[2.] Drug-based prevention, including MIP where relevant;
[3.] Covers management of in-country warehousing & distribution of malaria commodities, except for ITNs which are separately captured under "Vector Control".
Note: Categories shown reflect the harmonized financial taxonomy (Levels 1-3) developed by the Global Fund, and PMI in 2019, as part of a broader data harmonization initiative; potential for categories to continue to evolve through FY 2020 MOP process, as well as for additional donors and host country governments to adopt and reflect funding using the same categories.

Figure 10. Annual Budget by Level 3 Category, Detailed Breakdown for PMI and Global Fund

Level 1 Category	Level 3 Category	FY17/CY18[1]		FY18/CY19[1]		FY19/CY20[1]	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
Vector Control	Procure ITNs for Continuous Distribution	$10.5M	$1.1M	$6.7M	-	$1.2M	-
	Distribute ITNs via Continuous Distribution	$3.6M	$0.1M	$2.7M	-	$0.5M	-
	Procure ITNs for Mass Campaigns	-	$20.7M	-	-	$4.9M	$6.7M
	Distribute ITNs via Mass Campaigns	-	$2.7M	-	-	$2.0M	$0.9M

Level 1 Category	Level 3 Category	FY17/CY18[1]		FY18/CY19[1]		FY19/CY20[1]	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
	Other ITN Implementation*	-	-	-	-	-	-
	IRS Implementation[4]	$9.9M[4]	$4.9M	$10.6M[4]	$5.1M	$10.7M[4]	$5.1M
	Procure IRS Insecticide	-	$0.1M	-	$8.2M	-	$8.3M
	Other IRS*	-	-	$0.0M	-	-	-
	Entomological Monitoring	$0.7M	-	$0.6M	-	-	-
	SBC for Vector Control[5]	-	-	-	-	-	-
	Other vector control measures	-	$0.6M	-	$0.2M	-	$0.2M
	Removing human rights- and gender-related barriers to vector control programs**	-	-	-	-	-	-
Case Management	Active Case Detection**	-	$0.3M	-	-	-	$0.1M
	Community-based case management	-	-	-	-	-	-
	Facility-based case management	-	$0.2M	-	$0.1M	-	$0.1M
	Private-sector case management	-	-	-	-	-	-
	Procure ACTs	-	$3.6M	-	$2.5M	$0.3M	$2.7M
	Procure Drugs for Severe Malaria	$0.4M	-	$0.6M	-	$0.5M	-
	Procure Other Diagnosis-Related Commodities	$0.4M	$1.7M	$0.4M	$1.4M	$0.4M	$1.7M
	Procure Other Treatment-Related Commodities	$0.4M	$0.001M	-	$0.001M	$0.7M	$0.03M
	Procure RDTs	-	$2.0M	-	$1.5M	$0.5M	$1.7M
	Therapeutic Efficacy	-	-	$0.2M	-	-	-
	SBC for Case Management[5]	-	-	-	-	-	-

Level 1 Category	Level 3 Category	FY17/CY18[1]		FY18/CY19[1]		FY19/CY20[1]	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
	Other Case Management	$4.8M	$2.9M	$5.2M	$4.9M	$5.9M	$5.7M
Drug-Based Prevention[2]	Procure SMC-Related Commodities	-	-	-	-	-	-
	SMC Implementation	-	-	-	-	-	-
	Prevention of Malaria in Pregnancy Implementation	$0.3M	-	$0.3M	-	$0.3M	-
	Procure IPTp-Related Commodities	-	-	-	-	-	-
	IPTi**	-	-	-	-	-	-
	SC for Drug-Based Prevention[5]	-	-	-	-	-	-
	Other Prevention**	-	-	-	-	-	-
Supply Chain[3]	In-Country Supply Chain[3]	-	-	-	-	$0.1M	-
	Supply Chain Infrastructure	-	-	-	-	-	-
	Ensuring Quality	-	-	-	-	-	-
	Pharmaceutical Management Systems Strengthening	$1.1M	-	$2.3M	-	$1.4M	-
	Supply Chain System Strengthening	-	-	-	-	-	-
Monitoring, Evaluation & Research	Reporting, Monitoring, and Evaluation	$1.1M	-	$2.1M	-	$1.2M	-
	Program and data quality, analysis and operations research	-	$1.9M	-	$0.1M	-	$0.7M
	Surveys	-	-	$0.3M	-	-	-
	Other Data Sources**	-	-	-	-	-	-
	Support for FETP*	$0.3M	-	$0.3M	-	$0.2M	-
Other Cross-Cutting and Health Systems Strengthening	Integrated service delivery, quality improvement, and national health strategies**	-	-	-	-	-	-

Level 1 Category	Level 3 Category	FY17/CY18[1]		FY18/CY19[1]		FY19/CY20[1]	
		PMI	Global Fund	PMI	Global Fund	PMI	Global Fund
	Financial management systems**	-	-	-	-	-	-
	Community responses and systems**	-	$0.1M	-	$0.1M	-	$0.1M
	Support for PCV and SPAs*	$0.03M	-	$0.03M	-	$0.03M	-
	Cross-Cutting Human Resources for Health**	-	$0.1M	-	-	-	$0.1M
	Central and Regional Program management[6]	$0.6M	$0.2M	$0.5M	$0.2M	$0.4M	$0.2M
	In-Country Staffing and Administration*	$2.1M	-	$2.0M	-	$2.9M	-
	Other Program Management**	-	$0.6M	-	$0.6M	-	$0.6M
	SBC Unspecified[5]	$0.9M	-	$1.2M	-	$1.8M	-
Total		**$37.0M**	**$48.1M**	**$36.0M**	**$26.1M**	**$36.0M**	**$37.3M**

[1.] Each year's figures represent the FY for PMI and CY for Global Fund that most closely align;
[2.] Drug-based prevention, including SMC and MIP where relevant;
[3.] Covers management of in-country warehousing & distribution of malaria commodities, except for ITNs which are separately captured under "Vector Control";
[4.] May include cost of IRS insecticides if full cost of IRS implementation including commodities was bundled within single line in prior year's Table 2;
[5.] SBC was not historically split in the PMI budget across intervention areas, hence the row "SBC (unspecified)" for the FY2020 MOP cycle. Going forward, SBC proposed activities will be categorized across vector control, case management, and prevention (new categories).
[6.] PMI Proposed Activity "National-level support for case management" rolls up under "Case Management" Level 1.
Note: Categories shown reflect the harmonized financial taxonomy (Levels 1-3) developed by BMGF, Global Fund, and PMI in 2019, as part of a broader data harmonization initiative; potential for categories to continue to evolve through FY 2020 MOP process, as well as for additional donors and host country governments to adopt and reflect funding using the same categories.
* Category currently funded by PMI only
** Category currently funded by Global Fund only

Figure 11. Annual budget, breakdown by commodity

Year[1]	Funder	ITNS for Continuous Distribution	LLINs for Mass Distribution	IRS Insecticide[4]	ACTs	RDTs	Severe Malaria	Total
FY17/CY18	PMI	$10.5M	-	-	-	-	$0.4M	**$10.9M**
	Global Fund	$1.1M	$20.7M	$0.1M	$3.6M	$2.0M	-	**$27.6M**
	Total	**$11.6M**	**$20.7M**	**$0.1M**	**$3.6M**	**$2.0M**	**$0.4M**	**$38.5M**

Year[1]	Funder	ITNS for Continuous Distribution	LLINs for Mass Distribution	IRS Insecticide[4]	ACTs	RDTs	Severe Malaria	Total
FY18/CY19	PMI	$6.7M	-	-	-	-	$0.6M	**$7.3M**
	Global Fund	-	-	$8.2M	$2.5M	$1.5M	-	**$12.3M**
	Total	**$6.7M**	**-**	**$8.2M**	**$2.5M**	**$1.5M**	**$0.6M**	**$19.6M**
FY19/CY20	PMI	$1.2M	$4.9M	-	$0.3M	$0.5M	$0.5M	**$7.4M**
	Global Fund	-	$6.7M	$8.3M	$2.7M	$1.7M	-	**$19.5M**
	Total	**$1.2M**	**$11.6M**	**$8.3M**	**$3.0M**	**$2.2M**	**$0.5M**	**$26.8M**

[1.] Each year's figures represent the FY for PMI and CY for Global Fund that most closely align.
[2.] PMI commodity costs are fully loaded, including costs for the ex-works price of the commodity, quality control, freight, insurance, and customs.
[3.] Global Fund commodity costs in table above only include ex-works commodity value in a given year. Additional costs, including quality control, freight, insurance, and customs totaled $7.4 million over the CY 2018-2020 period;
[4.] IRS insecticide; for PMI, IRS insecticide commodity costs may be inextricable from IRS implementation costs in historical data – field left blank where this is the case.
Note: SMC and IPTp = N/A
Categories shown reflect the harmonized financial taxonomy (Levels 1-3) developed by BMGF, Global Fund, and PMI in 2019, as part of a broader data harmonization initiative; potential for categories to continue to evolve through FY 2020 MOP process, as well as for additional donors and host country governments to adopt and reflect funding using the same categories.

V. ACTIVITIES TO BE SUPPORTED WITH FY 2020 FUNDING

Please see the FY 2020 budget tables (Tables 1 and 2) for a detailed list of activities PMI proposes to support in Ethiopia with FY 2020 funding. Please refer to www.pmi.gov/resource-library/mops for the latest tables. Key data used for decision-making can be found in Annex A.

ANNEX A: INTERVENTION-SPECIFIC DATA

1. VECTOR CONTROL

NMCP objective

By 2017 and beyond, ensure that the population at risk of malaria has universal access to one type of globally recommended vector control intervention. Specific objectives include:
• Long-lasting insecticidal nets (ITN)
  o 100 percent of households in ITN-targeted areas own at least one ITN per two persons
  o Achieve and maintain levels of use above 80 percent by all age and gender groups
• Indoor residual spraying
  o Achieve 100 percent coverage of IRS in targeted *woredas* and/or *kebeles*
  o Maintain >85 percent coverage of unit structures in targeted *woredas* and/or *kebeles*
• Larval source management
  o 100 percent of permanent larval habitats are identified by health extension worker (HEW) and health development army (HDA) in the target communities
  o 100 percent of detectable anopheline larval habitats (in targeted areas) are managed through larval control methods.

NMCP approach
According to FMOH's NMSP (2017 - 2020), the two major insecticide-based malaria prevention services implemented in Ethiopia are targeted IRS and distribution of ITNs. The objective of the Ethiopian vector control program is to maintain universal coverage with ITNs in all malaria-endemic areas and targeted IRS in high transmission and epidemic-prone areas. All malaria affected communities in ITN targeted areas have the right to protect themselves from malaria infection through the use of ITNs, and should, therefore, be given access to (and be encouraged to use) ITNs. Ethiopia utilizes stand-alone, rolling mass campaigns as the only distribution method of ITNs. Campaigns are conducted at the community/*kebele* level through active participation and coordination of HEWs at health posts every three years. Other vector control activities, mainly larval control through environmental management and chemical larviciding, are also practiced in targeted/appropriate areas.

PMI objective, in support of NMCP
PMI supports all vector control activities in the NSP 2017-2020 with the exception of environmental management and chemical larviciding, as there is not sufficient evidence of the public health impact of these interventions.
PMI-supported recent progress (past ~12-18 months)
• PMI successfully supported an IRS campaign targeting 44 high malaria burden districts in Gambela, Benishangul-Gumuz, and Oromia Regions, spraying 487,746 out of 510,449 sprayable structures, resulting in 95.5 percent spray coverage. The campaign protected 1,334,868 residents, including 228,262 children under five years of age and 33,245 pregnant women. • Trained 2,675 individuals to deliver safe and effective IRS. • Conducted entomological monitoring including behavioral monitoring, species identification (including *An. stephensi*) , insecticide resistance, and IRS insecticide decay rate in selected sites. Procured and completed distribution via rolling mass campaigns of 10.4 million ITNs; an additional 5.57 million ITNs were procured and are currently being distributed.
PMI-supported planned activities (next ~12-18 months, supported by currently available funds)
• Continue spraying in high-burden districts in Gambela, Benishangul-Gumuz, and 10 districts in Oromia prior to the transmission season (June-July period). District selection will be based on factors such as malaria burden, capacity of local spray programs, etc. • Continue vector surveillance and insecticide resistance monitoring. • Procure and distribute via rolling mass campaigns 3.1 million ITNs.

1.A. ENTOMOLOGICAL MONITORING

Key Goal
Determine the geographic distribution, bionomics, and insecticide resistance profiles of the main malaria vectors in the country to inform vector control decision-making.

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?
Entomological monitoring in Ethiopia remains a priority to ensure that vector control interventions are guided by evidence. Ethiopia updated its national insecticide resistance monitoring and

management strategy to minimize insecticide selection pressure, and is currently implementing this plan. The discovery of a new malaria vector *An stephensi* in 2016 (Carter *et al.* 2018) and additional mapping by PMI showing the presence of this vector in 10 additional sites in eastern Ethiopia (Balkew *et al.* 2019) indicate the need to continue strengthening entomological monitoring for control. PMI plans to maintain its funding allocation in this area to continue to strengthen entomological monitoring (e.g., behavioral monitoring, insecticide resistance surveillance, etc.) and support the coordination of insecticide resistance surveillance for more timely reporting and data analysis.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

Where is entomological monitoring taking place, what types of activities are occurring, and what is the source of funding?

Supporting Data

Figure A1. Resistance and PMI-Supported Longitudinal Monitoring, 2019

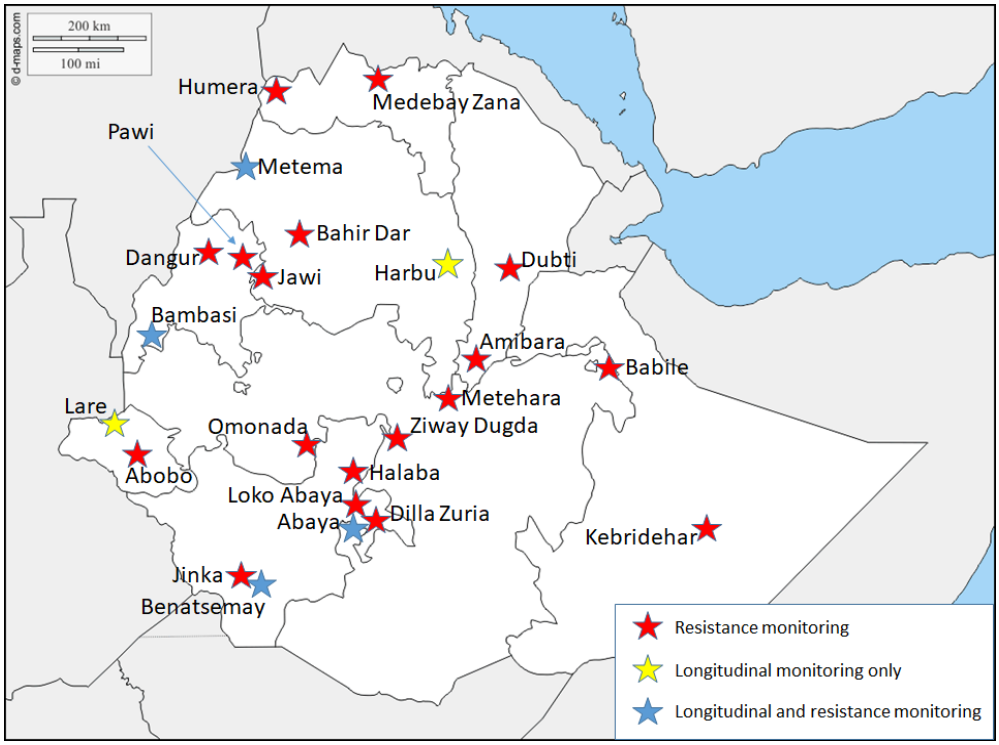
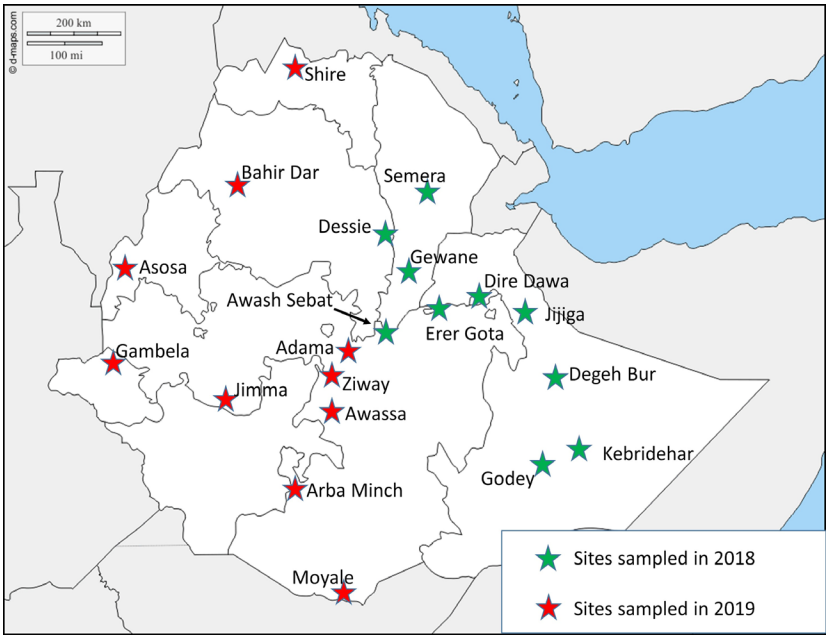


Figure A2. Monitoring Activities by Province

Province	Total sentinel sites	Activities	Supported by
Gambela	2	Resistance (1), longitudinal (1)	PMI
Southern Nation & Nationalities Peoples' Region	5	Resistance (4), longitudinal and resistance (1)	PMI
Oromia	5	Resistance (4), longitudinal and resistance (1)	PMI
Somali	1	Resistance (1)	PMI
Afar	2	Resistance (1)	PMI
Amhara	4	Resistance (2), longitudinal (1), longitudinal and resistance (1)	PMI
Benishangul- Gumuz	3	Resistance (2), longitudinal and resistance (1)	PMI
Tigray	2	Resistance (2)	PMI

Given that *An. stephensi* was found in Ethiopia in 2016, PMI is also supporting expanded species monitoring to understand the extent of *An. stephensi* distribution/abundance throughout Ethiopia (10 sites in 2018 and an additional 10 sites in 2019. See Figure A3). All ten sites monitored in 2018 confirmed the presence of *An. stephensi.*

Figure A3. An. Stephensi Abundance and Distribution in Ethiopia



Insecticide susceptibility of *An. stephensi* will be tested in Diredawa, Kebridehar, Bati, Semera, and Gewane, and *An. stephensi* bionomics will be evaluated through monthly collections in Dire Dawa and Kebridehar (June-November). The data presented in Figure A4 are from the PMI-supported 2018 Entomology Report (May 2018-April 2019). Note that entomological monitoring in Benatsemay (SNNPR), Metema (Amhara), and Harbu (Amhara) began in May 2019 and results will be presented in next year's MOP.

Figure A4. Entomological Monitoring 2018 -2019

Site	Major Vector	Minor Vector	Peak Abundance	Preferred Biting Location	Preferred Resting Location	Preferred Host	Peak Sporozoite Rate	Annual* EIR
Lare	*An. arabiensis, An. funestus*	*An. pharoensis*	*An. arabiensis*-February; *An. funestus*-December; *An. pharoensis*-August	outdoor (all species)	n/a	n/a	Overall *P. falciparum* sporozoite rate*: *An. arabiensis*: 0.65%, *An. funestus* 0.1%, *An. pharoensis* 0.1%	n/a
Bambasi	*An. arabiensis, An. funestus*	*An. pharoensis*	n/a	outdoor (*An. arabiensis*)	n/a	n/a	Overall *P. falciparum* sporozoite rate*: *An. arabiensis*: 0.83%	n/a
Abaya	*An. arabiensis*	*An. pharoensis*	*An. arabiensis*-April	outdoor (*An. arabiensis*)	n/a	n/a	Overall *P. falciparum* sporozoite rate: *An. arabiensis*: 0.64% (1/157)	n/a

*Note that one *Plasmodium vivax sporozoite-positive An. funestus* was found in both Lare and Bambasi

Conclusion

While *An. arabiensis* is often considered the only vector in Ethiopia, the detection of *Plasmodium*-infected *An. funestus* and *An. pharoensis* (and previously *An. coustani*) justifies that increased monitoring of the bionomics, resistance, and vectoral role of these mosquitoes are necessary. Additionally, the role, geographical distribution, and susceptibility pattern of *An. stephensi* should be explored and vector control options evaluated, particularly as recent experiments at the Adama field station have shown it is capable of transmission of *Plasmodium vivax* in Ethiopia.

Key Question 2

What is the current insecticide resistance profile of the primary malaria vectors?

Supporting Data

The data presented in this section are results of bioassays done with *Anopheles gambiae* s.l. (all molecular data indicate that this is primarily *An. arabiensis*) from the PMI-supported 2018 Entomology Report (May 2018-April 2019).

Figure A5. Susceptibility of An. arabiensis to Deltamethrin, Permethrin, and Alphacypermethrin in 13 Sites

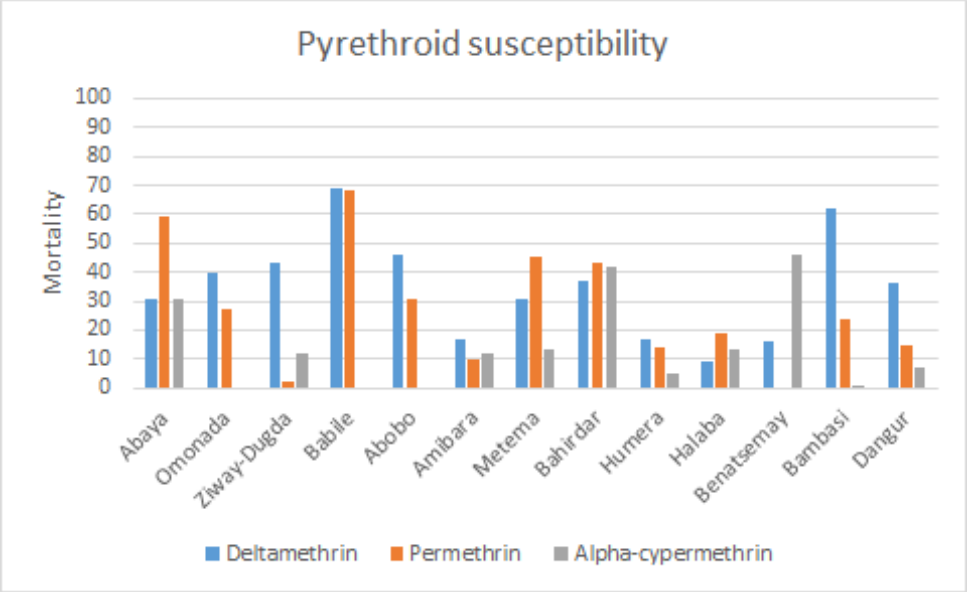


Figure A6. Intensity of An. arabiensis Deltamethrin Resistance and Susceptibility after Pre-Exposure to PBO

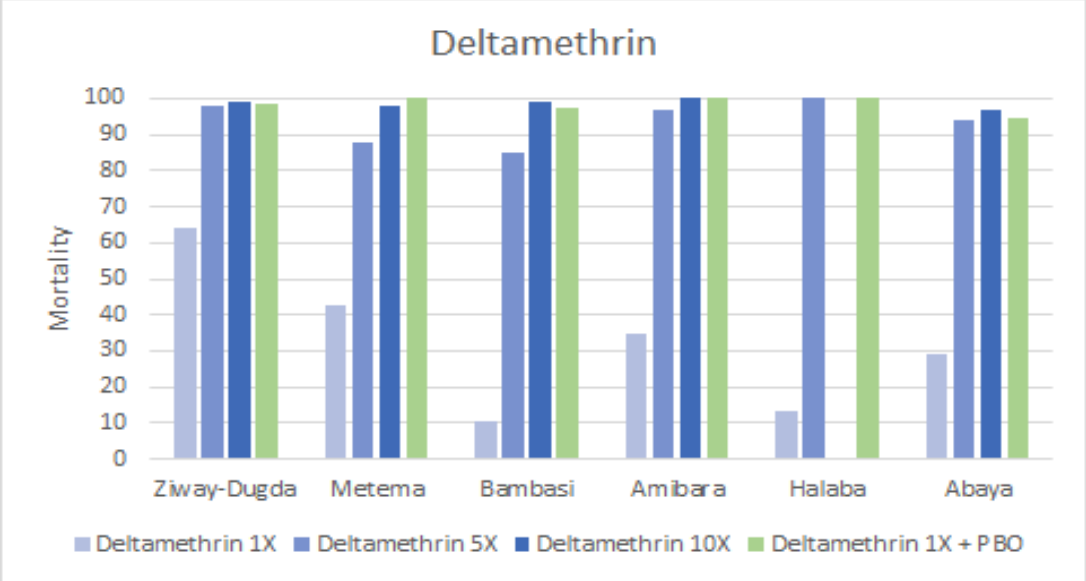


Figure A7. Intensity of An. arabiensis Permethrin Resistance and Susceptibility after Pre-Exposure to PBO

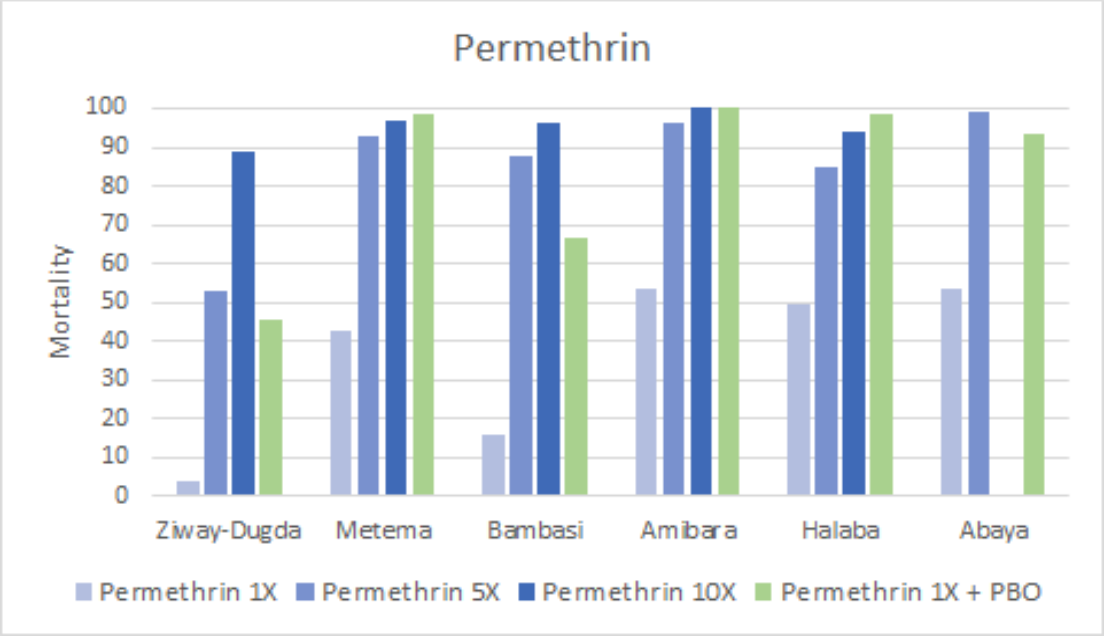
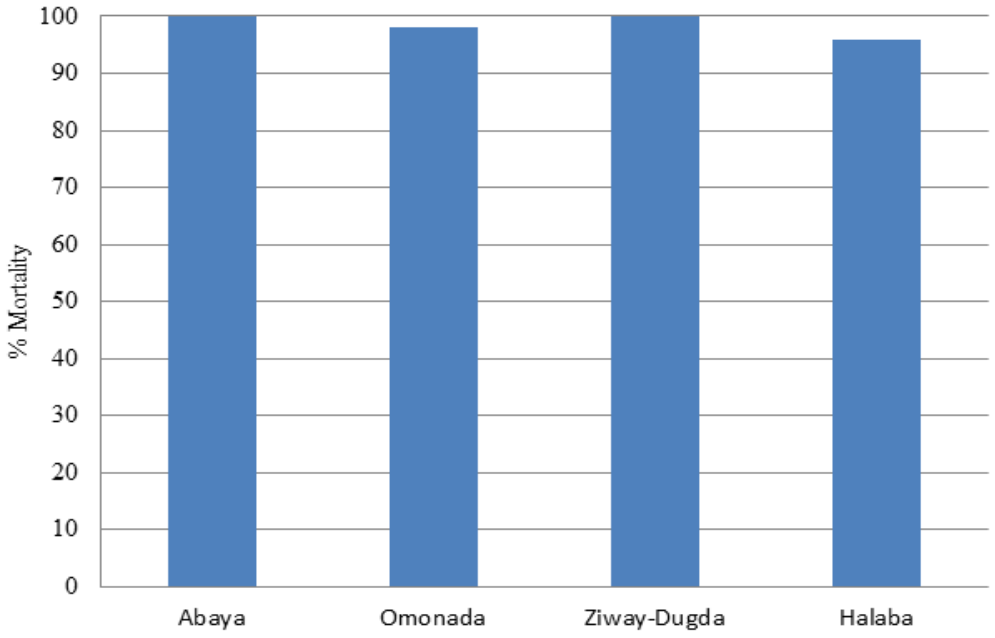
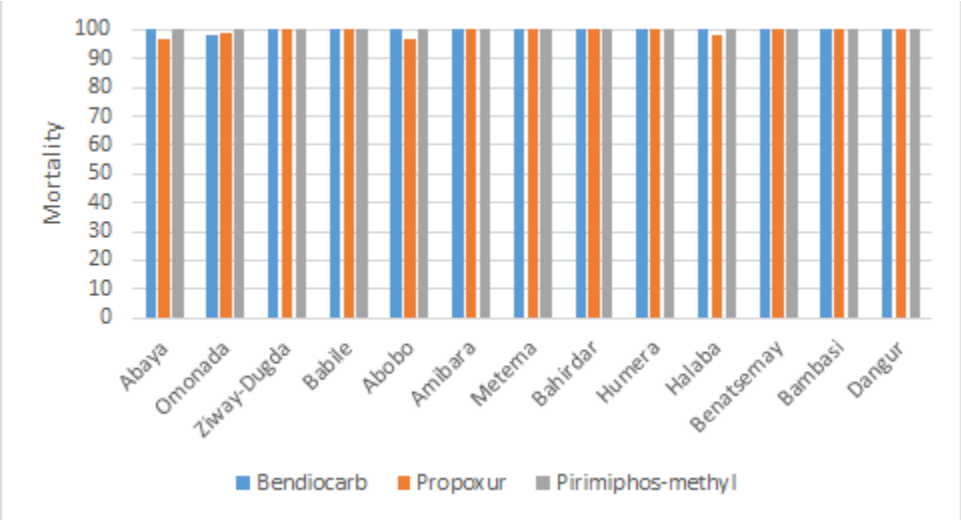


Figure A8. Measurement of Anopheles arabiensis Mortality in Exposure to Chlorfenapyr, CDC Bottle Bioassays at 100µg



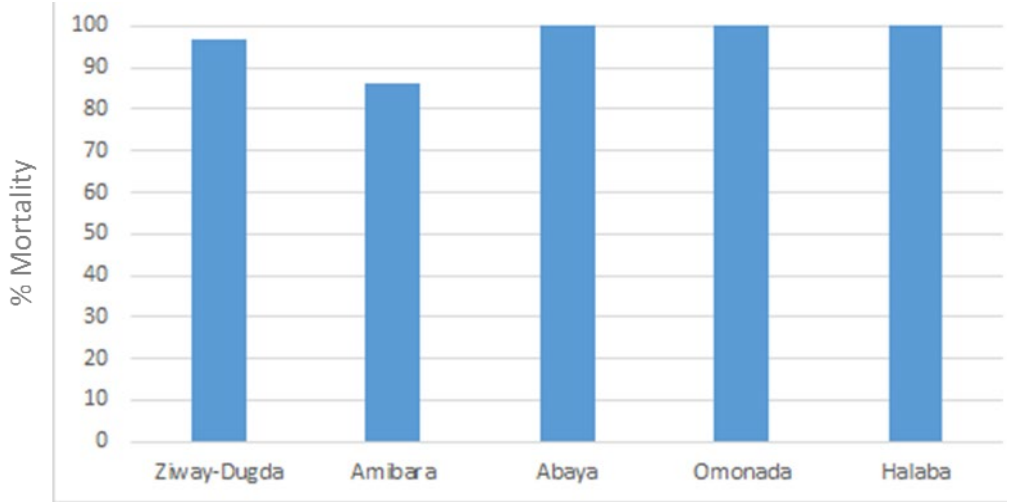
Anopheles arabiensis was exposed to three insecticides commonly used for indoor residual spraying, two carbamates (bendiocarb and propoxur) and one organophosphate (pirimiphos-methyl), and the mortality of mosquitoes was measured.

Figure A9. Measurement of Carabmate and Organophosphate Susceptibility



Finally, *Anopheles arabiensis* was exposed to a neonicotinoid used for IRS (clothianidin) in five sites and the mortality after exposure was measured.

Figure A10. Clothianidin Susceptibility



Conclusion

The results above indicate that pyrethroid resistance is widespread. Given that mortality increases after exposure to PBO, particularly for deltamethrin, PBO nets may be needed for future distributions. Additionally, chlorfenapyr resulted in high mosquito mortality indicating that nets treated with both pyrethroids and chlorfenapyr (dual insecticide-treated nets) may also be needed. The susceptibility of several insecticides used for IRS allows for insecticide resistance management strategy of rotation.

Key Question 3

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

No outstanding issues.

Conclusion

Overall, there is good capacity for entomological monitoring and molecular testing in Ethiopia at Jimma University and Armauer Hansen Research Institute. These activities should continue to be supported to address potential threats to effective malaria control (new vectors, insecticide resistance, etc.).

1.B. INSECTICIDE TREATED NETS (ITNs)

PMI Goal

Achieve high ITN coverage and usage of effective nets in malaria endemic areas (in the context of the current insecticide resistance); and maintain high coverage and use with consistent ITN distribution (via campaigns and/or continuous channels in a combination that is most effective given country context).

Are you proposing to increase, decrease, or maintain funding allocation levels for ITN distribution and SBC activities? Why? What data did you use to arrive at that conclusion?

In Ethiopia, ITN planning is based on the WHO recommendation of 1 net for 1.8 people. PMI supports the FMOH policy to distribute ITNs to communities at risk of malaria transmission as defined in the NMSP 2017-2020 malaria stratification. In calendar year 2021, the number of ITNs that will be procured and distributed with support from the Global Fund is unknown. Therefore, the gap analysis table reflects a large gap. PMI is proposing to procure 2.5 million ITNs with available funds. Discussions are planned with Global Fund to address the commodity gap in 2021.

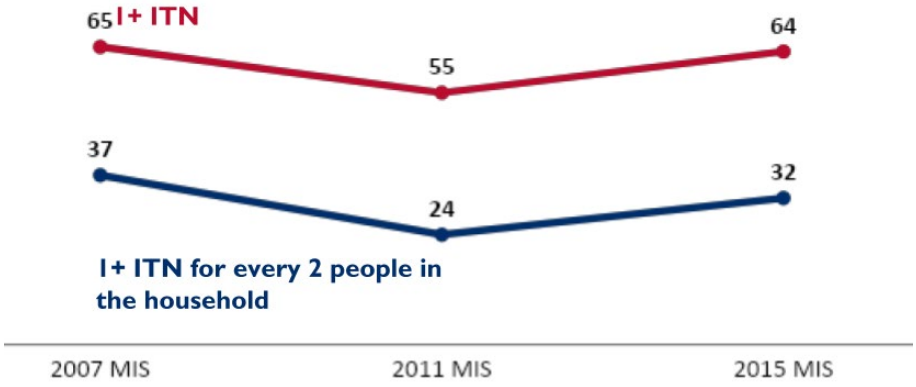
Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

How has net ownership evolved since the start of PMI in the country? Are households fully covered?

Supporting Data

Figure A11. Trends in ITN Ownership, Percent of Households



Conclusion

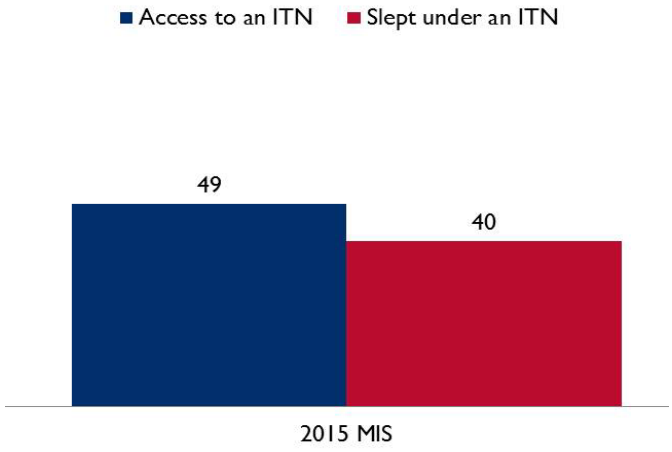
According to the MIS conducted between October and December 2015, 64 percent of all households owned at least one ITN in malarious areas (areas <2,000m above sea level). Although about 27 million ITNs were reported to have been distributed in 2015, the mass campaign was still ongoing during the MIS survey. Therefore, ITN access may have been greater immediately following the survey. Additionally, since 2015, Ethiopia has held four sub-national campaigns, distributing more than 35 million nets. These subsequent campaigns have focused on increasing resources to ensure distribution to the end user, utilized a tool to track ITN distribution, and relied on a comprehensive package of SBC activities.

Key Question 2

What proportion of the population has access to an ITN? In contrast, what proportion of the population reports using an ITN? What is the ratio between access and use? Does it vary geographically?

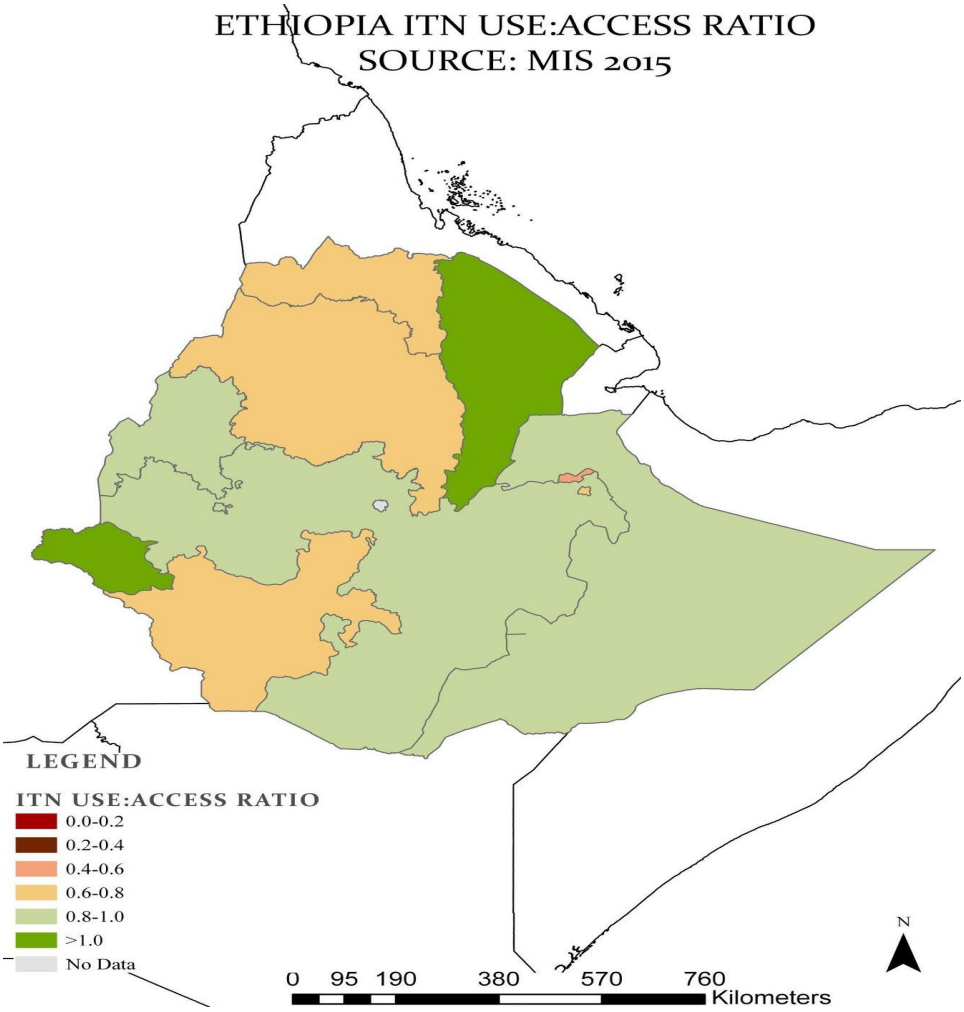
Supporting Data

Figure A12. ITN Access and Use, Percent of Household Population with Access to an ITN and Who Slept Under and ITN the Night Before the Survey



The use: access ratio is calculated by dividing the number of people reporting use of an ITN the night before by the number of people who could have used a net the night before the survey (number of ITNs x 2). During the 2015 MIS survey (areas below 2000m), use and access were both obtained, allowing a calculation of this ratio (see Figure A13).

Figure A13. ITN Use: Access Ratio



Conclusion

According to the 2015 MIS, net: use rates in households that owned a mosquito net or ITN are above or close to 1 in most of Ethiopia. In regions where there is room for improvement (Tigray, Amhara, and SNNP Regions), targeted SBC messages may be useful in increasing use of nets when there is access in these areas.

Key Question 3

In areas where ITN access is high but use is low, what is known about the key barriers and facilitators to use?

Supporting Data

Figure A14. Key Barriers and Facilitators to ITN Use

Facilitator	Type of Factor	Data Source	Evidence
High outcome expectancy - belief that net will protect them from malaria	Internal	Communication for health midline report (JHU- CCP, 2019)	94.3% people believe use of bed net can prevent malaria.
Barrier	**Type of Factor**	**Data Source**	**Evidence**
Low risk perception of malaria during dry season/low transmission season	Environmental	Communication for Health midline report (JHU- CCP, 2019)	Key informant interviews and qualitative studies indicated that people were less likely to use nets during low transmission season.
Net attrition	Environmental	Net durability study	The average life of an ITN is approximately two years and almost 72% of net attrition is attributed to wear and tear.

Conclusion

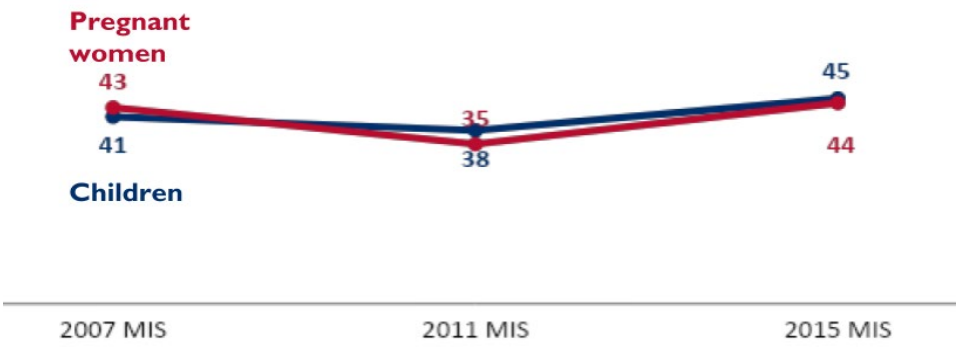
Midline reviews show that populations exposed to current SBC interventions have higher self-efficacy toward net use and higher outcome expectancy of net use. Therefore, the goal is to continue to leverage high response efficacy around net use in order to increase utilization of ITNs at the household and community level. Campaigns and messages towards consistent and correct use of ITNs will help address this behavioral gap. SBC activities are also needed to encourage net care (tying up, keeping away from children and animals, proper washing, etc.) in order to address the high net attrition.

Key Question 4

What percent of pregnant women and children under 5 report sleeping under an ITN?

Supporting Data

Figure A15. Trends in ITN Use among Children and Pregnant Women, Percent of Children under 5 and Pregnant Women Age 15-49



Conclusion

According to the 2015 MIS, access to use ratio is 0.81 (i.e., 8 out of 10 people with access to an ITN use the ITN). As the above figure shows, from all malarious areas, 44 percent of pregnant women and 45 percent of children under five slept under ITNs. However, in households owning at least one ITN, use by children and pregnant women was 70 percent and 74 percent, respectively. Ensuring that all children under five and pregnant women have access to ITNs should be the first step to increase net use. Additionally, the malaria SBC approaches and tools can be tailored to the identified behavioral gaps on ITN use.

Key Question 5

What channels are used to distribute ITNs?

Supporting Data

Figure A16. ITN Distribution 2015-2019

Channel	2015	2016	2017	2018	2019
EPI					
ANC					
Schools					
Community					
Mass Campaign	27,022802	3,500,000	5,300,000	10,400,000	15,888,013

ITNs are distributed through rolling mass campaigns to all malaria affected communities in ITN targeted areas every three years. Annually, the NMCP targets net distribution to specific geographic areas. Over the past three years, due to insufficient capacity and logistical challenges, the NMCP has not introduced distribution via routine channels to improve access to ITNs. Although there were plans to conduct a pilot of community-based continuous distribution in 20 to 30 districts using Global Fund

resources, it is unclear if this will move forward due mainly to perceived logistical concerns expressed by the NMCP.

Conclusion

Although ITN ownership did not reach set targets according to the 2015 MIS, the NMCP coordinated extensive planning and monitoring (down to end users) for subsequent campaigns together with comprehensive advocacy and SBC approaches to increase net ownership and utilization.

Key Question 6

What is the estimated need for ITNs over the next three calendar years? What volume of ITNs are available from partners and the public sector for the next three calendar years?

Supporting Data

Figure A17. Gap Table on ITN Commodities

Calendar Year	2019	2020	2021
Total Targeted Population[1]	28,080,520	12,438,188	21,843,629
Continuous Distribution Needs			
Channel #1: ANC	0	0	0
Channel #2: EPI	0	0	0
Mass Distribution Needs			
Mass distribution campaign	15,600,289	6,910,104	12,135,350
Estimated Total Need for Campaigns	15,600,289	6,910,104	12,135,350
Total Calculated Need Continuous and Campaign	**15,600,289**	**6,910,104**	**12,135,350**
Partner Contributions			
LLINs carried over from previous year	0	290,859	1,868,362
LLINs from Government	0		0
LLINs from Global Fund	10,318,035	3,189,620	
LLINs from Other Donors			0
LLINs planned with PMI funding [2]	5,573,113	5,297,987	2,500,000.00
Total LLINs Available	**15,891,148**	**8,778,466**	**4,368,362**
Total LLINs Surplus (Gap)	**290,859.00**	**1,868,362**	**(7,766,988.01)**

Footnotes:

[1] The total targeted population (12,438,188) to be covered in 2020 are in Benishangulgumuz, Gambella, Tigray, Afar and SNNP regions. In 2021, the targeted populations (21,843,629) are from Somali, Harar, Diredawa, Amhara and Oromia regions of Ethiopia. The data for 2021 (21843629) is based on the previous campaign which requires confirmation by the MOH.

[2] The new LLINs (3,457,553) to be procured by PMI fund in 2020 will be 2,849,753 LLINs from MOP19 and additional funding that have been reprogrammed from MOP 18 to procure 2,448,234 LLINs. In addition, 3,189,620 LLINs will be procured by Global Fund budget in 2020.

Conclusion

The Global Fund and PMI have been the only donors in Ethiopia to procure significant quantities of ITNs. There remains a large ITN gap for the 2021 mass ITN distribution campaign, despite PMI's commitment to procure 2.5 million ITNs with FY 2020 funds. Discussions with Global Fund are ongoing, as the current NFM grant does not include procurement of ITNs for the 2021 campaign, and the subsequent Global Fund grant-making cycle has yet to take place. Furthermore, the cost per net may increase if the NMCP decides to procure PBO, dual-insecticide, and/or higher-denier ITNs (see section below for discussion on denier).

Key Question 7

What is the current status of durability monitoring?

Supporting Data

Figure A18. ITN Durability Monitoring

Campaign Date	Sites	Brands	Baseline	12-month	24-month	36-month
May 2015	Three districts each from Tigray, Amhara, Oromia and SNNPR Regions	PermaNet® and MAGNet®	3,397	X	X	X

Figure A19. Key results of ITN Monitoring

Site	Survey and time since distribution (months)	Attrition wear and tear (%)	Remaining nets in serviceable condition (%)	Remaining nets hanging over sleeping space (%)		Optimal insecticidal effectiveness in bio-assay (%)
				Campaign	Other	
Total, Tigray, Amhara, Oromia and SNNPR	12m:	22.2	48.6	51.3		100
	24m:	39.1	39.6	41.5		95.3
	36m:	71.8	15.6	41		19.0

Figure A20. Attrition by Brand of ITNs

ITN Brand	Survey and Time since Distribution (Months)	Attrition Wear and Tear		
		Frequency	%	95% CI
MAGNet®	0m (n=2,283)			
	12m:	366	16.03%	[15.5,17.6]
	24m:	775	33.9%	[32.0, 35.9]
	36m:	1,443	63.20%	[61.19, 65.18]
PermaNet®	0m (n=1,114)			
	12m:	390	35.0%	[32.2,37.9]
	24m:	553	49.6%	[46.6, 52.6]
	36m:	1,001	89.6%	[87.9, 91.5]

Conclusion

Results from three years of PMI-supported durability monitoring were recently analyzed and disseminated. Results indicate that the average life of an ITN was less than two years, which falls short of the predicted three year lifespan of a net, where almost 72 percent of net attrition was attributed to net physical integrity (i.e. wear and tear). Given the major budget implications of switching to a two-year net replacement strategy, PMI and the NMCP will discuss results and implications with all stakeholders. Other possible strategies may include SBC for better use and care, distributing ITNs to at-risk population more frequently or procuring higher-denier ITNs to withstand physical damage and contributing to a possibly increased net longevity.

Key Question 8

What are the in-country that impact your funding allocation in this category?

Supporting Data

There is continued civil unrest in Ethiopia and in some districts, ITN distribution was delayed temporarily due to security concerns.

Conclusion

In ITN distributions down to the household level, working more closely with local authorities, district health offices and communities would solve some of the challenges.

1.C. INDOOR RESIDUAL SPRAYING (IRS)

Key Goal
Ensure high spray coverage, with an appropriate insecticide, in targeted endemic PMI-supported areas

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?
IRS is one of the mainstays of vector control in Ethiopia in high malaria burden and persistent epidemic-prone areas of the country. PMI plans to maintain funding allocation for IRS and will continue supporting IRS in districts with relatively high malaria burden in the western part of the country. PMI will determine whether to graduate PMI support for IRS in Oromia based on best available entomological and epidemiological data during MOP 2021 planning. However, PMI will likely continue to support IRS in districts in Oromia with continued high malaria transmission in the coming year. Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

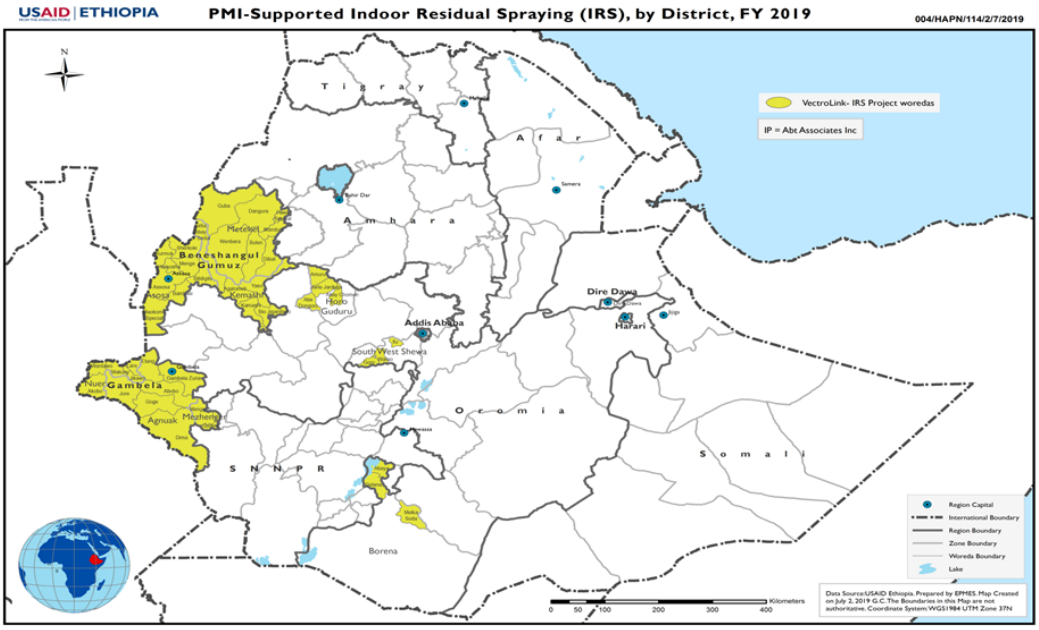
Key Question 1

What areas are targeted for IRS and why?

Supporting Data

According to the NSP 2017-2020, all areas stratified as high malaria burden (which includes a catchment area comprising 3.3 percent of the national population), highland fringe areas (epidemic-prone areas), and areas bordering high-burden districts should be targeted for IRS. These areas represent 14.8 percent of the national population. PMI currently supports IRS in 44 districts in high malaria burden areas (all 14 districts in Gambela, all 20 districts in Benishangul Gumuz, and 10 in Oromia region) as illustrated in the map below.

Figure A21. PMI-Supported IRS, by District for FY 2019



Note: Figure A21 shows PMI supported areas only. FMoH supports IRS in many other districts, however the list of districts is not available.

PMI began implementation of IRS in Gambela Region in June 2018. Routine health facility malaria case reports from the region demonstrate a 44 percent reduction of malaria cases from June to December 2018 when compared to a similar period in 2017. Similarly, in Abaya district, significant mosquito density reduction was observed subsequent to IRS implementation in June 2018.

Figure A22. Gambela Malaria Cases, June – December 2015 - 2018

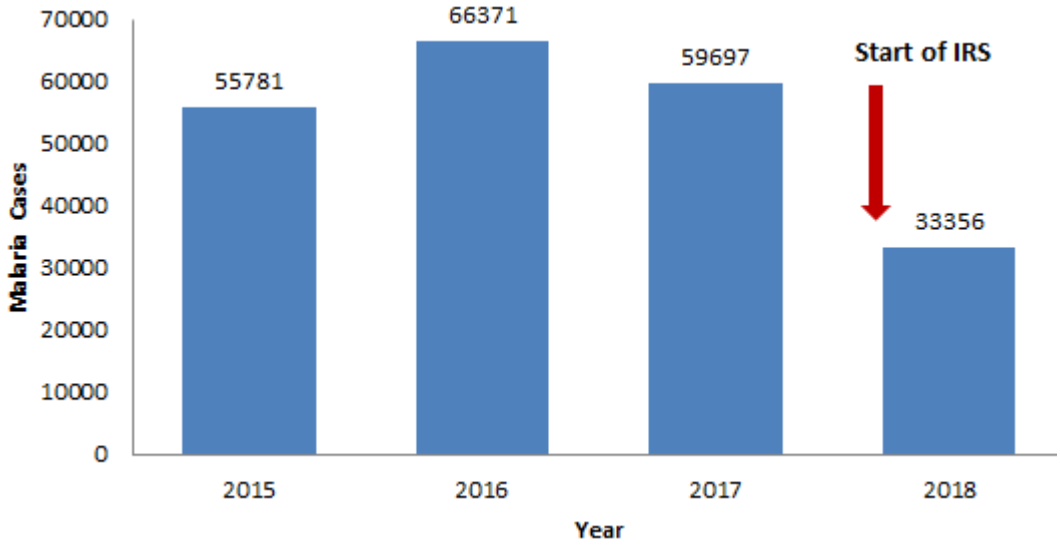
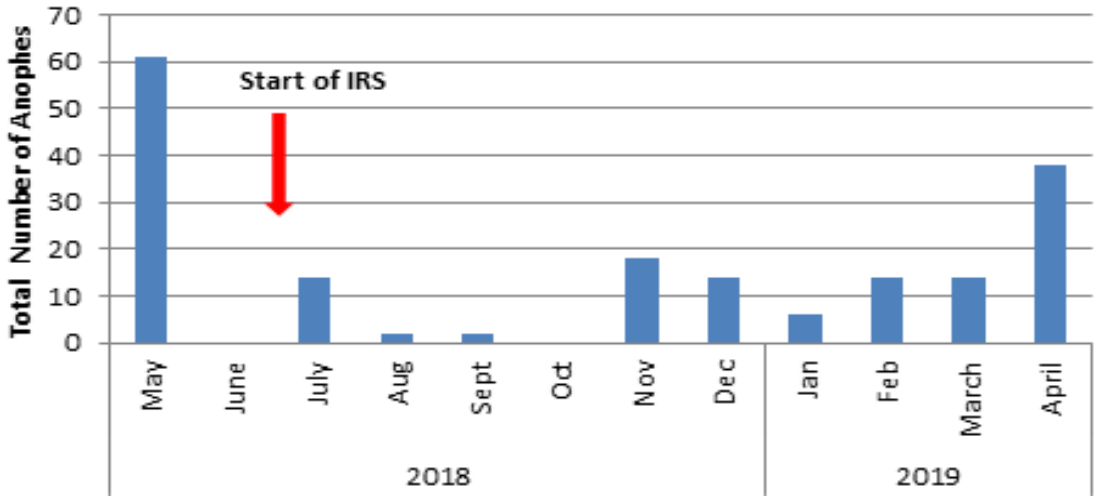


Figure A23. Anopheles Collected using PSC, CDC, and HLC from Abaya, May 2018-April 2019



The Ministry of Health conducts IRS in many districts using its own resources and via support from the Global Fund and MDG pool funds. However, details regarding government-operated IRS are not readily available by district.

Conclusion

Given the decrease in malaria cases and vector density in sprayed areas, and given the additional benefit of reducing the importation of cases to malaria free areas through migrant workers in Gambela and Benishangul-Gumuz, PMI proposes to continue a similar level of IRS support in high malaria burden districts with improved targeting using morbidity data, entomological monitoring, insecticide resistance information, and insecticide decay rate.

Key Question 2

In PMI-supported areas, what spray coverage rates have been achieved in the past 5 years?

Supporting Data

Figure A24. Spray Coverage Rates 2016-2020

Calendar Year	Number of Districts Sprayed	District Names**	Number of Structures Sprayed	Coverage Rate	Population Protected
2016	36	Oromia (36 districts)	715,541	99%	1,688,745
2017	44	Benishangul- Gumuz (8 districts), Oromia (36 districts)	738,810	99%	1,877,154
2018	44	Benishangul- Gumuz (20 districts), Gambela (14 districts), Oromia (10 districts)	472,569	97%	1,264,189
2019	44	Benishangul- Gumuz (20 districts), Gambela (14 districts), Oromia (10 districts)	487,746	95.5%	1,334,868

Calendar Year	Number of Districts Sprayed	District Names**	Number of Structures Sprayed	Coverage Rate	Population Protected
2020*	44	Benishangul- Gumuz (20 districts), Gambela (14 districts), Oromia (10 districts)			

*Denotes targets
**If more than 15 districts, list regions/provinces

Conclusion

High spray coverage has been achieved in PMI-supported IRS districts. PMI strives to keep high coverage with global standard best practices in IRS including the use of satellite imagery for accurate detection of target structures.

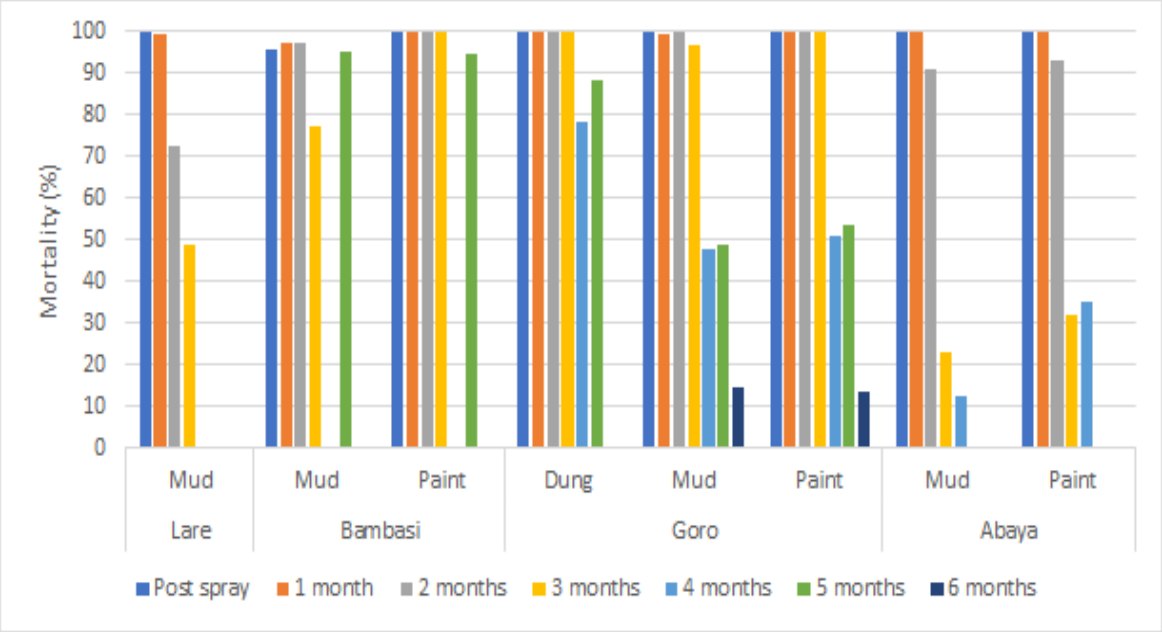
Key Question 3

What is the residual efficacy of the insecticides used for IRS in PMI-supported areas?

Supporting Data

The residual efficacy of Actellic IRS was assessed through 30 minute cone bioassays using colony-reared *Anopheles arabiensis* that were susceptible to pirimiphos methyl. The results are shown in Figure A25.

Figure A25. Residual Efficacy of Actellic IRS



Conclusion

The results show that the residual activity of Actellic on walls ranges from two to five (plus) months, which is shorter than the expected residual efficacy and data from other PMI focus countries using Actellic. The short length of activity in Gambela, Lare, and Abaya are particularly concerning, and

may be due to the physical characteristics of the mud used for walls. Therefore, it is critical that data is generated for efficacy of new insecticides for IRS in Ethiopia.

Key Question 4

What is the plan for insecticide rotation? What insecticide will be used next in PMI-supported areas?

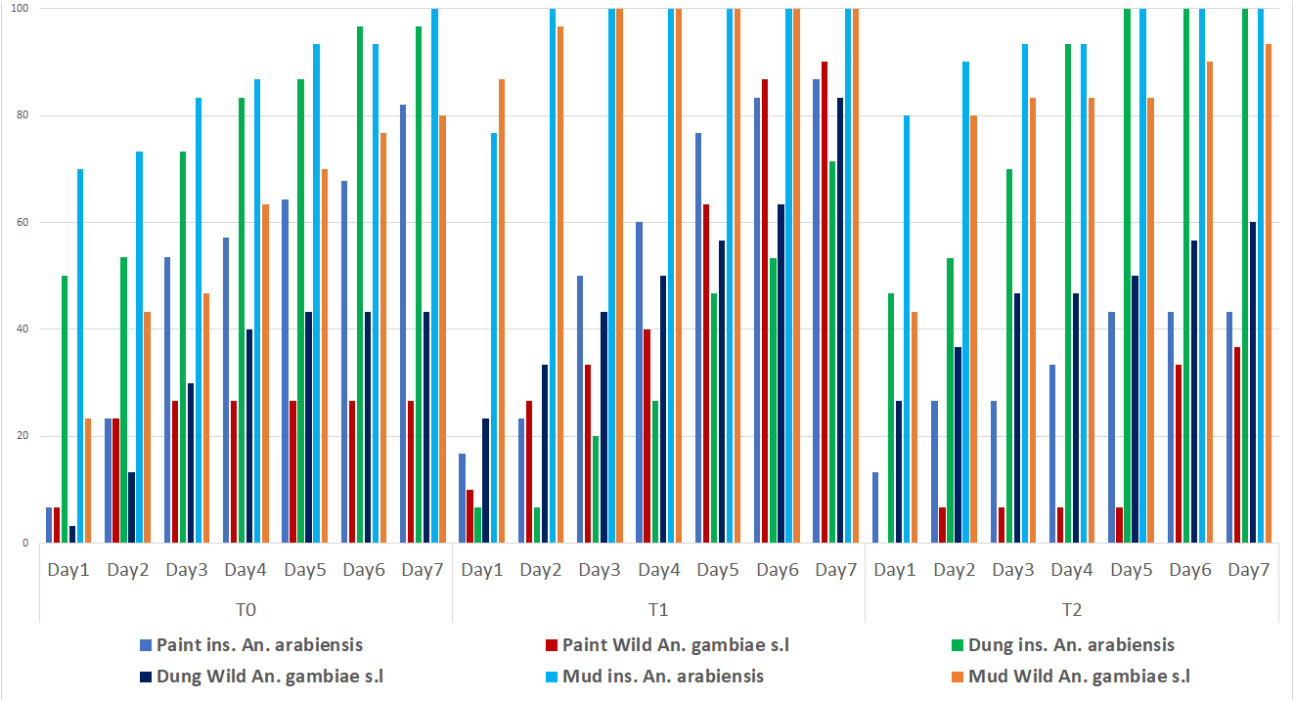
Supporting Data

Figure A26. Insecticide Rotation in PMI-Supported Areas

Year	Benishangul-Gumuz Region	Gambela Region	Gambela Region
2017	organophosphate	organophosphate	organophosphate
2018	organophosphate	organophosphate	organophosphate
2019	organophosphate	organophosphate	organophosphate
2020*	TBD	TBD	TBD

*Denotes planned insecticide classes

Figure A27. Mortality of Insectary *An. Arabiensis* and *An gambiae s.l.* from Cone Bioassay Tests of SumiShield-Sprayed Huts



Conclusion

Both PMI and the NMCP are cognizant of the importance of preserving insecticide efficacy and the importance of preemptively switching insecticides for IRS. To date, there is inadequate locally-generated evidence to support a switch to next generation insecticides. SumiShield performance dropped below 40 percent and 60 percent on painted and dung walls, respectively, in experimental hut trials on day 7 of T2 for both laboratory reared *An. arabiensis* and wild *An. gambie sl* (see graph

above). Therefore, PMI will continue to support insecticide decay rate measurements. PMI is also considering supporting small scale piloting of SumiShield spraying in residential houses to evaluate the performance of the new insecticides, as requested by the NMCP. Once the results are available and if favorable, IRS insecticide rotation will be implemented on a wider scale.

Key Question 5

Are any PMI-supported areas considering withdrawing IRS? If so, what programs are in place to cover anticipated increases in malaria cases and promote consistent net use and care-seeking behaviors?

Supporting Data

There is no plan to withdraw IRS from currently PMI-supported areas.

Conclusion

PMI will continue supporting IRS in Gambela and Benishangul-Gumuz Regions and will reassess IRS support in Oromia for 2021 during MOP FY2021 planning based on evolving entomological and epidemiological data.

Key Question 6

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

In Benishangul-Gumuz, the start date of IRS campaign was delayed for two weeks due to security problems. Subsequently, the campaign was also interrupted several times in different districts and some kebeles with active conflict and were finally excluded from IRS after discussion with regional and district officials.

Conclusion

PMI continues to implement IRS in collaboration with health facilities and district health offices through engaging local community members to maximize access and coverage.

2. HUMAN HEALTH

2.A CASE MANAGEMENT in health facilities and communities

NMCP objective
• By 2017 and beyond, 100 percent of suspected malaria cases are diagnosed using RDTs or microscopy within 24 hours of fever onset. • By 2017 and beyond, 100 percent of confirmed malaria cases are treated according to the national guidelines. • By 2020, all households living in malaria endemic areas will have the knowledge, attitudes, and practice to adopt appropriate health-seeking behavior for malaria prevention and control.
NMCP approach
• The FMOH's policy is for microscopy to be the primary means of malaria diagnosis at hospitals and health centers, and for malaria RDTs to be the diagnostic method at rural health posts. The FMOH states that artemether-lumefantrine with single low-dose primaquine should be used to treat *P. falciparum* infections, whereas chloroquine combined with radical cure primaquine should be used to treat *P. vivax* cases without prior G6PD testing. Oral quinine remains the treatment of choice for uncomplicated *P. falciparum* for pregnant women during the first trimester of pregnancy, and as second-line for treatment failures. Rectal artesunate should be available at rural health posts for pre-referral treatment for children less than six years of age, and parenteral artesunate or artemether (alternate) should be available at health centers and hospitals for the treatment of severe malaria. • The Ethiopian Public Health Institute (EPHI) developed the national laboratory master plan that establishes integrated quality-assured national laboratory systems for improved routine diagnosis and treatment practices including malaria. The laboratory system in Ethiopia is a four-tiered platform: the national and regional laboratories in the first and second tiers, respectively, play a role in policy development, capacity building, and coordination of quality assurance activities; the third tier, comprised of hospital laboratories, provides laboratory services and serves as EQA centers for health centers; and the fourth tier, comprised of health centers and health posts, provides laboratory diagnostic services only. The quality assurance (QA) activities include blind rechecking, panel testing, and onsite supportive supervision conducted quarterly, three times and two times a year, respectively. • According to the 2017/2018 annual performance report of FMOH, there are a total of 290 functional public hospitals, 3,962 functional health centers, and 17,086 health posts. Of the health centers, 75 percent (3,189) of the facilities are estimated to be in malarious areas.

There are 7,702 physicians, 10,129 health officers, 55,255 nurses and 36,660 HEWs in the public health sector in Ethiopia.

- The typical health post is staffed by two HEWs delivering 16 selected health packages, including one health package on malaria [http://cnhde.ei.columbia.edu/training/index.html]. HEWs are paid FMOH staff; they undergo a one-year training program after having received a high school diploma, and usually originate from the communities they serve. The HEWs focus on preventive services; however, they also provide curative health care services for malaria for all ages, and pneumonia and diarrhea in children less than five years of age using the integrated community case management (iCCM) approach of evidence-based diagnostic and treatment algorithms. For malaria, HEWs have been trained to confirm and report malaria diagnoses among clinically evaluated acutely ill patients using malaria multispecies RDTs. Severe malaria cases are to be referred to the next appropriate health facility, with initial pre-referral management using rectal artesunate. The HEWs are encouraged to consider other diagnostic possibilities for patients who test negative by malaria RDT, and to avoid empiric treatment with antimalarials when malaria RDTs are available.
- MIS 2007 and 2015 surveys suggested that 24.1 and 36.4 percent of people, respectively, initially receive care for febrile illnesses through the private sector. The NMSP states that partnership with the private sector will be promoted through public private partnership framework and regulations. The NMCP guidance for malaria diagnosis and treatment in the private sector is similar to that for the public sector. Malaria diagnosis should be confirmed with RDT for those clinics without microscopy services. Microscopy, if available, is the recommended method to diagnose malaria in private clinics. In general, drug availability and use are the same in the public and private sectors, except for the wide availability of artemether injection in the private sector to treat severe malaria.
- The NMSP aims to train all HEWs in RDT testing and laboratory professionals in malaria laboratory diagnosis and provide quality assured diagnostic commodities at all health facilities.

PMI objective, in support of NMCP

- PMI builds the capacity of NMCP, EPHI, Ethiopia Pharmaceutical Supply Agency (EPSA), regional laboratories, regional health bureaus, and districts to manage the malaria case management program effectively. PMI supports the NMCP in updating malaria case management guidelines, training materials, and job aids. PMI is supporting training of HEWs, midwives, clinicians, pharmacy, and laboratory professionals on the current malaria case management guidelines. It also supports supervision and mentoring of health workers to improve the quality of malaria diagnosis and treatment. PMI is also procuring essential commodities and drugs for malaria diagnosis and treatment.

- PMI builds capacity of woreda health offices to manage malaria case management in their catchment health facilities. A woreda will be graduated or transferred from PMI to RHB for routine support based on the following criteria:
    - Eighty percent of all health facilities and health posts in supported woredas have achieved greater than 85 percent in malaria lab diagnosis standard per audit result.
    - Eighty percent of all health facilities in supported woredas have malaria lab EQA (blinded rechecking) performance of greater than 85 percent for at least two consecutive rounds.
    - Eighty percent of all health facilities in supported woredas has achieved greater than 85 percent in malaria case management standards.
    - All the supported health facilities in the woreda have at least two OPD and/or ANC staff trained on fever case management.
    - All the supported health facilities in the woreda have at least one lab staff on malaria laboratory diagnosis and quality assurance.
    - All supported health facilities in the woreda received a package of malaria laboratory diagnosis and case management documents (e.g., SOPs, job aids, manuals, guidelines).
- PMI is supporting case management activities in all regions except Harari and Dire Dawa, which have low malaria burden.

PMI-supported recent progress (past ~12-18 months)

- From October 2018 to June 2019, PMI procured 313,764 vials of injectable artesunate, 600,000 quinine tablets, 8,477,000 chloroquine tablets, and 90,000 artesunate suppositories.
- PMI assisted in the development of a pocket guide on malaria case management and is supporting the development of a national malaria training manual for malaria program managers.
- From October 2017 to March 2019, PMI supported malaria case management training for 5,634 clinical health workers and onsite clinical training for 1,305 clinical health workers. PMI also supported malaria laboratory diagnosis training for 560 laboratory professionals including several rounds of onsite supportive supervision and mentorship. Laboratory strengthening activities for malaria microscopy include quality improvement, purchasing laboratory equipment and additional supplies, supportive supervisions for treatment processes, and activities to improve private sector case management.

- From October 2017 to March 2019, PMI supported external quality assessments (EQAs) for malaria microscopy in 150 health facilities and performance assessments for RDTs in 115 out of 12,815 health posts.
- From October 2017 to March 2019, PMI succeeded in expanding its case management support:
- PMI expanded its supportive supervision to 140 hospitals (representing 48 percent of total), 347 health centers (12 percent of total) and 527 health posts (4 percent of total) integrated with maternal and child health project.
- Of the 691 targeted health facilities in high burden areas, PMI expanded its quarterly clinical mentoring to 275 health facilities, quarterly malaria microscopy mentoring to 246 health facilities, and quarterly monitoring and evaluation and data quality mentoring (which is integrated with case management support) to 63 health facilities.
- The FMOH and EPHI is scaling up malaria microscopy EQA using Global Fund resources with PMI providing technical assistance.
- PMI provided biomedical support for five of 15 targeted subnational biomedical centers and two of four biomedical engineering teaching universities. Twenty-five biomedical engineers were trained on equipment maintenance of five types of equipment (microscopes, centrifuge, fridge, biosafety cabinet, and incubator).
- In 2018, PMI supported data collection for a therapeutic efficacy monitoring study of artemether-lumefantrine and Dihydroartemisinin-piperaquine for *P. falciparum* and chloroquine and Dihydroartemisinin-piperaquine for *P. vivax.* Preliminary data analysis is complete, including molecular testing through PMI-supported Antimalarial Resistance Monitoring in Africa (PARMA).
- Recent studies have confirmed high rates of HRP2-deletions in Eritrea and Sudan; thus, PMI Ethiopia has incorporated the HRP2 deletion test in the TES samples collected in September 2017. In addition, a collaborative effort between WHO and EPHI conducted a larger survey of several health facilities to investigate the occurrence of HRP2/3 deletions in districts in Gambela, Tigray, and Amhara Regions bordering Sudan and Eritrea. Results are pending.
- Bottlenecks or challenges that slowed or prevented implementation of case management strengthening activities are:
- The relatively large number of health facilities in Ethiopia along with low government capacity have posed challenges to scaling up EQA comprehensively as it requires skilled human resources and logistics to reach all facilities.
- There are gaps in the timely supply of quality reagents and laboratory supplies as well as lack of quality maintenance of microscopes and laboratory equipment.

- Maintaining the quality of services in graduated health facilities.
- Low adherence of health workers to standard protocols, e.g. testing all febrile patients, providing radical cure primaquine, over-diagnosis of severe malaria and over-utilization of artesunate injection.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- Provide program management support in malaria diagnosis and treatment to the FMOH, NMCP, RHBs, zonal health departments, woreda health offices, and health facilities.
- Train 418 laboratory and 730 clinical professionals and 70 program management staff.
- Support EQAs conduct onsite evaluations for malaria microscopy in 336 health facilities and support clinical mentoring in 405 health facilities. Provide data quality support focusing on data validity at the facility level to 300 health facilities.
- Provide onsite case management and RDT mentorship to 1,200 health posts out of a total of 12,815 expected to be located in malarious areas.
- Continue to provide support to national and 15 subnational biomedical centers and four biomedical engineering teaching universities to improve the availability of functional equipment for malaria case management.

PMI Goal

Improve access to and utilization of timely, quality, and well-documented malaria testing and treatment by providing facility- and community-based health workers with training, supervision, and malaria commodities to be able to provide high quality, effective care.

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

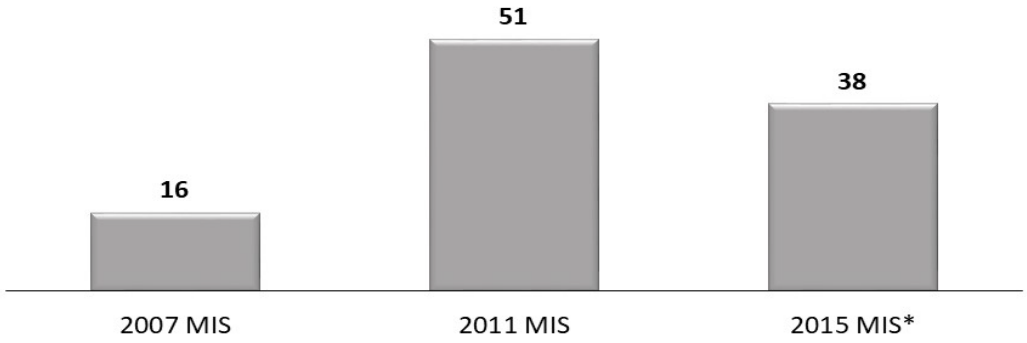
The funding level for malaria case management was reduced slightly from $5.9 million to $5.45 million due to the reduction of funding from the private sector mechanism, which is ending in FY 2020. Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

What is the status of care-seeking?

Supporting Data

Figure A28. Trends in Care-Seeking for Fever Among Children Under 5 with Fever in the 2 Weeks before the Survey, for Whom Advice or Treatment Was Sought the Same or Next Day



*Febrile children for whom advice or treatment was sought at any time, including beyond 24-hours.

Conclusion

According to 2007, 2011, and 2015 MIS surveys, 16 percent, 51 percent, and 38 percent of children under five years of age, respectively, sought medical attention for fever. While health-seeking behavior has improved from the 2007 baseline, the decline from 2011 to 2015 is concerning. Of those with fever, 12 percent in 2007 and 33 percent in 2011 took any antimalarial drug. Although, we do not have this indicator data from 2015, the proportion receiving an ACT improved dramatically from 29 percent in 2011 to 89 percent in 2015.

Key Question 2

What is known about the major barriers and facilitators to care-seeking?

Supporting Data

Figure A29. Key Barriers and Facilitators to Care-Seeking

Facilitator	Type of Factor	Data Source	Evidence
High favorable attitude toward treatment seeking	Internal	Communication for health 2019 midline report	The outcome expectancy (motivation) and self-efficacy (an individual's belief in his or her capacity to execute behaviors) for seeking treatment for children under 5 years within 24 hours of onset of fever is 95.2% and 92.0%, respectively.
Increased access to malaria services	Environmental	FMoH, SARA 2018	The readiness of government facilities for malaria diagnostic capacity is improved (80%). Health posts were the lowest (65%) among the public facilities to offer malaria treatment and diagnosis services.

Barriers	Type of Factor	Data Source	Evidence
Misconception on cause of malaria	Internal	Socio-cultural study (C4H qualitative, 2018), midline report 2019 C4H, PMI Ethiopia Jimma study, 2016	The 2018 socio-cultural study by C4H has shown that there is a wide misconception on the causes of malaria in the community. In addition, the 2016 PMI/Ethiopia study on malaria related perception on care seeking in Jimma zone has listed out a number of malaria related local misconceptions that include less hygienic food or drinks, eating maize or sugarcane, witchcraft or devils attack, cold weather conditions, hunger and getting soaked with rain. Such beliefs would have a negative influence on prompt care seeking and treatment source (Birhanu et al, Malaria Journal, 2016).
Low comprehensive knowledge on signs and symptoms	Internal	C4H Midline study 2019	Knowledge on three or more signs and symptoms of malaria is low, 31% and 39%, respectively.

Conclusion

PMI is planning to support SBC activities to mobilize communities to adopt effective malaria treatment behavioral practices (early diagnosis and treatment, adherence to antimalarials) through continued SBC interventions utilizing health extension workers, school clubs, road shows, and health bazar coordinated with service delivery. To improve the knowledge of current behaviors and barriers related to treatment for malaria PMI is funding a malaria behavioral survey in 2021 to better inform future interventions.

Key Question 3

How have malaria testing and treatment practices evolved over time?

Supporting Data

Figure A30. Malaria Trend and Proportion of Malaria Cases Tested with RDT or Microscopy from 2012-2018 (from HMIS data)

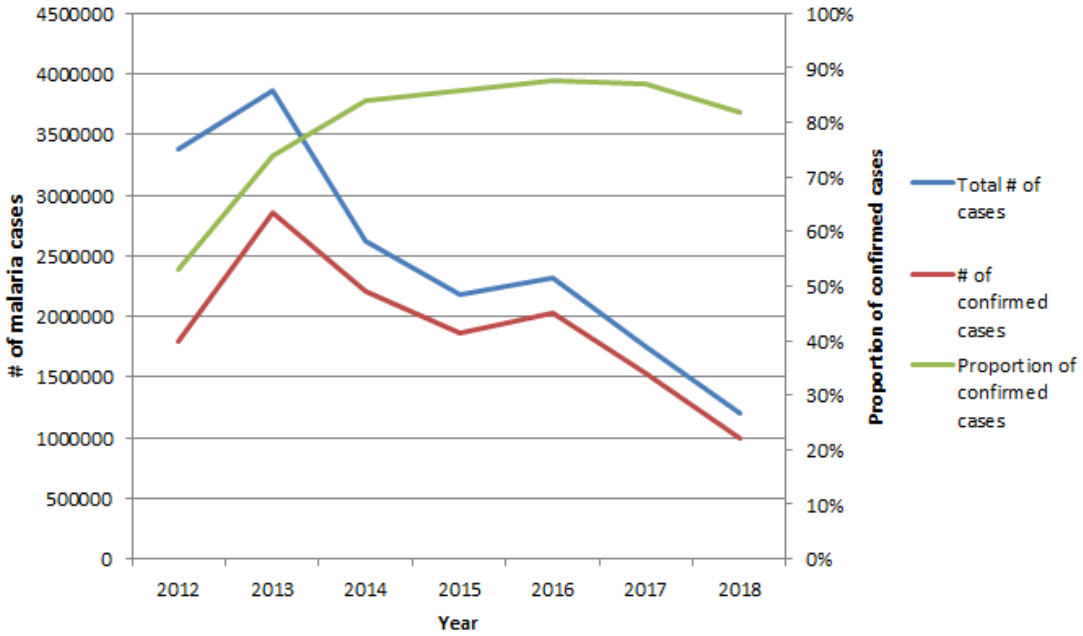
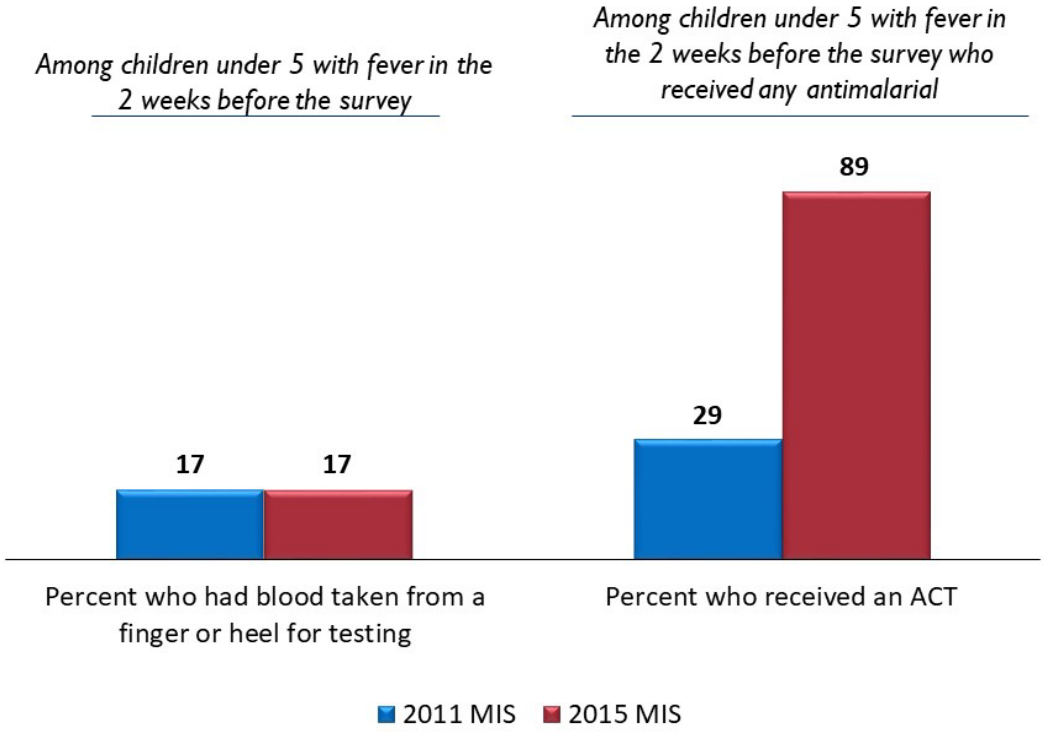


Figure A31. Trends in Diagnosis and Treatment of Children with Fever



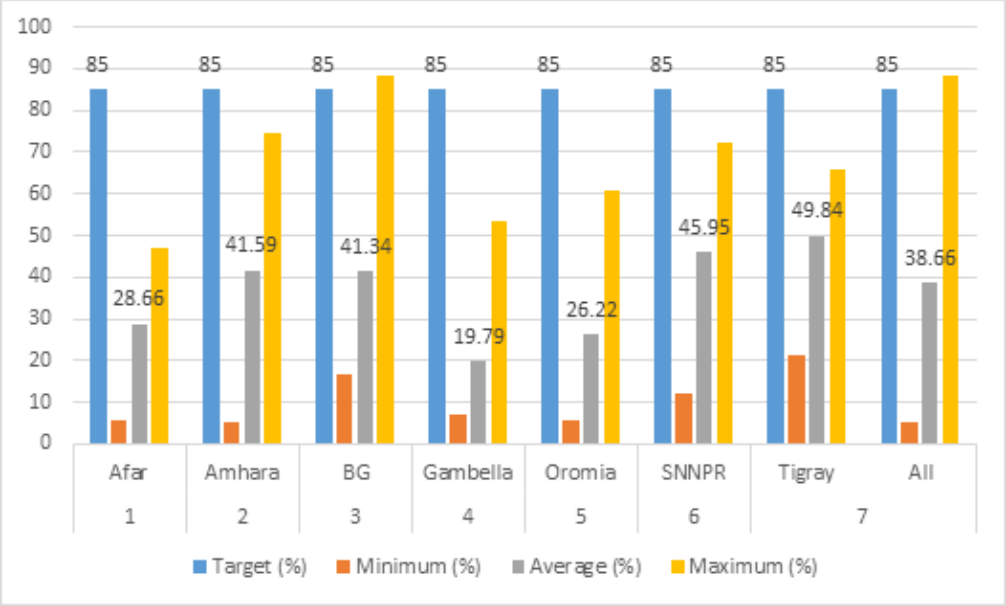
An analysis of health management information system (HMIS) data indicate that Ethiopia has made progress in scaling up diagnostic testing for malaria: the percentage of suspected malaria cases reported that were confirmed by either RDT or microscopy increased from 54 percent in 2012 to 82

percent in 2018, leaving only 217,219 presumed malaria cases (i.e., those cases that were clinically treated without laboratory confirmation) among the 1,206,891 total cases in 2018. However, these data do not capture all fever cases (suspected cases) and therefore the testing rate should be interpreted with caution. The MIS, however, yielded a much lower test rate at 17 percent (with no improvement between 2011 and 2015).

To assess a facility's capacity to provide services for clinical assessment/treatment, PMI uses a composite score comprised of facility readiness (essential equipment such as thermometer; blood pressure apparatus and weight scale; antimalarial drugs; job aids) and provider performance in adhering to recommended management of fever/malaria cases. To meet the minimum standards to provide malaria case management at all of its service outlets (i.e., OPD, pediatric clinics and ANC clinics), a facility must score 85 percent. The findings below are from facilities where PMI has recently started support.

This assessment includes observation, patient chart review and review of records and reports. The assessment will be followed by quarterly review meetings that provide a platform for discussing the findings. In addition, there is a capacity building activity for district managers on malaria program management through training and joint supervision for follow up and action. The combination of training with follow up supervision and mentoring approach has a significant improvement in case management at facilities in Oromia where PMI has been supporting for the last 9 years. Parasite detection by microscopists increased from 64% to 98%, false positive decreased from 18.3% to 3% and species misdiagnosis reduced from 8% to 0% (N.B. these findings are also from PMI supported facilities only).

Figure A32. Expected target score versus mean baseline percentage score of surveyed health facilities in malaria case management by region, December 2018, (n=482)



All regions have low average performances (38.7 percent) in providing malaria diagnosis and treatment services according to national guidelines, ranging from 19.8 percent in Gambela to 49.8 percent in Tigray.

Conclusion

Although testing confirmation rates for malaria cases have improved tremendously, health facility performance as assessed by health facility readiness and provider performance remains very low nationally, with Gambela performing the worst amongst the regions. Of the composite score, adherence to recommended approaches for fever assessment and management (i.e., assess, classify, treat according to the guidelines, and counsel) is low with mean performance of 37 percent.

Key Question 4

What is known about provider behavior in relation to testing and treatment practices?

Supporting Data

Low adherence of health workers to standard protocols, e.g. testing all febrile patients, providing radical cure primaquine, over-diagnosis of severe malaria and over-utilization of artesunate injection are among the challenges in malaria cases management. Based on a baseline assessment conducted in 126 facilities in Oromia Regional State in 2011, clinicians working in 42 (33 percent) facilities reportedly discuss malaria laboratory results with laboratory personnel. In cases where the clinicians were unsatisfied with the laboratory results, they would either request a repeat test or treat empirically. No studies, including this baseline assessment, have explored facilitators and barriers to provider testing and treatment practices.

Conclusion

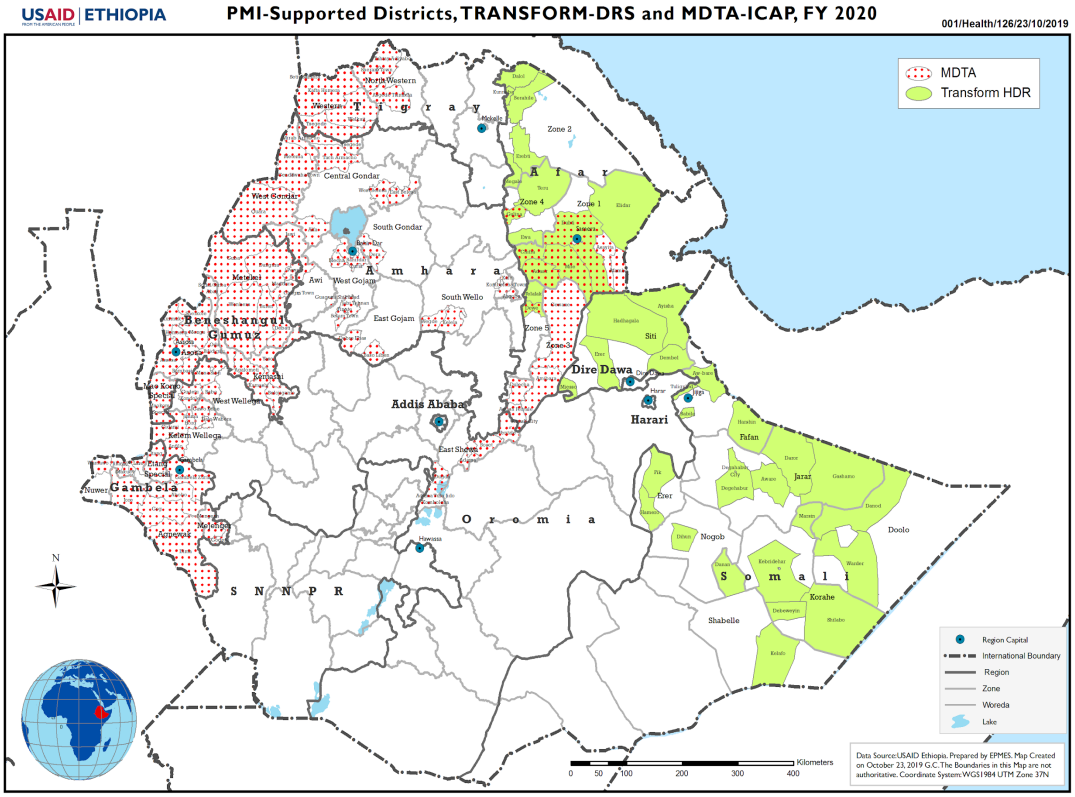
There is no evidence on facilitators and barriers about provider behavior in relation to testing and treatment practices. Thus, formative assessment of providers' behavior will be undertaken.

Key Question 5

What is the current and planned support for case management at health facilities and in the communities by CHWs?

Supporting Data

Figure A33. PMI-Supported Districts, TRANSFORM-DRS and MDTA-ICAP, FY2020



PMI supports comprehensive malaria diagnosis and treatment activities in 157 woredas (red highlights) and iCCM and integrated management of neonatal childhood illnesses support in 37 woredas (green highlights). Support includes training, mentoring, supportive supervision and review meetings.

Conclusion

In FY 2020, PMI will continue health worker training followed by mentoring and supportive supervision to ensure laboratory diagnosis of all fever cases and treatment of all confirmed malaria cases. Priority will be given to remote high-burden, hard-to-reach malarious areas and selected elimination districts. A total of 751/3,189 health centers and hospitals and 700/12,816 health posts in high burden area will be supported.

Key Question 6

What is the estimated need for RDTs for FY 2020?

Supporting Data

Figure A34. Gap Analysis Table on RDT Commodities

Calendar Year	2019	2020	2021
RDT Needs			
Total country population	96,864,694	99,383,176	101,967,138

Calendar Year	2019	2020	2021
Population at risk for malaria [1]	58,118,816	59,629,906	61,180,283
PMI-targeted at-risk population	58,118,816	59,629,906	61,180,283
Total number of projected fever cases[2]	7,012,892	6,662,247	6,329,135
Percent of fever cases tested with an RDT[3]	70%	70%	70%
Total RDT Needs [4]	**4,909,024**	**4,663,573**	**4,430,395**
Partner Contributions (to PMI target population if not entire area at risk)*			
RDTs carried over from previous year	448,837	2,225,953	*5,114,072*
RDTs from Government	0	0	0
RDTs from Global Fund	6,686,140	7,551,693	NA
RDTs from other donors	0	0	0
RDTs planned with PMI funding	0	0	0
Total RDTs Available	**7,134,977**	**9,777,646**	**5,114,072**
Total RDT Surplus (Gap)	**2,225,953**	**5,114,072**	**683,678**

Footnotes:
[1] Population at risk: country-wide
[2] The total number of projected fever cases is calculated based on total malaria cases obtained from HMIS 2017 and adding 25% of cases in migrant population not captured by HMIS and expected cases by reactive case detection (Scott et al. 2016). The qualification included assumptions of fever cases to decrease by 5% in 2020 and 2021.
[3] Percent of fever cases tested with an RDT: The target population for RDTs and microscopy was assumed by considering service based forecast based on the information obtained from HMIS. As indicated in the recent national malaria quantification report, August 2019, and Global Fund Gap analysis table 2018 (RDT: 70%; microscopy: 30%)

Conclusion

PMI will not procure RDTs with FY 2020 funding as the national need will be covered by the Global Fund. PMI will follow the HRP2/3 deletion study outcomes closely to assess its potential impact on the appropriate RDT selection for Ethiopia.

Key Question 7

What is the estimated need for ACTs for FY 2020?

Supporting Data

Figure A35. Gap Analysis Table for ACT Commodities

Calendar Year	2019	2020	2021
ACT Needs			
Total country population	96,864,694	99,383,176	101,967,138
Population at risk for malaria	58,118,816	59,629,906	61,180,283
PMI-targeted at-risk population [1]	58,118,816	59,629,906	61,180,283
Total number of P. falciparum cases[2]	1,636,342	1,493,863	1,375,484
Total projected number of ACT treatment courses to be issued[3]	1,636,342	1,493,863	1,375,484
Total ACT treatment courses Needs [4]	**1,718,159**	**1,568,556**	**1,444,258**

Calendar Year	2019	2020	2021
Partner Contributions (to PMI target population if not entire area at risk)[1]			
ACTs carried over from previous year	1,122,660	2,345,221	3,910,015
ACTs from Government	0		
ACTs from Global Fund	2,940,720	3,133,350	NA
ACTs from other donors	0	0	0
ACTs planned with PMI funding [4]	0	0	0
Total ACTs Available	**4,063,380**	**5,478,571**	**3,910,015**
Total ACT Surplus (Gap)	**2,345,221**	**3,910,015**	**2,465,757**

Footnotes:

[1] Population at risk: country-wide

[2] The total number of projected malaria cases is calculated based on total malaria cases obtained from HMIS 2017 and adding 25% of cases in migrant population not captured by HMIS and expected cases by reactive case detection (Scott et al. 2016) for 2019 and 10% reduction in cases and adjustment for population growth (1.2 % prevalence) for the 2020 and 2021. Seventy percent of total malaria cases are due to *P. faciparum*

[3] Total ACT needs based on estimated cases data including 5% buffer.

Conclusion

PMI will not procure ACTs with FY 2020 funding as the national need will be covered by the Global Fund.

Key Question 8

What is the projected need for severe malaria treatment and any other treatments as applicable?

Supporting Data

Figure A36. Gap Analysis Table for Injectable Artesunate

Calendar Year	2019	2020	2021
Injectable Artesunate Needs			
Projected Number of P. falciparum Cases[1]	1,636,342	1,493,863	1,375,484
Projected # of severe cases	16,363	14,939	13,755
Total Injectable Artesunate vials Needs 2 3	**206,179**	**188,227**	**173,311**
Partner Contributions			
Injectable artesunate vials carried over from previous year	48,910	156,495	168,268
Injectable artesunate vials from Government	0	0	0
Injectable artesunate vials from Global Fund	0	0	0
Injectable artesunate vials from other donors	0	0	0
Injectable artesunate vials planned with PMI funding	313,764	200,000	83,555
Total Injectable Artesunate vials Available	**362,674**	**356,495**	**251,823**
Total Injectable Artesunate vials Surplus (Gap)	**156,495**	**168,268**	**78,512**

Footnotes:

[1] Seventy percent of the total malaria cases are P. falciparum and one percent of the total P. falciparum projected malaria cases are severe. Total number of malaria cases is calculated based on total malaria cases obtained from HMIS 2017 and adding 25% of cases in migrant population not captured by HMIS and expected cases by reactive case detection (Scott et al. 2016).

[2]N.B. # of health centers and hospitals in malarious areas equal 3189 : a minimum stock of Artesunate inj to treat 5 to 7 cases at each facility is planned in 2020 and 2021.
[3] Twelve vials are needed treat one averaged size man with the 60mg preparation. Total need includes a 5% of buffer.

Conclusion

PMI will procure annually ~200,000 injectable artesunate vials and ~30,000 artesunate suppositories to meet the national need. In addition, PMI will procure 1.3 million and 1.7 million chloroquine treatment doses in 2020 and 2021, respectively, to meet the national need for *P. vivax* treatment.

Key Question 9

Are the first-line ACTs effective and monitored regularly?

Supporting Data

Figure A37. Most Recently Completed and Ongoing Antimalarial Therapeutic Efficacy Studies

Year (CY)	Sites	Treatment arms	PCR-corrected ACPR>90%?	Where molecular resistance work was completed or the plan, if any, for molecular resistance work
2017	Pawe, Arbaminch	AL, DP for Pf DP, CQ for Pv	Yes Yes	CDC Atlanta (PARMA)
2019*	Arbaminch and Abergele,Tigray	AL+SDPQ for Pf CQ+14PQ for Pv	N/A	N/A
2020	Tigray, Amhara and Arbaminch	DP, PY for Pf DP, PY for Pv	N/A	N/A

Source: Unpublished data, final results pending
*Supported by Global Fund
Footnotes - ACPR: adequate clinical and parasitological response; AL: artemether-lumefantrine; CQ: chloroquine; DP: Dihydroartemisinin-piperaquine; N/A: not available; PY: Pyramax (artesunate/pyronaridine); PARMA: PMI-supported Antimalarial Resistance Monitoring in Africa; Pf: *Plasmodium falciparum*; Pv: *Plasmodium vivax*

Conclusion

As of 2018, AL and DP remain efficacious in Ethiopia for the treatment of *Plasmodium falciparum* infection and DP, AL, and CQ remain efficacious for the treatment of *Plasmodium vivax* infection. First-line regimen, AL, for *P. falciparum* will be tested in 2019 with funding from the Global Fund.

Key Question 10

Are there other key items, such as lab strengthening, private sector support, etc. that should be considered?

Supporting Data

MIS 2007 and 2015 surveys suggested that about 24.1 to 36.4 percent of people initially receive care for febrile illnesses through the private sector, respectively. The NMSP states that partnership with the private sector will be promoted through public private partnership framework and regulations.

PMI is working directly with private clinics (including on-site farm/workplace clinics) to improve malaria diagnosis and treatment for migrant workers. Furthermore, as part of an FMOH migrant worker advisory group, PMI is helping to develop consistent health treatment policies, explore HEW outreach, and create commodity distribution guidelines that will improve migrant worker access to public health facilities and antimalarial drugs.

From October 2017 to March 2019, PMI supported the provision of malaria case management in 163 of 7,307 private for-profit health facilities. A total of 521,682 suspected cases were tested, of which 97,289 (18.6 percent) were positive for malaria, 15,075 (16 percent) were children under five years of age, and 150 (0.2 percent) were pregnant women. PMI is also supporting updating maps of workplace clinics that provide services to clients at the small- and large-scale farms and factories in malarious areas in Amhara, Oromia, Tigray, Gambela, and SNNP Regional States. With FY 2020 funding, PMI will support 74 private facilities in towns with very high malaria transmission potentially serving migrant workers and refugees.

Conclusion

Although the number of supported private health facilities are limited, the number of suspected cases tested and reported from these facilities are high as high-volume facilities in high-burden areas were selectively targeted.

Key Question 11

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

N/A

Conclusion

Joint planning of PMI and Global Fund resources helps meet the overall case management needs within the public sector of Ethiopia. Despite recent efforts to understand and address any gaps, there are unplanned or unmet needs both within migrant workers and refugee populations that would benefit from increased coordination, planning, and resource allocation.

2.B. DRUG-BASED PREVENTION

NMCP objective
Given the low prevalence of malaria in Ethiopia, intermittent preventive treatment for pregnant women (IPTp) is not part of the national strategy. However, the FMOH and PMI support promotion

of universal ITN coverage and prompt diagnosis and treatment of clinical cases of malaria in pregnant women as they remain a vulnerable group.

The NMCP does not implement SMC.

NMCP approach

- Early diagnosis and prompt treatment of malaria
- Universal coverage with ITNs giving priority to pregnant women and under five children
- IPTp is not implemented in Ethiopia due to low prevalence of malaria in Ethiopia
- SMC not applicable

PMI objective, in support of NMCP

PMI supports malaria prevention and treatment in pregnancy by supporting malaria case management and universal coverage with ITNs.

PMI-supported recent progress (past ~12-18 months)

Please refer to case management and ITN progress sections

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

Case management and prevention interventions are provided to pregnant women as described in case management and ITN sections.

2.B.i MALARIA PREVENTION IN PREGNANCY (MIP)

PMI Goal

Support the national strategy of universal coverage with ITNs prioritization for pregnant women and children less than five years of age. PMI also supports effective case management of malaria for pregnant women in accordance with the WHO recommendations.

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

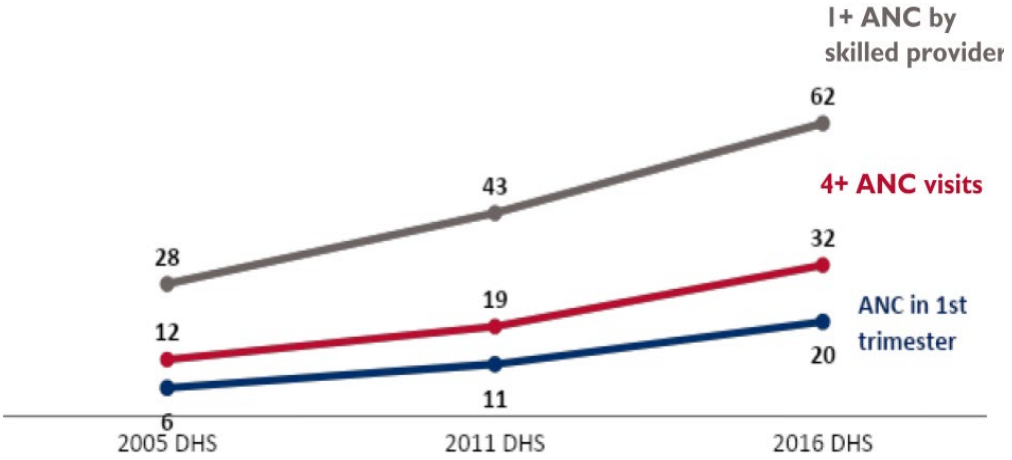
PMI proposes to maintain the same level of funding targeting malaria case management for pregnant women in the 54 high malaria burden districts. There is also ongoing technical assistance and program management support from federal to district level so that the system is able to provide malaria diagnosis and treatment services to pregnant women. Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

What proportion of pregnant women are receiving antenatal care (ANC) early and frequently (as recommended by national and/or WHO strategies) during their pregnancy?

Supporting Data

Figure A38. Trends in ANC Coverage, Percent of Women Age 15-49 with a Live Birth in the 5 Years Before the Survey for Most Recent Birth



*Skilled provider includes doctor, nurse, midwife, health officer, and health extension worker (HEW). The 2005 tabulated ANC from a health professional.

Conclusion

ANC attendance is not optimal in Ethiopia, and the proportion of health facilities that manage malaria in ANC are below 60 percent. Most pregnant women with malaria are managed in the adult outpatient department. Strengthening case management in both adult OPD and ANC will ensure effective malaria case management in pregnancy.

Key Question 2

What proportion of pregnant women are receiving the recommended doses of IPTp?

Supporting Data

N/A

Conclusion

N/A

Key Question 3

What is the gap between ANC attendance and IPTp uptake? What barriers and facilitators exist, especially among providers?

Supporting Data

N/A

Conclusion

N/A

Key Question 4

What proportion of pregnant women with fever and malaria infection are getting diagnosed and treated? What barriers and facilitators exist?

Supporting Data

Malaria in pregnancy is not reported in the recent, routine national HMIS or Public Health Emergency Management (PHEM) reports. Therefore, dis-aggregated data are not available on malaria in pregnancy. A report from an implementing partner from 663 health facilities from October to December 2018, during the peak malaria transmission season, showed that 706 pregnant women out of 180,293 ANC attendants (0.4 percent) had malaria, and of those, two percent had severe malaria with no deaths reported. A random follow up visit was conducted by an implementing partner in October to December 2018. It was noted that 150 of 340 health centers (44 percent) and 42 of 73 primary hospitals (58 percent) provide malaria diagnosis and treatment for pregnant women at ANC while the remaining refer pregnant women to the adult outpatient department.

In Ethiopia, surveys on treatment seeking focus on children under five years of age and not pregnant women, therefore, there are no data on facilitators and barriers for pregnant women to access malaria diagnosis and treatment.

Conclusion

There is a need to capture pregnancy status in all components of malaria data (cases, species, admission and death) incorporating it into routine HMIS and PHEM data collection to better understand its epidemiology. In addition, future surveys should explore the facilitators and barriers of treatment seeking among pregnant women.

Key Question 5

What is the estimated need for IPTp commodities over the next three years and what proportion of this need will PMI support?

Supporting Data

N/A

Conclusion

N/A

Key Question 6

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

N/A

Conclusion

There are no other in-country considerations at this time.

3. CROSS-CUTTING AND OTHER HEALTH SYSTEMS

3.A. SUPPLY CHAIN

NMCP objective
Improve the overall management of the malaria supply chain by supporting the forecasting, procurement and distribution of anti-malaria commodities.
NMCP approach
Ethiopia's National Strategic Plan for Malaria 2017- 2020 outlines the NMCP's approach to provide a continuous and sustainable availability of antimalarial commodities through the following activities: • Provide timely forecasting for all malaria commodities. • Administer guidance on the procurement of malaria commodities. • Monitor stock status of malaria commodities at all levels of the FMOH supply chain. • Work with malaria stakeholders to clear malaria commodities entering the country and provide sustainable and uninterrupted distribution to all service delivery points. • Ensure the quality of antimalarial products at all health facilities. • Promote the rational use of malaria products.
PMI objective, in support of NMCP
PMI provides support to the NMCP and malaria supply chain in the following areas: • Technical assistance on supply planning and forecasting of malaria commodities • Procurement, warehousing and distribution of ITNs to the last mile • Procurement of antimalarial pharmaceuticals and diagnostic commodities • Post-market surveillance of malaria commodities • Logistics management information system monitoring and capacity building • Data visibility for the assessment and monitoring of stock levels • Warehousing and distribution process improvements Institutional capacity-building and human resource development
PMI-supported recent progress (past ~12-18 months)
• Supported the Auditable Pharmaceutical Transactions and Services (APTS) activity, an initiative implemented to improve the quality of pharmacy services, financial transactions

and supply chain in 198 facilities. Of these sites, 77 sites were transitioned from the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) program to the FMOH while 121 additional sites were added.

- To improve stock visibility of ITNs, PMI supported the tracking of ITNs to the last mile and maintenance of the ITN dashboard to allow for timely decision making. End-to-end visibility into ITN campaign progress was established using an Interactive Voice Response (IVR) technology combined with other existing information systems which can readily provide near real-time visibility into ITN stock movements from the central level of the national supply chain down to quantities dispensed to households. The IVR is a mobile based system whereby the health extension workers (HEWs) tasked with dispensing ITNs to households call a hotline on a daily basis during distribution then enter data following audio prompts, including quantities dispensed and households served. Then these data is aggregated at the woreda (district) level through an adaptation to an existing mobile information system called mBrana, and the subsequent presentation of these transactions in an online dashboard accessed by EPSA hubs, Regional health bureaus and FMoH. This system is pretested, piloted and implemented in 229 Woredas.
- Supported EPSA in the quantification of malaria commodities.
- Conducted three rounds of EUVs covering 356 health facilities and 18 PFSA regional hubs.
- Provided support to strengthen the Integrated Pharmaceutical Logistics System for antimalarial commodities. Additionally, PMI supported the development and maintenance of Health Commodity Management Information System (HCMIS).
- Established Data Use - Supply Chain and System Strengthening Quality Teams within EPSA, which help support the identification of facilities with low reporting rates and communicating with the facilities to support process improvement as well as providing written feedback to woredas and zones on the performance of facilities within their catchment for their follow up.
- Provided technical support to the development of drug therapeutic committees (DTCs) in 360 hospitals and health centers. DTC is a committee composed of medical, pharmacy and administrative departments in a facility. The role of the DTC is improving the supply management and promoting the rational use of medicines in a facility. DTCs are tasked to determine what medicines will be available, at what cost, how they will be used, and disposed.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- Provide site-level support to 400 hospitals and health centers through on-the-job training and mentoring to pharmacy and drug store staff.

- Strengthen Drug Therapeutic Committee in 25 selected facilities.
- Support EPSA in the quantification and distribution of malaria commodities to their service delivery points.
- Provide continued support for the NMCP and EPSA in maintaining the ITN distribution tracking and monitoring system (ITNs dashboard) as well as invest in more effective distribution to ensure that all procured ITNs reach the end-user.
- Coordinate ITN-specific SBC activities during mass campaigns focusing on community empowerment and mobilization using existing SBC tools to increase ITN utilization.
- Continue supporting Global Supply Chain Standards (GS1)-related activities in alignment with the mission's health system strengthening priorities.

PMI Goal

Ensure continual availability of quality products needed for malaria control and elimination (ACTs, RDTs, injectable and rectal artesunate, and ITNs) at health facilities and at the community level.

Do you propose to increase, decrease, or maintain funding allocation levels for this activity? Why, and what data did you use to arrive at that conclusion?

We propose to continue the same funding allocation levels to support ongoing supply chain-related technical assistance activities to ensure availability of malaria commodities in control and elimination settings.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

Has the central level (or sub-central level if appropriate) been stocked according to plan for ACTs, RDTs and art. inj over the last year? If not stocked according to plan, have they been under, over or stocked out?

Supporting Data

Figure A39. Central Stock Levels for ACTs

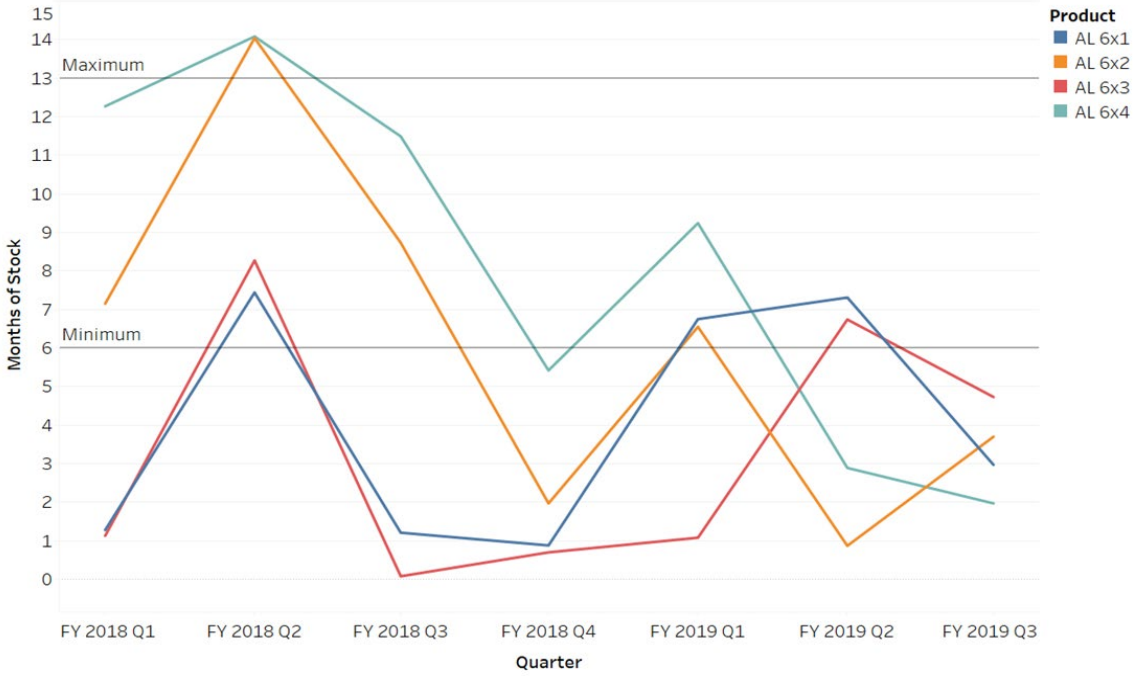


Figure A40. Central Stock Levels for Injectable Artesunate, 60mg

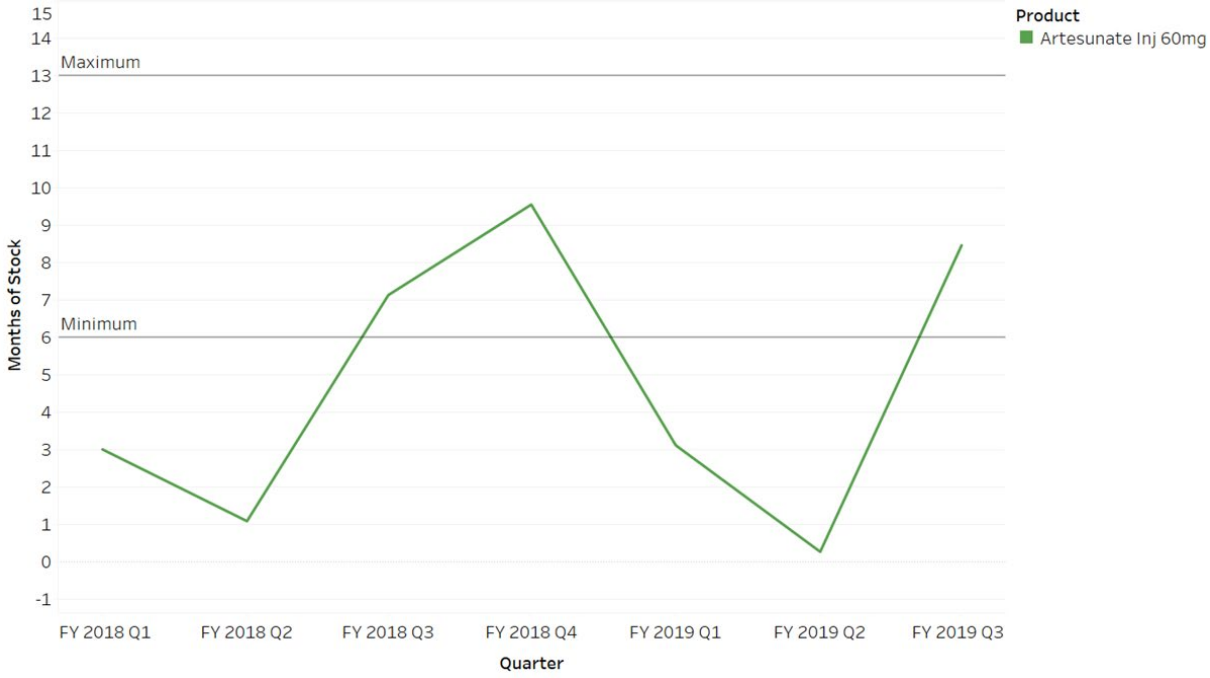
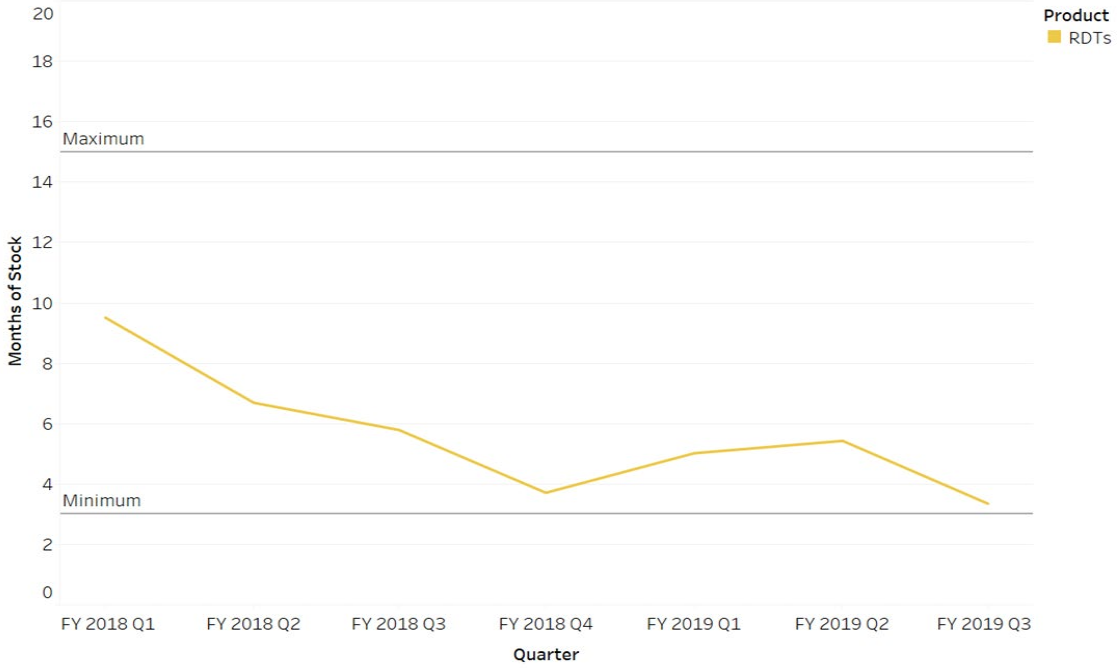


Figure A41. Central Stock Levels for RDTs



Conclusion

The data source for the above graphs is Procurement, Planning and Monitoring Report for malaria (PPMRm) data, which captures central stock level data from all 19 EPSA regional hubs including the central hub.

There have been delays in procurement of Global Fund commodities leading to erratic stock levels at the central level. Procurement of commodities has taken longer in recent quarters due to delays in approval of purchase orders, customs clearance, and in the delivery of malaria commodities to Ethiopia. The Malaria Logistics Technical Working Group, chaired by the EPSA, is addressing those issues and has started preparation to initiate procurement based on long term framework agreements with suppliers to help reduce lead times.

Procurements for commodities have been expedited by the Global Fund to prevent any central level stockouts and continue the distribution of commodities to the facility level.

Key Question 2

What are the trends in facility- and community health worker-level stockout rates for ACTs (including AL ability to treat) and RDTs over the last year (if tracked)? Is there a seasonal or geographic difference in stockout rates?

Supporting Data

Figure A42. ACT Stockout Rates

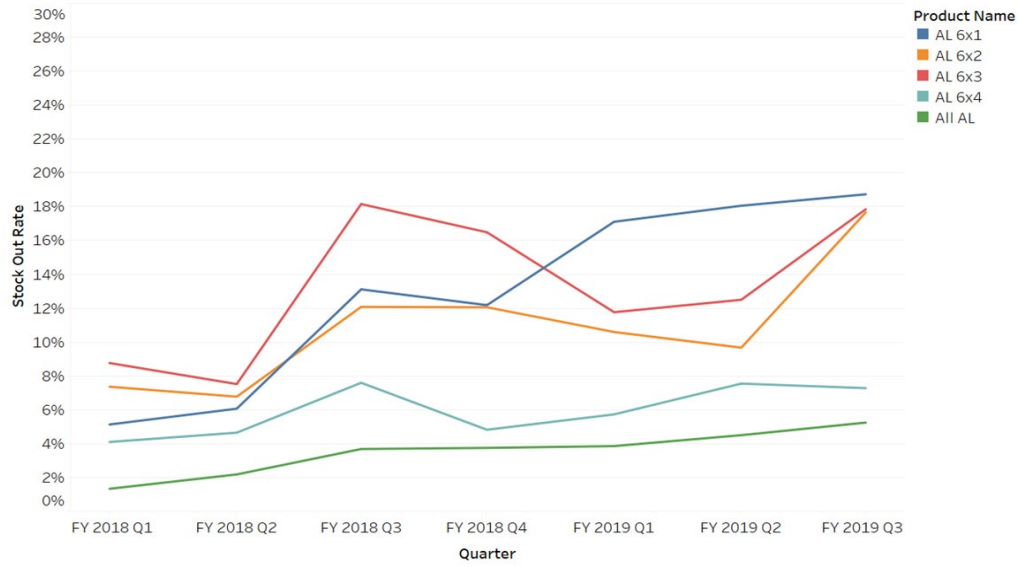
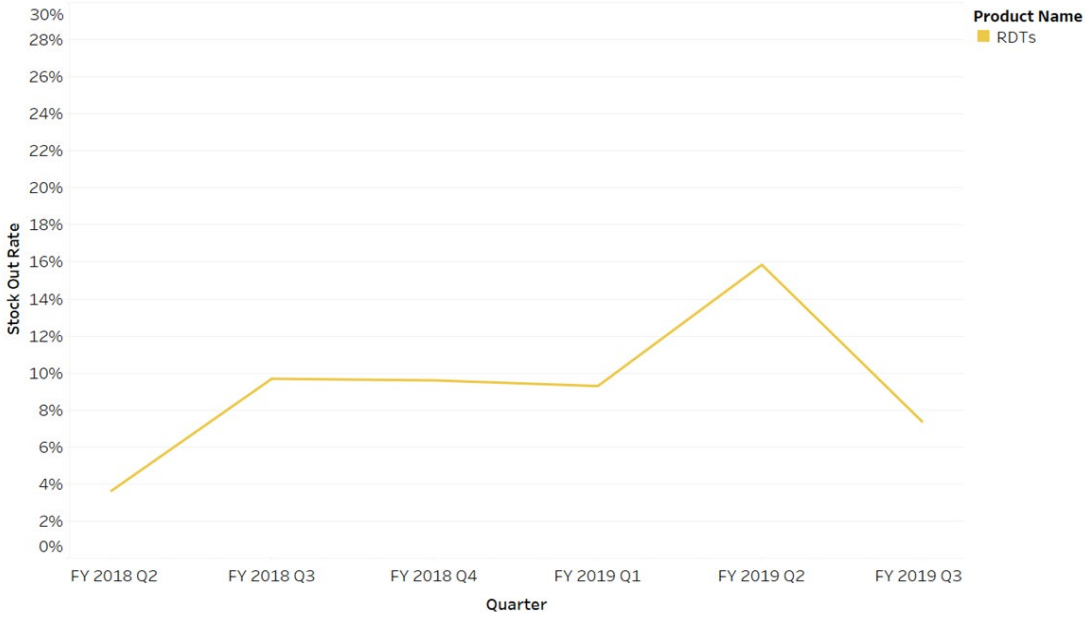


Figure A43. RDT Stockout Rates



Conclusion

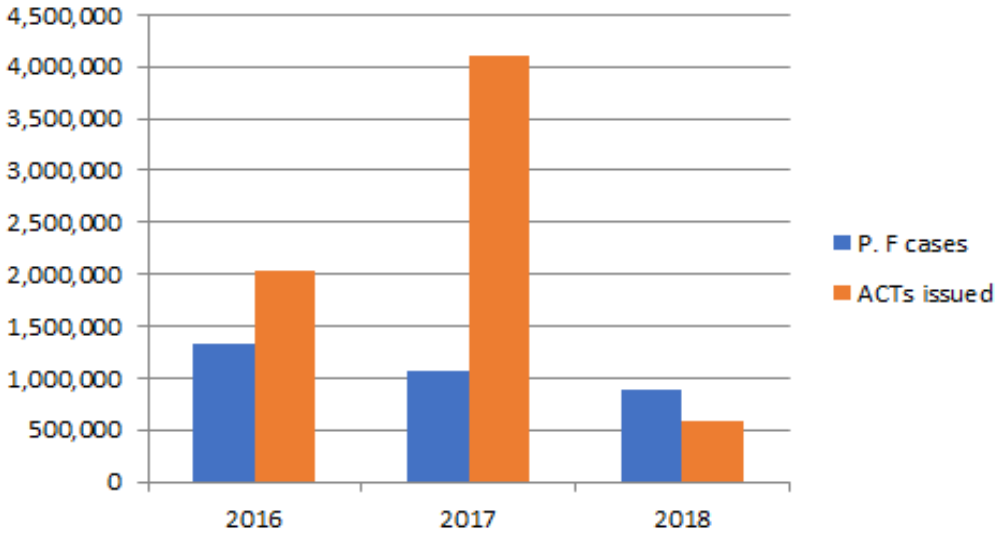
The LMIS reporting in the above graphs is from RRF reports that EPSA hubs aggregated from the 1,044 PMI supported facilities out of the total 3,962 health facilities in Ethiopia. The LMIS reporting has limitations due to reporting challenges. The stockout of RDTs at the health center level does not necessarily mean there is stockout at the health post level as the health centers could have transferred the RDTs to the health post in their catchment. Additional analyses will be needed to determine actual stockout levels.

Key Question 3

What is the difference between quantities for ACTs consumed and malaria cases, and RDTs consumed and numbers tested? What is driving any differences seen?

Supporting Data

Figure A44. ACT Treatments Issued vs. Number of *Plasmodium falciparum* Cases Reported on HMIS 2016-2018



* Issued data will not show the actual consumption. Hence the ACTs issued in one year will be used in the following years. ACTs are being procured with Global Fund funding by EPSA.

It is not possible to construct a graph showing the number of patients tested with RDTs versus RDTs consumed because the number of patients tested with RDT is aggregated with the number of patients tested with microscopy.

Conclusion

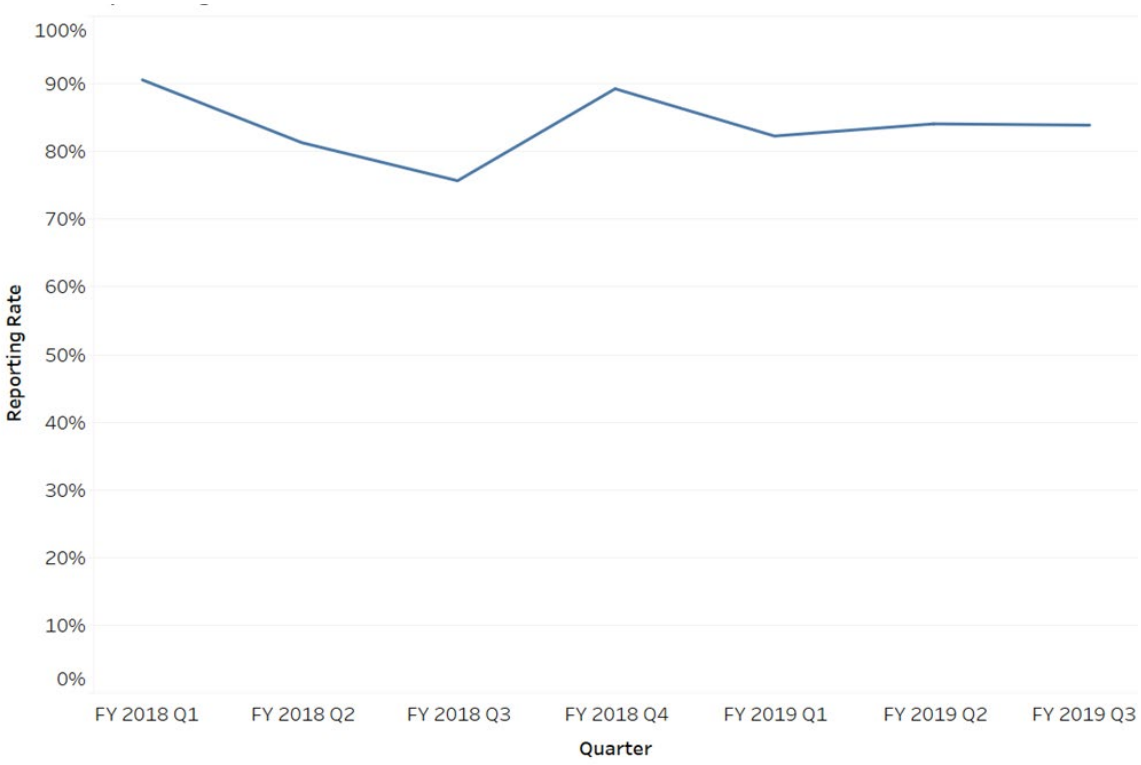
Issue data is used as proxy to consumption for malaria commodities. RRFs captures treatment and tested with RDTs at facility or health post level, however, the data are aggregated with health center data where microscopy is used for malaria testing. Additionally, health post's RRF reporting rates are unknown and it would, therefore, be misleading to use issue data as consumed. Furthermore, malaria case data may not be reliable due to underreporting and data quality issues. Currently GF is conducting an assessment to investigate the discrepancy between morbidity and ACTs issued data in coordination with supply chain and case management partners.

Key Question 4

What are the trends in LMIS reporting rates?

Supporting Data

Figure A45. LMIS Reporting Rate



* This data was analyzed from 1,044 PMI supported facilities (seconded staff at EPSA for follow-up and monitoring of LMIS reporting)

Conclusion

In the graph above LMIS reporting rate refers to the RRF reporting and is currently limited to select health facilities and does not include health post level reporting. Some of the challenges in LMIS reporting are:

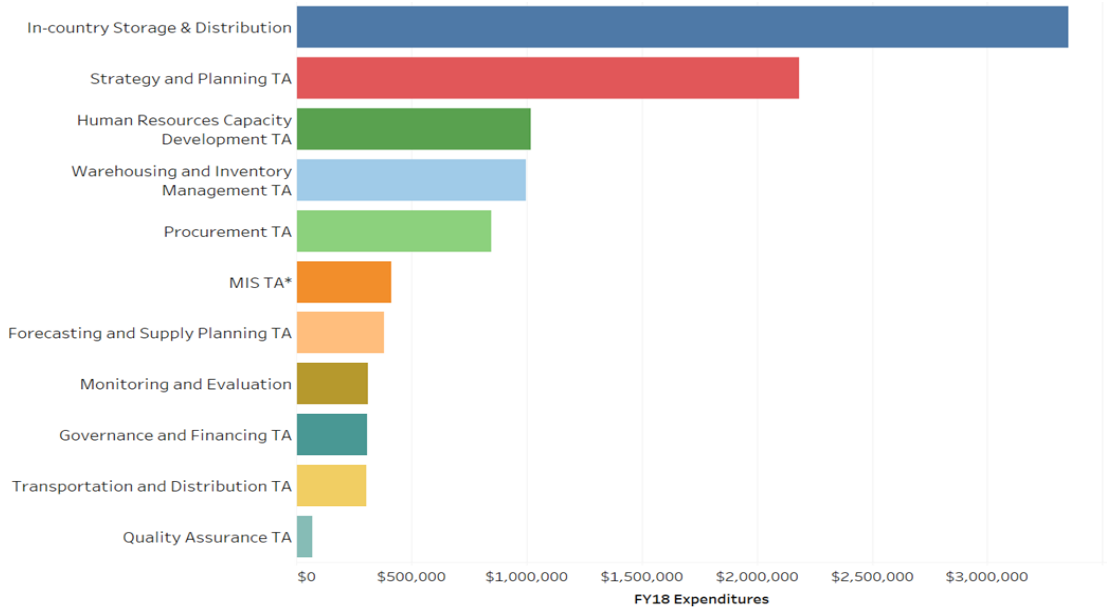
- Inadequate support from administrative units to report on time
- Low commitment of health workers to write and submit report
- Security issues in some parts of the country
- High staff turnover

Key Question 5

What are the main supply chain functions supported by PMI? For areas that are not as strong is there additional investment that PMI should make? In areas performing well, is it dependent on PMI/donor funding and so should be maintained?

Supporting Data

Figure A46. PMI Supply Chain Investments in FY 2018



*MIS includes support for AIDS Free

Conclusion

PMI has provided technical and financial support to the FMOH in annual commodity forecasting, quarterly supply planning, monitoring and evaluation exercises, integrated warehousing and stock management, logistics management information systems, and procurement and distribution of commodities to the last mile. This includes support to EPSA for the mass distribution of ITNs to households and other malaria commodities to their service delivery points.

In addition to continuing support for these supply chain activities, PMI will be allocating more resources for improving data visibility through investing in a malaria module within the electronic Community Health Information System (eCHIS) for community level supply chain data. While EPSA has a Health Commodity Information System, there have been challenges with reporting. Due to these challenges, PMI plans to continue investing in the EUV along with its investments into the eCHIS to obtain facility level LMIS data.

PMI will also put additional investments in pharmaceutical management systems strengthening to improve the regulation of malaria commodities as a response to discrepancies in morbidity and consumption data.

Key Question 6

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

EPSA is currently providing pharmaceutical commodities services for the public and private health institutions through 19 regional-level hubs throughout Ethiopia. Malaria commodities are integrated

in the HCMIS which has visibility at hubs and EPSA direct facilities level. In general, the supply chain has improved. Most initiatives to improve the supply chain system are donor supported.

Conclusion

A proclamation was passed by the Ethiopia parliament to use GS1 as the global standards for uniquely identifying, accurately capturing and automatically sharing vital information about products in Ethiopia. Different guidelines and master product guidelines are drafted and under discussion by multiple stakeholders. The Electronic Regulatory Information System (eRIS) modules, which is the basis for the traceability suite of tools, are now 60 percent developed and operational. The plan is to implement track and trace products using these tools and the GS-1 standards. To strengthen the data visibility and facilitate data driven decision making, LMIS software tools known as Health Commodity Management Information System (HCMIS) have been developed at EPSA with support from USAID and other implementing partners. The system is designed to be used by anyone in the public sector health care supply chain. Currently, the system is used by the executive and technical staff at EPSA, FMOH staff, the regional health bureaus and regional EPSA hubs.

3.B. SURVEILLANCE, MONITORING & EVALUATION (SM&E)

NMCP objective
The FMOH's NMSP (2017-2020) highlights the need for strong SM&E systems and emphasizes the constant need for detection and response to focal and widespread malaria epidemics in control districts and a robust surveillance system for real-time data reporting in elimination districts to measure progress towards achieving desired goals.
NMCP approach
The NMSP describes the following SM&E core activity areas: • Collecting data actively and passively to monitor the operational aspects of the program and measuring impact, outcome, or process indicators to ensure that the activities are yielding desired results and moving the program towards achieving its operational targets and objectives. • Monitoring changes in epidemiological indicators and appropriately interpreting results and informing revisions in policies or strategies, when needed, to help ensure progress. • Supporting progress towards malaria elimination through case and foci investigation and classification. In addition to malaria morbidity and mortality impact indicators, elimination-specific indicators are to be tracked.

PMI objective, in support of NMCP

- Strengthen the malaria SM&E system of Ethiopia as per the national strategic plan.
- Build the capacity of FMOH/EPHI and RHBs in malaria monitoring and evaluation (M&E) including conducting surveillance, surveys and operational research.

PMI-supported recent progress (past ~12-18 months)

- PMI provided substantial support for SM&E strengthening activities including training of health workers from NMCP, EPHI and RHB on data quality, data analysis, real time data transfer, and strengthening routine surveillance systems. Accordingly, 1,315 health workers from 245 health centers and 1,560 health extension workers from 1,252 health posts were trained on data quality assessment and data utilization. PMI's PHEM support was targeted to enhance reporting from rural health posts where half of all malaria morbidity is detected and treated, to enable reporting of indicators on a weekly basis, and build capacity at district and health facility level to generate quality data, analyze, and use for decision making.
- Developed a malaria elimination assessment tool and conducted a baseline assessment through EPHI. Data cleaning, analysis, and report writing was completed, and each elimination district received reports of findings with recommendations. Support strengthening malaria surveillance, M&E, and data quality in 245 Primary Health Care Units (PHCU) in 50 districts. Trained health staff at different levels and provided job aids and register books. Provided supportive supervision and mentorship and conducted quarterly review meetings in collaboration with RHBs.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- Expand current SM&E support from 50 to 90 districts, which will include training health workers from the new health facilities and districts from the expansion districts on quality data collection, analysis, reporting, and use. Of the total 90 supported districts 79 are elimination districts.
- Start surveillance-based elimination implementation activities, including foci and case investigation in about 500 selected health facilities in PMI-supported districts using nationally developed protocol.
- Surveillance systems strengthening, including the DHIS-2 roll-out, climate data integration and developing a malaria module of electronic community health information system (eCHIS) for reporting of malaria cases from the health post to the health centers and case notification and investigation in low transmission districts.

PMI Goal

To support the NMCP to build their capacity to conduct surveillance as a core malaria intervention using high quality data from both surveys and routine health information systems.

Are you proposing to increase, decrease, or maintain funding allocation levels for this activity? Why? What data did you use to arrive at that conclusion?

PMI is proposing to maintain funding allocation levels for this activity.

Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

Which sources of data are available to inform estimates of intervention coverage, service availability and readiness, and morbidity and mortality?

Supporting Data

Figure A47. Available Data Sources

Data Source	Data Collection Activities	Year								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
Household Surveys	Demographic Health Survey (DHS)		x				(x)			
	Malaria Indicator Survey (MIS)	x						(x)		
	Multiple Indicator Cluster Survey (MICS)									
	EPI survey	x*								
Health Facility Surveys	Service Provision Assessment (SPA)									
	Service Availability Readiness Assessment (SARA) survey			x						
	Other Health Facility Survey									
Other Surveys	EUV	x	x	x	x	x	(x)	(x)		
	School-based Malaria Survey									
	Other (Malaria program review)			x*			x*			

Data Source	Data Collection Activities	Year								
		2015	2016	2017	2018	2019	2020	2021	2022	2023
	Other (Malaria Impact Evaluation)									
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System Microplanning	x								
	Support to HMIS (DHIS2 and eCHIS)					x	(x)	(x)		
	Support to Integrated Disease Surveillance and Response (IDSR/PHEM) (SMMES)	x	x	x	x	x	(x)	(x)		
	Other (Electronic Logistics Management Information System (eLMIS)	x	x	x	x	x	(x)	(x)		
	Other (Malaria Rapid Reporting System)									

*Asterisk denotes non-PMI funded activities; x denotes completed activities and (x) denotes planned activities.

Conclusion

The Federal Ministry of Health together with major donors (GFATM, USAID, B&MGF and GAVI) is working to improve its various networks of health information systems including systems related to supply chain management. USAID will collaborate with the FMOH's Data Use Partnership (DUP) which brings together the diverse partners working across the health information systems spectrum in Ethiopia. PMI will continue supporting the electronic Health Information System (eHIS) to improve evidence-based decision making by strengthening data collection, management, analysis and utilization of health data at all levels of the health care delivery system.

Key Question 2

What HMIS activities have been supported in your country? What current priorities will be supported with this MOP funding?

Supporting Data

Figure A48. HMIS-Supported Activities

Intervention	PMI-Funded? (X)			Does Global Fund plan to fund this? (X)	Does another donor plan to fund this? (X)
	FY 18	FY 19	FY 20		
Central/National Level					
Register, tools (e.g. checklists, indicator glossary), job aids (design, indicators, definition of data elements, data dictionary, system support)	X	X	(X)	X	X
Data quality assessments (separate from supervision – funding for travel to lower levels)	X	X	(X)	X	X
Program monitoring and technical assistance (funding for travel to lower levels)	X	X	(X)	X	X
Training (funding for central level to conduct training at lower levels, capacity building, i.e. on the job training for central level staff)	X	X	(X)	X	X
Human Resources (secondment of person in NMCP for SM&E, office/team for SM&E)			(X)		
Data Use (analysis, interpretation, visualization (dashboards, bulletins, dissemination/feedback to lower levels, decision-making)			(X)		
Policy guidelines and coordination (updating policies, guidelines, supporting sub-committee meetings, supporting participation in sub-committee meetings)			(X)		
External relations/Communications/Outreach (support travel to international meetings and publications)		X	(X)		
Support to annual operational plans for national malaria program					
Desk review to catch “logic errors system” (provide TA to catch logic errors)					
Admin 1 Level (Region). PMI supports activities in 1 regions (Oromia) while Global Fund supports activities in the rest of regions.					
Registers (warehousing, printing, distribution)			(X)		
Data quality assessments (separate from supervision – funding for travel to lower levels)	X	X	(X)		
Program monitoring and technical assistance (funding for travel to lower levels)	X	X	(X)		

Intervention	PMI-Funded? (X)			Does Global Fund plan to fund this? (X)	Does another donor plan to fund this? (X)
	FY 18	FY 19	FY 20		
Training (funding for district staff to conduct training at lower levels, capacity building (i.e. on the job training for district level staff)	X	X	(X)		
Human Resources (secondment of person for malaria SM&E, office/team for SM&E)	X	X	(X)		
Data Use (analysis, interpretation, visualization (dashboards, bulletins), dissemination/feedback to lower levels, decision-making)	X	X	(X)		
Adaptation of national policy guidelines and coordination (adapting policies, guidelines, supporting sub-committee meetings, supporting participation in sub-committee meetings)	X	X	(X)		
Adaptation of checklists and job-aides	X	X	(X)		
Participation in national meetings (support for travel costs)					
Support to Annual Operational Plans for National Malaria Program	X	X	(X)		
Admin 2 Level (District)					
Data entry, summary, and transmission (training, re-training, computers, internet, tools)	X	X	(X)		
Supervision (training, traveling, supervision tools/checklists, create/design system for organized/methodical supervision)	X	X	(X)		
Data validation (data validation activities before monthly data submission - organize health facilities)	X	X	(X)		
Monthly/Quarterly data quality review meetings (venue, meeting support)	X	X	(X)		
Data Use (analysis, interpretation, visualization (i.e. dashboards), dissemination/feedback to facilities, decision-making)	X	X	(X)		
Human Resources (secondment of person for malaria SM&E, office/team for SM&E)					
Annual planning with national program (support travel)					
Facility Level					
Data collection/entry, summary, and transmission (training, re-training, computers, internet, tools)	X	X	(X)		

Intervention	PMI-Funded? (X)			Does Global Fund plan to fund this? (X)	Does another donor plan to fund this? (X)
	FY 18	FY 19	FY 20		
Supervision of CHWs (training, traveling, administering supervision tools/checklists of community health workers)	X	X	(X)		
Data use (analysis, interpretation, visualization (dashboards), dissemination/feedback to CHWs, decision-making)	X	X	(X)		
Monthly/Quarterly data quality review meetings(support for travel)	X	X	(X)		
Community Level					
Data collection/entry and transmission (training, re-training, tools	X	X	(X)		
Data use (analysis, interpretation, decision-making)	X	X	(X)		
Monthly/quarterly data quality review meetings (support for travel)	X	X	(X)		

Conclusion

Timely collection, analysis and use of data at each level guides and improves program implementation. Significant improvements in data quality and use documented in PMI supported districts and health facilities. PMI plans to continue supporting data quality improvements in existing and new districts and health facilities. Please see Table 2 for more details.

Key Question 3

What are the outcomes of HMIS strengthening efforts?

Supporting Data

PMI directly supports strengthening the HMIS outcomes in 1,497 health facilities (245 health centers and 1,252 health posts) in East and West Harage in Oromia Region

Figure A49. PMI-Supported HMIS Strengthening Efforts

		2017*	2018
Timeliness	% of reports received on time	63	80
Completeness	“Confirmed malaria cases for children under 5 years of age" was reported in 100% of facility-months	53	75
Accuracy	Populate with most recent DQA data(Percent of facilities with accurate report/Total number of expected reports*100)	59	78

*Baseline

Conclusion

The timeliness and accuracy of national surveillance data remains a challenge. PMI is supporting the FMOH to address this in 1,497 PMI supported health facilities (health centers and health posts) in 50 districts through hands on training, mentoring and supportive supervision.

Key Question 4

What are the in-country that impact your funding allocation in this category?

Supporting Data

There are major challenges regarding data quality and access in Ethiopia. Limitations exist at various levels with the capacity to analyze, interpret, and use the available data. PMI will continue supporting project-targeted districts, RHBs and the NMCP in strengthening malaria SM&E and data quality improvement.

Conclusion

PMI is continuing to support surveillance improvements and mentoring at the health facility level. To contribute to improved data quality and access in Ethiopia, PMI is also supporting a new, integrated electronic health information data system to improve timeliness and accuracy of morbidity and mortality data. The Field Epidemiology Training Program is also supported to improve surveillance data quality and data analysis capacity at the health facility, regional and national level.

3.C. SOCIAL AND BEHAVIORAL CHANGE (SBC)

NMCP Objective

In the NMSP 2017-2020, the SBC objective states that "By 2020, all households living in malaria endemic areas will have the knowledge, attitudes, and practices towards malaria prevention and control." In order to achieve this objective, the NMSP utilizes HEWs, HDAs, and model family households to deliver proven SBC interventions. The following are the four SBC approaches mentioned in the strategy, which outline the malaria program's objectives for SBC:

1- Guiding and harmonizing health education and communication interventions.

2- Improving knowledge, attitudes, and practices; addressing barriers for behavior change.

3- Community empowerment.

4- Promoting multi-sectoral involvement in addressing social determinants of malaria.

NMCP Approach

The National Health Promotion and Communication Strategy 2016-2020 provides guidance for all areas of health, including malaria prevention and control. The strategy also outlines major activities to empower communities and mobilize malaria prevention efforts with the development and integration of malaria-specific communication messaging for a national communication strategy. This national strategy also looks towards increasing the use of mass-media to reach a larger

population in local languages, integrating key malaria prevention and control directly into school programs, and developing messages targeted to gain strong commitment of the local leaders in malaria elimination districts. These approaches, and other SBC-focused activities, are utilized to improve malaria prevention behaviors (e.g., ITN utilization, IRS, early diagnosis, and treatment compliance). For behavior change communications activities related to RDTs and ACTs in particular, PMI works with health providers at different levels of the health system to strengthen their patient communication skills.

There is a national SBC coordinating working group under the NMCP Technical Advisory Committee. This working group provides technical assistance on guideline development, malaria campaigns and malaria communication activities in general. For example, the Advocacy, National Advocacy, Communication and Social Mobilization Guide for Malaria Elimination for 2016-2030 was developed through this platform.

PMI Objective in Support of NMCP

Since 2014, PMI has initiated and supported two local organizations' community-based malaria SBC activities as part of the USAID/Ethiopia Local Capacity Development program. These community-based malaria SBC activities have been implemented in selected zones of Oromia and Amhara Regions. PMI's support to these activities is intended to complement national level malaria SBC activities through capacity building of selected schools and faith-based organizations in high malaria transmission areas.

Starting from July 2015, PMI also supported an integrated SBC activity implemented in four major regions- Oromia, Amhara, SNNP, and Tigray. The support focused on malaria communication capacity building at national and sub national levels, messaging and implementation of SBC activities through integrated platforms and M&E of malaria SBC.

PMI-Supported Recent Progress *(Past 12-18 Months)*

In 2018/19, PMI continued school-based malaria SBC activities support focusing on a development corridor area in the Amhara Region. School- and community-based malaria communication interventions were implemented in 75 schools & 75 kebeles of the targeted five malarious districts, implementing peer education as a model to help modify existing norms. A total of 1,188 students completed the peer education-leader training, who then completed the 12 rounds of peer-to-peer education malaria sessions, then conducted 11,650 peer education sessions to reach 16,283 students. Eventually, graduated students are expected to reach out to the community at large.

Two hundred nineteen sessions of literature competition events were organized, reaching 52,124 school and community members with key messages on malaria in 75 schools. As mass media campaigns are important for challenging deeply held beliefs and customs regarding malaria practices, PMI supported 318 school-based mini-media clubs to disseminate malaria action messages.

In PMI-supported districts of Amhara Region, many community members migrate seasonally to agricultural regions to work, which usually coincides with the malaria transmission season. Upon returning home, these seasonal workers can become a source of imported cases contributing to the local malaria burden. According to information from Amhara RHB, approximately 33 percent of total malaria cases are imported cases from other development areas. To address this health challenge, students in the targeted 75 kebeles were taught to track and report when migrant workers return to their neighborhood. HEWs then followed up to ensure appropriate diagnosis and treatment is provided through home visits. In 2018/19, activities related to migrant workers tracking, diagnosis and treatment were conducted in 43 of the 75 kebeles. Accordingly, 2,869 migrant workers who returned home were tracked on arrival by the school students and were referred to health post by the students. Of these returning workers, 260 (9 percent) were found to be malaria positive (Pv =158 (61 percent); Pf=102 (39 percent)). All cases were treated for malaria.

With the addition of an integrated SBC approach in 2018/19, malaria campaigns were conducted in 44 new selected districts across the four regions. The campaign aimed to promote health behaviors related to malaria prevention and treatment. A total of 145 roadshows in rural malarious areas were conducted reaching approximately 180,000 individuals with malaria prevention and treatment messages, including in support of ITNs distribution campaigns.

The integrated SBC effort has also developed, promoted and distributed the mobile application called *Hulu Beteina* which does not require internet connectivity and can work with simple phones. It is a mobile app for mothers and fathers which promotes appropriate care seeking behavior and bed net use prioritizing pregnant women and all children under 5. The 2018 Communication for Health midline review showed close to half of the midline respondents (48 percent) that live in malarious areas reported owning at least one bed net, which was a statistically significant decline from the baseline of 66 percent. Bed net use by women in reproductive age (15-49) showed an insignificant increment from baseline (62.3 percent) to 63.2 percent at midline. However, bed net use among exposed women (66.3 percent) was statistically significantly higher than bed net use among women not exposed to the messages (55.9 percent). Similarly, bed net use behavior among adults (age 35-49) was also significantly higher among exposed than unexposed. Bed net use by children under 5 years of age showed significant decline from baseline (67.3 percent) to midline (59.3 percent). The decline in bed net use behavior could be associated with the lack of access to replacement nets if household nets are damaged or missing.

PMI-Supported Planned Activities *(Next 12-18 Months Supported by Currently Available Funds)*

The school-based SBC project will scale up malaria-focused activities to 30 districts in high risk malaria areas in Amhara Region. Additionally, SBC school-based materials, guidelines, and trainings based on the previous successful SBC efforts will be expanded to additional districts.

The following are major activities which will be implemented in 2019/2020:

- Enable each household to practice the key malaria prevention and control actions at the household level including ITN use and maintenance and timely care seeking for malaria.
- Tracing of migrant workers by school communities and volunteer malaria workers to promote accessing test and treat services through the HEWs.
- Increased the capacity of school communities to plan, coordinate, manage, implement and evaluate malaria SBC activities in schools and communities.
- Malaria communication messages disseminated through locally acceptable and audience-oriented channels.

The integrated SBC approach will focus on demand creation activities at individual, household and community level with some engagement in capacity strengthening at system and organizational level activities. This activity will focus on the following four major areas:

- Implement community campaigns that promote key behaviors related to malaria.
- Strengthen the dissemination of different malaria SBC tools and health messages to be able to reach a greater number of at-risk households and communities.
- Enhance ownership of malaria SBC activities by communities and the health system to ensure sustainability.
- Conduct malaria roadshow campaigns.

PMI Goal

Through the use of social and behavior change interventions and in alignment with a country's national malaria control communication strategy, PMI supports the uptake and correct and consistent use of malaria interventions, thereby improving the overall quality of malaria control efforts that will contribute to reductions in malaria morbidity and mortality.

Are you proposing to increase, decrease, or maintain funding allocation levels for this activity? Why? What data did you use to arrive at that conclusion?

With FY 2020 funds, PMI/Ethiopia proposes to maintain current funding allocation for SBC. The SBC focus areas were selected based on previous SBC studies, MIS results, and malaria case surveillance data. PMI will support district level multi-sectoral coordination and capacity strengthening activities, and interpersonal communication at household and community level in order to generate high demand for malaria interventions as well as measuring the results. Please see Table 2 for a detailed list of proposed activities with FY 2020 funding.

Key Question 1

What behaviors is PMI proposing to prioritize through its SBC programming? Will support be geographically targeted or at national scale? What data support this prioritization?

Supporting Data

PMI Ethiopia is proposing to prioritize the malaria behaviors related to proper use and maintenance of ITNs by households, proper care seeking behavior, and household preparation and cooperation with IRS efforts through SBC programming. The school-based SBC efforts will be targeted in high risk areas of Amhara Region while the integrated SBC project will be a nationwide approach in malarious regions.

Regarding ITN use and maintenance, the MIS 2015 and an ITN utilization study have shown approximately 64 percent of individuals with ITNs are using them properly. Data from a recent ITN durability study also suggests that ITNs are not lasting the expected 3 years indicating an increased emphasis on ITN maintenance may be required.

Improving treatment seeking behaviors to promote early access to testing and treatment also remains a priority. The SBC project midline report showed close to 12 percent of under five children in malarious areas had a fever in the two weeks before the survey. Out of these children, only 44% sought timely treatment within 24 hours of fever incidence, with 70 percent eventually seeking treatment. The MIS 2015 of these same districts showed 16 percent of children under five years of age had fever during the two weeks preceding the survey and treatment was sought for only 38 percent of children with fever. IRS project assessments have shown that increasing the timing and specificity of IRS messages in PMI IRS targeted regions are also is important.

To support behavioral change for the selected SBC priorities, malaria knowledge, misconceptions and perception (risk & efficacy) related behaviors will also require attention. According to the midline report, knowledge about the cause of malaria, knowledge about three or more signs or symptoms and women who knew sleeping under an ITN to protect from malaria is 31.1 percent, 38.9 percent and 20.5 percent, respectively. The 2015 MIS 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. This might be due to methodological differences. Evidence has shown that complacency can undermine important behavioral gains. More in-depth evidence on this will be sought in FY 2020 to develop evidence-based malaria SBC intervention(s). The 2018 SBC project socio-cultural qualitative study also supported the finding of the midline study. It is reported that most study participants either did not know the cause of malaria or believed that it is caused by cold weather and hunger. Poor environmental protection activities and incomplete distribution of insecticide-treated nets, especially in remote areas, were identified as causes for malaria.

Conclusion

In summary, various data have been used to identify three priority malaria behaviors for FY 2020. In FY 2020, SBC efforts will focus on the household and community level.

Figure A50. Priority Malaria Behaviors for FY 2020

Behavior	Target Population	Geographic Focus	Justification
Correct and sustained ITN Use and net care (vector control)	General population	Amhara, SNNP and Tigray	ITN use by U5 children was 59.3 percent (C4H midline report, 2019); and 45 percent and 44 percent for under five years of age and pregnant women, respectively (EMIS, 2015). All household use was 63 percent and 40 percent reported in the C4H midline 2019 and EMIS 2015, respectively. Note that lack of ITN access also contributed to that response.
Prompt treatment seeking for malaria (case management)	Mothers of Children Under Five Years of Age	Amhara, SNNP and Tigray	Timely treatment seeking for fever within 24 hours is 44.1 percent (C4H midline report, 2019) and treatment was sought only for 38 percent of children with fever (EMIS, 2015).
Service provider	healthcare providers	Amhara, SNNP & Tigray.	According to 2018 health facilities survey in malaria case management, all regions have low average performances (38.7 percent) in providing malaria diagnosis and treatment services according to national guidelines.

Key Question 2

Given the priority behaviors identified, what data are available to better understand the factors influencing low uptake? What are the behavioral determinants of the prioritized behaviors? Are there gaps in understanding the barriers to uptake?

Supporting Data

Shortages of antimalarial drugs for small children was reported as a common problem in rural communities that worsens the impact of malaria. Participants reported "[t]here is no medicine for small children in drug stores." Study findings have shown that there are misconceptions about the causes of malaria, including that malaria is caused by cold weather and lack of food. For example, participants reported that "[i]f the weather is cold and if you don't eat enough food you can have malaria." Similarly, the 2019 midline quantitative study has shown that knowledge on the cause of malaria and knowledge on three or more signs and symptoms of malaria is 31 percent and 39 percent, respectively. In addition, there is a gap in understanding health care providers behavior in adhering to the national malaria guidelines which will have an effect on service uptake.

Figure A51. Summary of Determinants and Gaps for FY2020 Prioritized Behaviors

Behavior	Key Facilitators	Key Barriers	Knowledge Gaps
Correct and sustained ITN use and care (vector control)	High favorable attitude for use of malaria interventions	Inconsistent use of Nets	What are the factors for inconsistent use of ITNs?
Prompt treatment seeking for malaria (case management)	High favorable attitude for use of malaria interventions	Delayed seeking treatment and using traditional healers as a first choice	What are the determinant factors hindering prompt treatment seeking for malaria?
Service provider adherence to national malaria guidelines	High favorable attitude for use of malaria interventions	Low performances in providing malaria diagnosis and treatment services according to national guidelines	What are the factors for low adherence to the national diagnosis and treatment protocols?

Conclusion

In FY 2020 PMI Ethiopia will support identified and prioritized behavioral interventions based on the available data. Factors influencing low uptake and the behavioral determinants of the prioritized behaviors are mainly related to misconception on cause of malaria (low comprehensive knowledge on signs and symptoms); inconsistent availability of malaria products and services; and perceived risk and efficacy (efficacy related to susceptibility, severity and response). There is limited evidence for understanding the barriers to uptake malaria products and services. However, Ethiopia has diverse epidemiological, ecological, and social features and each geographic area and area stratified by malaria prevalence needs appropriate and adapted behavioral interventions. Future formative assessments including a malaria behavior survey will be stratified accordingly and include service provider behavior to inform our SBC approaches.

Key Question 3

What activities are needed to bolster the country's capacity for SBC? Are these activities needed at the national or sub-national level?

Supporting Data

In general, for the last four years, the SBC activity has strengthened almost non-existent SBC skills and structures at the national, regional and district level through advocacy and a close working relationship with the Government of Ethiopia. Leadership in health communication training was provided at all levels to enhance local capacity in SBC. SBC Technical Working Groups were established at national and regional levels. Mass media, mobile applications and social mobilization for malaria interventions were implemented at various levels. The SBC activities support Ethiopia's Journey to Self-Reliance by promoting sustainability and ownership by the country.

Conclusion

Due to previous support at the national and regional level in malaria SBC capacities and coordination, FY 2020 efforts will focus on demand creation activities at individual, household and community level with some engagement in capacity strengthening of the district system and organizational level activities.

Key Question 4

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

The in-country considerations related to SBC activities revolves around ensuring community empowerment and country ownership as part of Journey to Self-Reliance. Security issues remain an issue throughout Ethiopia, but SBC efforts will be adapted as needed to reach the target communities.

Conclusion

There are no additional in country considerations not already addressed

3.D. PROGRAM EVALUATION (PE) AND OPERATIONAL RESEARCH

NMCP objective
The FMOH's NMSP (2017-2020) envisions the need for operational research studies to guide program decisions.
NMCP approach
• The NMSP identified the following priority areas for OR studies: to detect insecticide and antimalarial drug resistance, to evaluate appropriate antimalarial interventions for seasonal migrant workers and design relevant intervention for these populations, and to improve the effectiveness of antimalarial interventions, while anticipating program needs related to elimination activities. • PMI has also sponsored various conferences involving universities and EPHI, the lead agency for public health research within FMOH, and partners to learn about ongoing research and to harmonize PMI Ethiopia's OR priorities with FMOH research goals.
PMI objective, in support of NMCP
Priority areas for PMI Ethiopia OR are informed by PMI strategy and PMI OR priorities with input from the NMCP and their NMSP. Since the launch of PMI, several OR studies across various technical areas have been conducted to address key gaps in knowledge or bottlenecks.

PMI-supported recent progress (past ~12-18 months)

- To address the limitations of microscopy in low transmission settings, an assessment of seroprevalence in schools and through MIS samples were conducted which showed a wider prevalence range than microscopy.
- PMI supported an OR study performed at EPHI which analyzed the genotypic prevalence of glucose-6-phosphate dehydrogenase (G6PD) deficiency among 1,414 dried blood spots obtained from the MIS 2011. The absence of clinically significant A- or Mediterranean G6PD variants, helped support the single, low-dose primaquine for *P. falciparum* and primaquine radical cure for *P. vivax* treatment policy adoption by the FMOH.
- Migrant workers were identified as a high risk population and a population that may lead to resurgence of malaria in low prevalence areas and districts selected for elimination. This information gap led PMI to work with the government and local universities to develop operational research that investigated migrant worker malaria risk factors, knowledge, movement, entomological vector behaviors, and worker malaria prevention behaviors.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- Current operational research to evaluate the hematologic outcomes to assess the safety of the primaquine radical cure for *P. vivax* without testing for G6PD is currently underway in health centers in Amhara, Oromia, and SNNP Regions and have noted no serious adverse events to date.
- The protocol for a MOP-funded cluster randomized controlled trial to evaluate targeted mass drug administration compared to reactive case detection on malaria transmission and elimination in Oromia, Ethiopia, is currently under review by the national ethical review board. It has been approved already by the CDC and AHRI institutional review boards. Planning for the baseline survey in Q4 of 2019 are underway pending national ethical review approval.
- PMI Ethiopia will also support a program evaluation to monitor the impact of PBO nets compared to standard nets in areas with and without IRS on entomological and epidemiological outcomes.

PMI Goal

PMI will conduct OR/PE that helps: to evaluate coverage of population at-risk, quality of intervention(s), and efficiency in intervention delivery, or study reducing remaining malaria transmission and disease burden, test effectiveness of new or evolved priority interventions and strategies, or explore new metrics and mechanisms to assess the impact of interventions.

Are you proposing to increase, decrease, or maintain funding allocation levels for this activity? Why? What data did you use to arrive at that conclusion?
Current OR and PE projects have appropriate funding and will be supported until completion. No new OR activities are proposed with FY 2020 funding.

Key Question 1

Have technical challenges or operational bottlenecks that require operations research or program evaluation been identified in consultation with the NMCP? How have they been prioritized?

Supporting Data

Current OR projects have been selected based on Ethiopia government and program priorities.

PE/OR currently conducted in country with USG, GF, multilaterals or other major donors.

Source of Funding	Implementing institution	Research Question/Topic	Current status/ timeline
ICEMR	University of California Irvine; Jimma University; Addis Ababa University	Environmental Modifications in Sub-Saharan Africa: Investigating the Changing Epidemiology, Transmission and Pathogenesis of *Plasmodium falciparum* and *Plasmodium vivax* Malaria	Initiated in 2017
BMGF/GSK	PATH-MACEPA	Clinical evaluation study of the quantitative G6PD test from SD Biosensor	Initiated in 2018
University of Calgary	University of Gondar	LAMPREG: The Impact of Molecular Diagnosis of Malaria With LAMP on Maternal and Fetal Outcomes	Initiated in 2017
Menzies School of Health Research	Arba Minch University	Reducing the Risk of *P. vivax* After *falciparum* Infections in Co-endemic Areas - a Randomized Controlled Trial	Initiated in 2019

Conclusion

PMI continues to support a research network to share research findings, coordinate proposed program evaluation and OR topics, and inform NMCP's OR priorities to accelerate malaria control and elimination efforts towards achievement of national targets.

Key Question 2

In the technical areas covered above, are there specific issues in any of the intervention areas that merit further exploration, in anticipation of establishing intervention strategies that are or could become available in the future that could be applied?

Supporting Data

Ethiopia faces many technical and operational challenges. Some of these challenges are being addressed to some extent by currently funded PE and OR activities e.g. durability of PBO and higher denier nets and insecticide effectiveness, role of PBO or next gen nets in transitioning away from IRS, understanding about effective interventions to reach migrant workers, and tailored SBC strategies to ensure community uptake of malaria behaviors in different transmission areas. Additional challenges such as the role of HRP2/3 deletions and effective *P. vivax* case management to potentially include G6PD testing and use of tafenoquine require further consultation with the NMCP, Global Fund, WHO and other partners to ensure a coordinated approach in the future.

Conclusion

PMI will continue to identify and conduct PE and OR in consultation with the research stakeholders in Ethiopia under the leadership of the NMCP.

Key Question 3

What are the in-country that impact your funding allocation in this category?

Supporting Data

There are continued security concerns in Ethiopia, but they currently are not impacting our OR projects.

Conclusion

The current planned OR and PE projects will be critical to informing effective and evidence-based decision making for Ethiopia. There are no other in-country considerations at this time.

3.E. OTHER HEALTH SYSTEMS STRENGTHENING

NMCP objective
The FMOH's NMSP (2017-2020) envisions a strengthened health system including adequate number of well-qualified and committed health workers to support malaria control efforts nationwide. It also recognizes insufficient technical support and capacity-building as well as shortages of human resources and high turnover of experienced staff as major weaknesses in the health system of Ethiopia.
NMCP approach
• The Ethiopian government has focused on improving and retaining a skilled health workforce for service delivery of key health services including malaria. This involves both pre- and in-service trainings and has four key result areas. • The pre-service training of HEWs is a one-year training which includes coursework as well as field work to gain practical experience. HEWs carry out and promote 16 preventive health actions, including malaria prevention and control. The Health Extension Program has over

36,600 trained HEWs based at health posts, and they are assisted by local volunteers within the HDA that, together, address many of the malaria health needs in rural communities. The HDA volunteers typically focus on SBC activities.

- Build capacity of FMOH to institutionalize evidence based decision making for improving HRH productivity and performance, program development and research.
- The FMOH documented a shortage of malariologists and epidemiologists experienced in managing community-wide and large-scale malaria epidemics and complex health emergencies. Subsequently, Ethiopia began its own Field Epidemiology Laboratory Training, known locally as the EFETP, in October 2008 with technical assistance from CDC as a two-year, full-time, postgraduate competency-based training program consisting of about 25 percent class work and 75 percent fieldwork. The EFETP training is an in-service epidemiology training program for health workers. Trainees are supervised and provide epidemiology service to the FMOH. Graduates of EFETP receive a master's degree in Public Health and Field Epidemiology over the two-year training period.
- There are now over 150 Peace Corps volunteers in Ethiopia who have sufficient knowledge of malaria and of PMI's programs to help provide PMI-developed resources to HEWs and other district-level officials.

PMI objective, in support of NMCP Infrastructure

- PMI supports supply chain management, health information systems strengthening, drug quality monitoring, Ethiopia Field Epidemiology Training Program, U.S. Peace Corps Volunteers and NMCP capacity-building.
- The FMOH Human Resource for Health strategy was released in June 2010. PMI has contributed through supporting pre- and in-service training for HEWs, midwives, and other healthcare workers, to include best practices in malaria diagnosis and treatment and prevention of malaria among pregnant mothers and newborns.

PMI-supported recent progress (past ~12-18 months)

- Through FY 2018, PMI cumulatively supported training for 25,469 and 28,950 health workers in IRS operations and malaria diagnosis and treatment, respectively. As these trainings are part of a broader set of health systems strengthening activities, deliverables specific to malaria outcomes are not necessarily direct. Although this is a challenge, training inputs are primarily around strengthening various aspects of the health system. Ultimately, this will contribute to the development of a more competent and qualified workforce.
- Ethiopia FETP residents have conducted numerous malaria research projects in Ethiopia providing data for decision makers and have made significant contributions to the PHEM surveillance system including developing weekly bulletins which include malaria data. PMI has provided support to EFETP residents annually since 2008 to enhance their training and

expertise in malaria and related outbreaks of acute febrile illness that can be confused with malaria. In its current structure, EFETP includes over 400 residents from 8 different universities, with PMI providing malaria-related mentorship, training, and technical assistance to create malaria expertise to a targeted subset of fellows among these future public health leaders. Former EFETP residents currently hold leadership positions in the FMOH and their malaria experience make them valuable advocates for malaria prevention and control goals.

Peace Corps volunteers have helped with ITN distributions in some communities, and have helped to promote ITN use through programs aimed at school-aged children.

PMI-supported planned activities (next ~12-18 months, supported by currently available funds)

- PMI will continue to support supply chain capacity and development.
- PMI will support Ethiopia Field Epidemiology Training Program residents, 2-4 residents combined in the first and second year cohort, by conducting malaria training, provide technical expertise to support malaria research and outbreak response, support small grants to conduct malaria projects, and mentor residents to improve national capacity for malaria prevention and control.
- PMI will continue to support and provide malaria technical guidance for United States Peace Corps volunteers in Ethiopia (currently over 125 Peace Corps volunteers are located in Ethiopia). ITNs will be provided to the Peace Corps for community education and health efforts.

PMI Goal

PMI is committed to supporting a broad array of health system strengthening activities which cut across intervention areas, such as training of health workers, supply chain management and health information systems strengthening, drug quality monitoring, and NMCP capacity-building including mentoring and training FETP residents.

Key Question 1

What infrastructure support would address emergencies or infrastructure support or engages FETP or Peace Corps programs?

Supporting Data

Since 2017, with USG support, 469 Ethiopia Field Epidemiology Training Program residents, including epidemiological staff from 8 universities, were trained and mentored for epidemic investigation, and prevention and control earning an MPH at the completion of the program. During 2018-2019, FETP residents have conducted over 50 malaria outbreak responses, developed and implemented 14 malaria mini-grant research projects and planned studies, and conducted over 10 malaria surveillance evaluations. FY2020 data will continue to support FETP malaria response and

research activities. The FETP program provides support for health response capabilities and infrastructure in Ethiopia through the development of key epidemiological and analytical skills within current and future public health leaders that will prepare them to effectively respond to any health and natural disaster issues.

Conclusion

The FETP residents provide critical surveillance and data support for the National Malaria Control Program, Ethiopian Public Health Institute, and Ethiopia Ministry of Health. The FETP residents continue to provide malaria and technical expertise working for the FMOH or other organizations in Ethiopia after graduation from the program. There are currently over 125 Peace Corps volunteers in Ethiopia who have sufficient knowledge of malaria prevention to help provide appropriate resources to HEWs and other district-level officials. Peace Corps volunteers are embedded in the local communities and are able to assist with ITN distributions in some communities and have helped to promote ITN use through programs aimed at school-aged children.

Key Question 2

What are the in-country considerations that impact your funding allocation in this category?

Supporting Data

N/A

Conclusion

There are no other in-country considerations not already supported.

ANNEX B: COUNTRY PROGRAM INVENTORY

The MOP seeks to facilitate a consultative, collaborative process between PMI, the NMCP, and other partners, where relevant. This section outlines a high-level program inventory along key intervention areas, and is intended to structure discussions around the relative strengths and challenges facing a program, as well as prioritization and opportunities to drive catalytic impact with specific investments.

Key:

Example score

Figure B1. Category: Vector Control

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Entomological Monitoring	Insecticide Resistance monitoring	No insecticide resistance monitoring conducted	Limited insecticide resistance monitoring conducted on an ad-hoc basis	Insecticide Resistance monitoring conducted on an annual basis in a limited number of sites, not covering all administrative units. Occasional monitoring of molecular mechanisms	Insecticide resistance monitoring conducted in a greater number of sites on an annual basis with some collaboration with other partners, routine monitoring of some resistance mechanisms	Regular high quality insecticide resistance monitoring done in multiple sites per administrative division, consideration of molecular mechanisms and bioassay data, collaboration with other partners and NMCP
	Insectary	No functioning insectaries in country	Insectary present, but frequent ruptures in rearing and contamination of strains, frequent challenges in meeting needs	Insectary present, full-time staff present, some capacity for strain verification, sometimes challenges to get enough mosquitoes, occasional contamination	One or more insectary present, regular verification, rare challenges in getting sufficient mosquitoes, some capacity for strain verification	Highly functioning insectaries with verification of strains, capacity for rearing wild strains, quality controls in place
	Data-based vector control decision making	No consideration of entomological data when making decisions	Limited review of data, reliance on outdated data, uncoordinated analysis of data with limited collaboration with partners	Irregular and incomplete review of data from multiple partners, sometimes in collaboration with research and funding partners	Collaborative but irregular review of entomological data, sometimes providing timely evidence for decisions	Collaborative regular review of entomological data from multiple sources when making decisions about vector control
	Vector bionomics monitoring or research	No research or longitudinal monitoring done in country	Limited longitudinal monitoring and research done in country	Regular vector bionomics monitoring, and vector control research done in country, but generally not having an important role in decision making	Regular vector bionomics and vector control research conducted in country but not sufficient to respond to all major needs of the national program	Regular monitoring driven by program priorities conducted alongside research done in country to provide timely data on the best malaria vector control

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Institutionalization of funding	No resources	Only supported by external partners, no host government funding	Some host country government funding	>50% funded by host country government	Fully funded by host country government
ITNs	Consistent distribution channels, in accordance with national strategy	Infrequent campaigns with no continuous distribution	Regular (e.g., every 3 years) campaigns, no continuous distribution	Regular campaigns, inconsistent continuous distribution	Regular campaigns, plus at least 1 well- managed continuous distribution channel	Regular, well- executed campaigns and well-managed continuous distribution channels
	Regular supervision of routine ITN distribution (e.g. HFs)	No HFs regularly supervised in ITN distribution	0-25% of HFs regularly supervised in ITN distribution	25-50% of HFs regularly supervised in ITN distribution	50-75% of HFs regularly supervised in ITN distribution	75-100% of HFs regularly supervised in ITN distribution
	ITN distribution reporting capabilities	Quantities of ITNs distributed not reported at all into LMIS (or other system)	Some quantities of ITNs distributed reported routinely	Some quantities of ITNs distributed reported routinely but cannot be disaggregated by channel	Quantities of ITNs distributed reported routinely and disaggregated by channel	All ITNs distributed captured routinely, disaggregated, and reported electronically
	Capacity to use data to appropriately target and rotate new types of nets	N/A	No capacity	Limited capacity	Some capacity	Good capacity
IRS	Host country government's IRS implementation capacity	N/A, no host country government implemented spray campaign	Host country government has very limited capacity to implement minor aspects of spray campaign	Host country government has capacity to implement some aspects of spray campaign	Host country government has capacity to implement most aspects of spray campaign	Host country government implements independent spray campaign
	Institutionalization of funding	N/A, no IRS conducted in country	No host country government funding, only supported by external sources (e.g. PMI, GF, mining companies)	Limited host country government funding in addition to external sources	>50% funded by host country government in addition to external sources	Fully funded by host country government, no external sources

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Coverage of Government-Implemented Spray Campaign	N/A, no government-implemented spray campaign	Spray coverage not reported	85+% coverage in some government-sprayed areas	85+% coverage in most government-sprayed areas	85+% coverage in all government-sprayed areas

Figure B2. Category: Case Management

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Community-based CM, if in national strategy	Coverage of CHWs trained in and providing CM (geographic or numerical target)	No CHWs conducting CM	0-25% of national target met	25-50% of national target met	50-75% of national target met	75-100% of national target met
	Regular supervision of CHWs in CM (regular defined as per national QA/QC guidelines)	No CHWs regularly supervised in CM	0-25% of CHWs regularly supervised in CM	25-50% of CHWs regularly supervised in CM	50-75% of CHWs regularly supervised in CM	75-100% of CHWs regularly supervised in CM
	CHW reporting capabilities	CHW-managed cases not reported into HMIS	Some CHW-managed cases routinely reported into HMIS	Cases routinely reported into HMIS but cannot be disaggregated from HF-reported cases	Cases routinely reported into HMIS and can be disaggregated from HF-reported cases	All CHW case data routinely captured and reported electronically
	Institutionalization of funding (salaries and/or other support)	No resources	Only supported by external partners, no host government funding	Some host country government funding	>50% funded by host country government	Fully funded by host country government
Facility based CM	Access to HF-based care (within 5 km of a health facility or as per national definition)	0-20% of population has access to HF	20-40% of population has access to HF	40-60% of population has access to HF	60-80% of population has access to HF	>80% of population has access to HF

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Regular* supervision of public HFs in CM	No HFs regularly supervised in CM	0-25% of HFs regularly supervised in CM	25-50% of HFs regularly supervised in CM	50-75% of HFs regularly supervised in CM	75-100% of HFs regularly supervised in CM
	Drug resistance monitoring	No TES performed in last 3 years	TES performed in last 3 years but results not available	Recent TES results available (within last 3 years) but no training in molecular testing	Recent TES results available (within last 3 years) and in-country staff trained in molecular testing	Recent TES results available (within last 3 years) and in-country capability for molecular testing

Figure B3. Category: Drug-Based Prevention

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
SMC (not applicable)	Geographic scope	No eligible districts receiving SMC		50% eligible districts receiving SMC		All eligible districts receiving SMC
	Coverage in targeted areas (% of eligible children 3-59 months who received complete SMC courses for all 4 rounds)	<60%	60-69%	70-79%	80-89%	90%+
	Institutionalization of funding	No resources	Only supported by external partners, no host government funding	Some host country government funding	>50% funded by host country government	Fully funded by host country government
MIP	National policy exists for malaria prevention in pregnancy	No policy	Policy exists but is not comprehensive (does not cover all aspects of MIP: ITN, IPTp and case management)	Comprehensive policy exists for prevention (ITNs, IPTp) and case management but not all WHO recommendations are included	Policy meets current WHO recommended MIP prevention	Comprehensive, WHO-aligned policy is actively implemented

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Country policy adoption/adaptation of ANC guidelines with at least 4 recommended contacts	No policy	Country has started discussions and consultations for adopting the new ANC guidelines and recommendations	Country has policy specifying ANC contacts but no provision for early delivery of IPTp and is not able to systematically track ANC visits in HMIS	Country policy specifies ANC contacts and has provision for delivery of IPTp at 13-16 weeks but cannot track all ANC visits in HMIS	Country policy specifies the number of contacts be delivered during pregnancy and has a provision for delivery of IPTp at 13-16 weeks and is able to track ANC visits in HMIS.
	National MIP working group established and coordinating effectively	No working group established	Working group formed and meets on an ad hoc basis, TORs are established	Working group engages in regular coordination but does not have mechanisms to ensure programmatic integration across technical areas	Working group coordinates at the national level only with Malaria and Maternal Health and has limited mechanisms for ensuring programmatic integration across technical areas	Working group engages in regular coordination at national and sub-national level with Malaria and Maternal Health and has mechanisms to ensure programmatic integration across technical areas.
	Supportive MIP supervision conducted	No HFs regularly supervised in MIP	0-25% of HFs regularly supervised in MIP	25-50% of HFs regularly supervised in MIP	50-75% of HFs regularly supervised in MIP	75-100% of HFs regularly supervised in MIP
	Routine SP resistance monitoring via biomarkers conducted	No SP resistance monitoring conducted	SP resistance monitoring conducted in the last 6-10 years	SP resistance monitoring conducted in the last year 4-5 years	SP resistance monitoring conducted in the last year 3 years	SP resistance monitoring conducted in the last 3 years and results published or being published.

Figure B4. Category: Supply Chain

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Supply Chain	Forecasting and Procurement Planning	Ad hoc forecasting based on poor, inadequate, or inaccessible data Insufficient skills for selecting and implementing appropriate forecasting methodologies. Procurement plans are not developed from forecasts No coordination among procurers	Annual forecasting and supply planning done but is based on poor, inadequate, or inaccessible data Locally based skills in quantification are developing Review of procurement plans is irregular. Coordination among procurers is limited	Annual forecasts incorporate service and/or/consumption data Supply plans updated semi-annually and incorporate review/revisions of available funding Coordinated procurement planning done at the national level (and regional level, if the health system is decentralized) and among procurers	Semi-annual forecasts incorporate service and/or/consumption data, account for seasonality Supply plans updated quarterly and incorporate review/revisions of available funding Coordinated procurement planning done at the national level (and regional level, if the health system is decentralized). Identified commodity gaps effectively communicated to stakeholders for purposes of resource mobilization	Near real-time demand/consumption, enhanced with additional programmatic contributions, drives monthly forecasting Forecasting and supply planning-specific software used and outputs visible across networks. Supply plans updated monthly and incorporate review/revisions of available funding Coordinated procurement planning done at the national level (and regional level, if the health system is decentralized). Identified commodity gaps effectively communicated to stakeholders for purposes of resource mobilization. Outputs shared through global platforms

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Warehousing/ Storage	Quality of infrastructure and operations at all stock holding levels (Central, Sub-central/facility) compromises ability to ensure commodities are adequately protected from damage, deterioration and loss. Unable to locate stock by batch in central/mid-level stores/warehouses.	Quality of infrastructure and operations in at least one stock holding level (Central, Sub-central/facility) ensures that commodities are adequately protected from damage, deterioration and loss. Paper-based inventory management system. No SOPs.	Quality of infrastructure and operations in at least two stock holding levels (Central, Sub-central/SDP) ensures that commodities are adequately protected from damage, deterioration and loss. Warehousing SOPs exist. Able to track inventory level with central level WMS but information is not routinely shared across warehouses. Some maintenance occurring Limited ability to scale storage capacity	Quality of infrastructure and operations at all stock holding levels (Central, Sub-central/SDP) ensures that commodities are adequately protected from damage, deterioration and loss Stock data is digitized in at least two stock holding levels Some routine maintenance occurring Storage capacity scaled through contracting of third party logistics providers (3PLs)	Quality of infrastructure and operations at all stock holding levels (Central, Sub-central/SDP) ensures that commodities are adequately protected from damage, deterioration and loss. Storage infrastructure and operations adhere to Good Warehousing Practices and/ or meet in-country compliance standards Stock data is digitized at all stock holding levels and near real-time stock visibility available across networks Routine and predictive maintenance budgeted for and institutionalized Storage capacity is logically located and can be effectively scaled with 3PLs

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Routine distribution/ resupply between stock holding levels	No routine requisition and resupply schedule between stock holding levels No resources routinely available and allocated for transportation from higher to lower stock holding levels	Routine requisition and resupply between at least two stock holding levels according to a schedule Resources for transportation from higher to lower stock holding levels provided on ad hoc basis	Routine resupply between all stock holding levels according to a schedule Allocated resources for transportation from higher to lower stock holding levels provided on an irregular basis and resupply often achieved through unplanned means Resupply performance monitored post-activity	Routine resupply between all stock holding levels according to a schedule shared with all levels and informed by accurate demand signals Allocated resources for transportation provided on a regular basis and augmented with 3PLs Resupply performance monitored real-time	Routine resupply between all stock holding levels according to a schedule shared with all levels and informed by accurate, timely, demand signals Robust emergency and inter-facility resupply mechanisms are in place Allocated resources for transportation available internally or outsourced with 3PLs. Resupply transaction data is digitized for all stock transfers Near real-time visibility into upstream and downstream activities Resupply operations adhere to GDP and or meet in-country compliance standards for maintaining quality during distribution

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Logistics Management Information System	System to aggregate, analyze, validate and display data (from all levels of the logistics system) that can be used to make logistics decisions and manage the supply chain not institutionalized or followed No facility level records or not maintained. Low reporting rates. No visibility into CHW supplies. No visibility by central level on facilities and none by facility level on central level.	Stand-alone, program specific LMIS processes and structures defined but no formal or ongoing monitoring or measurement protocol exists. Some visibility of facility level inventory and consumption, low reporting rates, mostly paper-based	The country has documented LMIS processes and structures. The structures are functional. Metrics for performance monitoring, quality improvement, and evaluation are systematically used. Migration of data collection and reporting from a paper system to an electronic system at the district level and above. A documented mechanism is in place for maintaining data quality throughout the data supply chain.	Government and stakeholders use the national LMIS systems for key performance monitoring and follow standard practices. Facility inventory and consumption data is digital at facility level, upstream data available to facilities, System alerts for low stock/expiry, use of master product list and master facility list Interoperability with other information systems (e.g., warehouse management, medical records, laboratory management, enterprise resource planning systems, and health information management systems)	Near real time visibility into inventory and consumption data at all levels, data from multiple systems feed into common platform/control tower (automated process), predictive analytics. The government and stakeholders routinely review interoperability activities and modify them to adapt to changing conditions. Compliance with standards for data exchange, messaging, and security is regularly reviewed. The regulatory framework is reviewed and updated to reflect best practices for data exchange, messaging, and systems security.

	Regulatory, Policy and Governance	Legal basis to enable a medicines (and related health commodities - e.g., devices, vaccines, etc.) regulatory agency to function is absent or inappropriate Formal organizational structure regarding in-country stakeholders and relevant agencies to whom authority is delegated, is absent or inadequate (e.g., up-to-date organogram of MOH). Human and financial capacity to enable regulatory functionality, weak or absent No approved supply chain strategic plan	Medicines framework exists and is sufficient to support basic regulatory functions including clinical dossier review (licensing) and marketing authorization with registration. Documented domestic financial support to enable regulatory activities - including human resources Approved supply chain strategic plan but not updated recently. Poorly implemented strategic plan	All SDP levels have in place policies that address STG, quality assurance and HR. Management policies for the supply chain system are in place at the MOH level. Policy and strategic leadership is not always translated into robust implementation plans, and supportive supervision, capacity building and guidance to managers within the system. No consistent approach to pharmacovigilance or a standard reporting structure for pharmacovigilance events Overall quality management system in place to support interface of product licensing,	Strong policy and strategic leadership by government, with firm grasp of budgets and financial sustainability Robust implementation plans, and supportive supervision, capacity building and guidance to managers within the system. Regulatory and policy bodies in alignment to support quality product availability National and standardized Pharmacovigilance or a standard reporting structure for pharmacovigilance events in place, not fully functional. Approved (and up to date) supply chain strategic plan (contains clear roles and responsibilities, stakeholder mapping, costs).	The MOH leads strategic functions such as, policy formulation, quality assurance and overseeing the funds required for policy implementation. Ability to ensure product quality, automated drug registration process, clear/transparent importation process, robust post-market surveillance system and, track and trace regulations developed and/or in the process of implementation. Approved (and up to date) supply chain strategic plan (contains clear roles and responsibilities, stakeholder mapping, costs). Includes risk mitigation plan.

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
				registration, manufacturing, post-marketing surveillance. Approved (and up to date) supply chain strategic plan. Partially implemented		

Figure B5. Category: Strategic Information

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
Data, Surveillance, Monitoring & Evaluation	Overall HMIS reporting rate (CY 2018)	<60%	60-69%	70-79%	80-89%	90%+
	Element specific reporting rate: "Confirmed malaria cases among children under 5" (CY 2018)	<60%	60-69%	70-79%	80-89%	90%+

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	HMIS data quality assurance and quality control	Few standards exist for data collection, assembly, & analysis. Data quality reviews and audits are ad hoc for specific data needs. No data-quality assurance plan and national coordinating body exist.	Standards used for data collection, assembly & analysis in limited settings. Some electronic tools used for data quality review and audit. Data-quality assurance plan is available.	Standards defined and implemented for data collection, assembly, analysis, and used nationally. Data quality reviews and audits scheduled and include a remediation process to address identified issues. SM&E staff are seconded to NMCP	Data reviews and audits are integrated in strategic plans, conducted on a regular schedule. Regular meetings held by national data-quality governing body; issues identified are addressed through an established remediation process.	Continuous review and auditing through automated and manual processes, to ensure defined levels of data quality. Data quality metrics are used for continuous improvement. The data-quality assurance plan is reviewed periodically by a national coordinating body and appropriate stakeholders.
	Reporting Systems	Data collection tools are not standard, and procedures are not consistently followed; data are collected and stored in an unstructured format. NMCP does not have access to malaria data from HMIS.	Data systems support longitudinal health data (clinical, surveillance, M&E) in limited settings. The data are available for centrally mandated reporting. A parallel malaria reporting system may exist.	Most data platforms/applications ensure data availability at all levels for decision support and M&E for authorized users. No parallel malaria reporting system exists. NMCP has access to malaria data from HMIS.	The data systems in use ensure reliable and appropriate access to data at all levels for authorized users. Changes in reporting requirements are accommodated with minimal disruption to data availability. Data systems support secondary use of data and NMCP has access.	Data availability is monitored for continuous improvements and to meet emerging health sector needs. Reporting is available from private facilities and community-level providers and can be disaggregated.

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Data collection	Data collection is not done at the most peripheral level (CHWs) and is irregular and inaccurate at rural and more central health facilities. System is entirely paper based, but registers may be absent	Data collection is well managed at HF level, but incomplete at community level (CHWs); most collection is paper and aggregation is paper based; registers generally available; timeliness and completeness remain challenges	Data collection is well managed at HF level and at community level (CHWs); most collection is paper based, aggregation is electronic; registers available; timeliness and completeness >80%, feedback to collectors limited	Data collection at all levels); collection is electronic and sometimes paper based, aggregation is electronic; registers include all program-critical data; timeliness and completeness >80%, feedback to collectors is standardized	Data collection occurs at all levels, is transmitted in real time with timely feedback to those collecting and those using the data; data checks exist at point of collection; electronic transmission is the norm, including to data collectors
	Data use	Activities (analysis, interpretation, visualization) to ensure data use are rarely implemented	Limited data use activities are implemented (bulletin has been developed but analysis and interpretation for decision- making needs to be strengthened)	Country conducts regular data use activities (review meetings, bulletin at least quarterly, at least at the central level).	Country conducts regular data use activities at all levels (review meetings, bulletins, dashboard at least quarterly).	Country has developed their own high- quality dashboard to facilitate data use, and data-informed decision making is evident at all levels, on a frequent basis.
OR/PE	PMI in-country OR experience	No previous PMI OR experience in country	PMI team has prepared concept notes (CNs) but has not completed protocols or conducted OR	PMI team has completed protocols and received approval for OR; studies in planning, underway, or recently completed	PMI team and/or other country partners have completed a OR study and prepared and shared reports	Multiple OR studies completed in country that address malaria program implementation bottlenecks with publication and sharing of results, with involvement from MOH co-investigators

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Country mechanisms for OR/PE review	No in-country process for research review, determination or IRB processes	Limited in-country processes for research review, determination and IRB oversight	Processes in place for research and IRB review with federal-wide assurance approval; no previous PMI in-country OR experience	Processes in place for research and IRB review with federal-wide assurance approval; previous PMI in-country OR experience	Full complement of research review, approval, oversight processes including data safety and monitoring boards and systems for results sharing
	In-country partnerships for OR	No in-country partners (academic, NGO, or other) with OR experience	1-2 in-country partners with OR experience, but no malaria specific experience	3+ in-country partners with OR experience; 1+ with some malaria expertise; no current PMI-linked OR work	3+ in-country partners with OR experience; 1+ with malaria expertise; current or recent work with PMI OR	Multiple in-country partners with specific malaria experience in PMI OR, including completed past work and reporting on malaria OR
	Conceptualization of problems needing scientific evaluation	No experience	Some but limited experience in identifying programmatic problems and prioritization	Experience with identifying program problems and prioritizing PE and OR	Experience with identifying problems needing PE or OR and developing study approaches with partners	Extensive experience with problem identification, prioritization, proposal development and conducting PE or OR

Figure B6. Category: Support Systems

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
SBC	National Malaria SBCC Strategy used to guide design and implementation of malaria SBC activities	No strategy exists.	Strategy exists but there is no evidence that it has been used to guide design or implementation.	Strategy exists and is used from time-to-time to guide design and implementation, but is of poor quality and does not include any of the key elements identified in the RBM SBCC Working Group National Malaria SBCC Strategy Template.	Strategy is used from time-to-time to guide design and implementation, but lacks alignment with the broader National Malaria Strategy and only incorporates a couple of the key elements identified in the RBM SBCC Working Group National Malaria SBCC Strategy Template.	Strategy is well aligned with the broader National Malaria Strategy, includes the key elements identified in the RBM SBCC Working Group National Malaria SBCC Strategy Template, and is used to guide design and implementation.
	SBC Technical Working Group coordinates effectively	No technical working group exists.	The SBC Technical Working Group exists on paper, but has not been operationalized.	The SBC Technical Working Group has significant resource and staffing gaps and does not have clear pathways for coordination.	The SBC Technical Working Group lacks some needed resources/staff and generally only coordinates at the national level only.	The SBC Technical Working Group is well resourced and staffed and engages in regular coordination at both the national and sub-national level.

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	High-quality formative assessments used to inform intervention design	No high-quality, formative assessment conducted in the last five years.	Formative assessment conducted, but significant quality issues in the design and no evidence that data was used to inform intervention design.	High-quality, formative assessment conducted, but no evidence that data was used to inform intervention design.	Data from prior projects used exclusively to guide intervention design; no new data collected.	High-quality, formative assessment conducted, and data used to inform intervention design.
Elim (relevant only for countries actively pursuing elimination	Elimination planning to implementation	No elimination or pre-elimination targets in the national strategic plan	Risk stratification conducted using latest incidence data and interventions targeted	Readiness assessment/ capacity inventory conducted	Capacity built and systems in place to initiate elimination activities	Elimination activities implemented fully in targeted areas
	Surveillance system readiness to track all cases	Monthly, aggregate data from public sector only	At least monthly, aggregate data from public, private, and community levels	Case-based reporting initiated	Real-time, case-based surveillance inclusive of all sectors and levels in targeted areas	Real-time, case-based reporting and response activities implemented
General Infrastructure	Staffing	No staff	Manager and a few technical staff; not all intervention areas are covered	Manager and technical staff for each intervention area; many staff have limited training and experience ; limited program support staff	Full staffing of program areas and support systems but some staff need further training to optimize their effectiveness; limited plans and opportunities for such training	Fully staffed with personnel with relevant training and experience; complete plan for professional development

Activity	Metrics/ Criteria	Relative Continuum, for discussion purposes				
		1	2	3	4	5
	Office space, transport	No office space or transport	Office space exists but is insufficient for staff; Transport available at intervals but limited for program needs	Office space adequate for current staff but no growth possible; office not well positioned for access to MOH leadership. Transport available but not covering all needs and not well managed/maintained	Office space adequate for current staff and some technical areas (e.g., lab) but not fully adequate for growth and all technical services. Transport covers most needs.	Office space is fully adequate for current staff and technical needs (lab, insectary, meeting space, etc.) and some growth and well positioned in the MOH; Transport is fully available for needed purposes -- trucks and 4-wheel drive vehicles where needed - all maintained and managed.
	Internet connectivity	No Internet connectivity	Intermittent connectivity; poor bandwidth; challenging maintenance; very little budget	Mostly connected with some outages; ok but not ideal bandwidth; irregular maintenance; modest budget	Generally stable connections, adequate bandwidth for most work, fair to good maintenance and sufficient budget	Fully connected, maintained, good bandwidth for all needs, and sufficient budget including all needed hardware and software
	NMCP placement within Ministry of Health	NMCP exists but is barely visible in the MOH structure	NMCP is visible in the MOH structure but NMCP manager reports to supervisor who is still low in the MOH system	NMCP is visible and manager reports to high level leader in MOH (e.g., Director of Public Health or Permanent Secretary for Health)	NMCP (or NMEP) is highly visible and reports at a high level in MOH and has some access to other ministry leadership (e.g., education, agriculture, community development)	NMCP (or NMEP) is highly visible within MOH and with all other relevant ministries and has ready access to country leadership (e.g., the president/prime minister; and parliament)