

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 final funding available to support the plan outlined here is pending final FY 2019 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.



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PRESIDENT'S MALARIA INITIATIVE

ANGOLA

Malaria Operational Plan FY 2019

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ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
ADECOS	Community health workers (<i>agentes de desenvolvimento comunitário e de sanitário</i>)
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
CECOMA	Central Medical Store (<i>Central de Compras de Medicamentos e meios medicos de Angola</i>)
CDC	Centers for Disease Control and Prevention
DHS	Demographic and Health Survey
DHIS2	District Health Information System 2
DP	Dihydroartemesinin and piperazine
DPS	Provincial Health Directorate (<i>Dirrecção Provincial de Saúde</i>)
DNME	National Directorate of Medicines and Equipment (<i>Direcção Nacional de Medicamentos e Equipamentos</i>)
E8	Elimination 8
EPI	Expanded program for immunization
EUV	End-use verification
FETP	Field Epidemiology Training Program
FY	Fiscal year
GEPE	Office of Planning and Statistics (<i>Gabinete de Estudos, Planeamento e Estatística</i>)
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GRA	Government of the Republic of Angola
GTI	Office of Information Technology (<i>Gabinete de Tecnologia da Informação</i>)
HIS	Health Information System
HMIS	Health Management Information System
iCCM	Integrated community case management
IM	Intramuscular
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated net
IV	Intravenous
MAT	Ministry of Territorial Administration (<i>Ministério de Administração Territorial</i>)
M&E	Monitoring and evaluation
MEWS	Malaria Early Warning System
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MoH	Ministry of Health
NGO	Non-governmental organization
NMCP	National Malaria Control Program
OR	Operational research
PNDS	National Health Development Plan (<i>Plano Nacional de Desenvolvimento Sanitário</i>)
PMI	President's Malaria Initiative

PSC	Pyrethrum spray catches
QA/QC	Quality assurance/quality control
RA	Resident Advisor
RDT	Rapid diagnostic test
SBCC	Social and behavior change communication
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
TES	Therapeutic efficacy study
USAID	United States Agency for International Development
WHO	World Health Organization

I. EXECUTIVE SUMMARY

When it was launched in 2005, the goal of the President’s Malaria Initiative (PMI) was to reduce malaria-related mortality by 50 percent across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Sub region of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

In 2015, PMI launched the next six-year strategy, setting forth a bold and ambitious goal and objectives. The PMI Strategy for 2015-2020 takes into account the progress over the past decade and the new challenges that have arisen. Malaria prevention and control remains a major U.S. foreign assistance objective and PMI’s Strategy fully aligns with the U.S. Government’s vision of ending preventable child and maternal deaths and ending extreme poverty. It is also in line with the goals articulated in the Roll Back Malaria (RBM) Partnership’s second-generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and the World Health Organization’s (WHO’s) updated *Global Technical Strategy: 2016-2030*. Under the PMI Strategy 2015-2020, the U.S. Government’s goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination.

In 2017, consistent with an increase in annual appropriations, PMI again launched new country programs in Cameroon, Côte d’Ivoire, Niger, and Sierra Leone, and expanded an existing program in Burkina Faso to PMI focus country status. With the addition of these new focus countries, PMI now has programs in 24 countries in sub-Saharan Africa, in addition to two bilateral programs and targeted support in the Greater Mekong Sub region in Asia.

Angola began implementation as a PMI focus country in FY 2005.

This Fiscal Year (FY) 2019 Malaria Operational Plan presents a detailed implementation plan for Angola, based on the strategies of PMI and the National Malaria Control Program. It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. It was also informed by findings from past program evaluations and aimed to complement other partner activities. The activities that PMI is proposing to support align with the Government of the Republic of Angola’s (GRA) National Strategic Plan for Malaria Control (2016-2020) and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria

(Global Fund) malaria grants. PMI currently focuses implementation efforts in 24 municipalities within six northern provinces in the country. However, in an effort to demonstrate greater impact, PMI Angola plans to expand strategic interventions to cover all 61 municipalities within these six PMI focus provinces.

This document briefly reviews the current status of malaria control policies and interventions in Angola, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2019 funding.

The proposed FY 2019 PMI budget for Angola is \$20 million. PMI will support the following intervention areas with these funds:

Entomologic monitoring and insecticide resistance management: PMI will continue its support for entomologic monitoring in FY 2019 in light of the GRA's (a) renewed commitment through the hiring of permanent PMI-trained entomological technicians, (b) maintenance of the PMI-donated insectary in Huambo, (c) central coordination of activities from Luanda, and (d) improved collaboration with Elimination 8 project and implementing partners to implement entomological monitoring in three southern provinces. PMI will provide targeted technical assistance to the Government of the Republic of Angola (GRA). The re-oriented focus of PMI with FY 2019 funding will be to support the GRA-funded entomology technicians to implement a protocol for entomologic monitoring in the wake of the campaign for universal coverage with ITNs. To offset costs, the NMCP will provide in-kind logistical and operational support, such as staffing and the provision of vehicles, for PMI-supported entomology activities in the provinces. PMI will support the training of personnel and implementation of monitoring activities in six provinces.

Insecticide-treated nets (ITNs): The goal of the NMCP, with the support of PMI and the Global Fund, is to ensure that 80 percent of households own at least one ITN, and that 80 percent of those that own one sleep under it, particularly pregnant women and children less than five years of age. PMI and its partners contributed to distribution activities in previous years, but not through a true universal mass campaign. In 2016, three of the 18 provinces received ITNs. As such, the current (2017-2019) mass campaign focuses on covering the remaining 15 provinces to achieve universal coverage. With FY 2019 funds, PMI will return to supporting continuous distribution of ITNs through routine channels in its six focus provinces, which will satisfy 20 percent of the nationwide need. Support will include procurement, distribution, and technical assistance for ITNs distributed through antenatal care (ANC) clinics and expanded program for immunization.

Indoor residual spraying (IRS): No IRS-related activities are planned with FY 2019 funds.

Malaria in pregnancy (MIP): With FY 2019 funds, PMI will focus capacity building efforts on increasing IPTp rates in its six PMI focus provinces. PMI will support health facilities to continue to strengthen ANC services, maintain and expand support for training and supervision in all municipalities, and promote early and regular ANC attendance through community health workers. PMI will also procure sulfadoxine-pyrimethamine as needed to support IPTp. While the GRA continues to procure sulfadoxine-pyrimethamine, oral quinine, and ACTs, many provinces and municipalities continue to face stockouts due to overall lack of capacity in supply chain management at all levels.

Case management: The National Malaria Strategy aims to have all individuals with suspected malaria seeking care at health facilities or by trained community health workers, and tested for malaria prior to treatment, by 2020. To achieve this objective of testing and subsequent treatment, PMI will devote FY 2019 resources to procurement of rapid diagnostic tests (RDTs), ACTs, and severe malaria drugs, and the GRA will continue contributing to filling the national gap in commodity requirements. PMI will also provide limited support for training and supervision for case management strengthening, laboratory diagnosis, and quality control. In 2017, the GRA initiated a community health worker project (ADECOS) in selected provinces. In coordination with the Global Fund, PMI will expand support to ADECOS by supporting the procurement of RDTs and ACTs for their use. PMI will support a seconded technical advisor at the NMCP to improve its ability to provide technical support in case management at all levels, including the community level.

Social and behavior change communication (SBCC): With FY 2019 funds, PMI will focus on increasing community understanding of and commitment to improving health through participation in and ownership of prevention and case management activities. PMI will work to improve the interpersonal communication skills of care givers, thereby improving their relationships with clients and communities, to improve program impact. As the GRA expands the coverage of ADECOS, PMI will train these community health workers and their supervisors to improve their technical and communication skills to deliver tested messages in a manner that promotes preventive behaviors and increases treatment compliance. Similarly, PMI will support facility-based health workers to develop their skills in interacting effectively with patients, utilizing stronger interpersonal communication skills to increase treatment compliance. As it is necessary for patients, caretakers, and community members to understand the importance of timely, appropriate diagnostics for successful treatment outcomes, PMI will support SBCC messaging and outreach to promote demand for malaria testing prior to requesting treatment.

Surveillance, monitoring, and evaluation (SM&E): With FY 2019 funding, PMI will continue to support malaria SM&E within the framework of the National Malaria M&E Plan described in the GRA's new National Strategic Plan for Malaria Control (2016-2020). PMI support will be targeted towards improving Angola's M&E capacity, data quality assurance, and use of data for decision-making. This will include supporting the Demographic and Health Survey in 2020 to collect malaria control indicators, and strengthening monthly malaria surveillance data reporting through Health Management Information System and implementation of the Demographic Health Information System at the municipal, provincial, and central levels. Finally, PMI will conduct a health facility survey to determine the extent to which health workers are following training in case management according to national policy.

Operational research: There are no plans to fund operational research studies with FY 2019 funds.

II. STRATEGY

1. Introduction

When it was launched in 2005, the goal of PMI was to reduce malaria-related mortality by 50 percent across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Sub region of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

In 2015, PMI launched the next six-year strategy, setting forth a bold and ambitious goal and objectives. The PMI Strategy for 2015-2020 takes into account the progress over the past decade and the new challenges that have arisen. Malaria prevention and control remains a major U.S. foreign assistance objective and PMI's strategy fully aligns with the U.S. Government's vision of ending preventable child and maternal deaths and ending extreme poverty. It is also in line with the goals articulated in the Roll Back Malaria Partnership's second-generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and the World Health Organization's (WHO's) updated *Global Technical Strategy: 2016-2030*. Under the PMI Strategy 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination.

In 2017, consistent with an increase in annual appropriations, PMI again launched new country programs in Cameroon, Côte d'Ivoire, Niger, and Sierra Leone, and expanded an existing program in Burkina Faso to full PMI focus country status. With the addition of these new focus countries, PMI now has programs in 24 countries in sub-Saharan Africa, in addition to two bilateral programs and targeted support in the Greater Mekong Sub region in Asia.

Angola began implementation as a PMI focus country in FY 2005.

This FY 2019 Malaria Operational Plan presents a detailed implementation plan for Angola, based on the strategies of PMI and the National Malaria Control Program (NMCP) strategy. It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. It was also informed by findings from past program evaluations and shared best practices from other PMI countries. The activities that PMI is proposing to support align with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund malaria grants and the Bill and Melinda Gates Foundation grant. This document briefly reviews the

current status of malaria control policies and interventions in Angola, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2019 funding.

2. Malaria situation in Angola

According to the final results of the 2014 population census conducted by the *Instituto Nacional de Estatísticas* (National Institute of Statistics of Angola), Angola had a total population of approximately 25.8 million, and projections for 2018 and 2019 were 29.3 and 30.2 million, respectively. Fifty-two percent of the population are women and 62 percent of the population lives in an urban setting. The country is divided into 18 provinces, 162 municipalities, and 559 communes. Data from the 2011 Malaria Indicator Survey (MIS) show a decline of almost 40 percent in parasitemia among children less than five years of age from the 2006-2007 MIS (from 21 to 13.5 percent). However, Angola's first Demographic and Health Survey (DHS), conducted from 2015 to 2016, reported no change from the 2011 MIS in parasitemia among children less than five years of age. Comparing MIS and DHS data, the mortality rate for children less than five years of age has decreased by 25 percent over the past five years and currently it is estimated there are 68 deaths per 1,000 live births.

Malaria continues to be the major health problem in Angola and is the principal cause of morbidity and mortality. According to the 2013 *Plano Nacional de Desenvolvimento Sanitário* (PNDS) (National Health Development Plan), malaria accounts for 35 percent of curative care demand, 35 percent of mortality in children, 40 percent of pre-natal mortality, and 25 percent of maternal morbidity, and causes 60 and 10 percent of hospital admissions in children less than five years of age and pregnant women, respectively. Malaria is also a leading cause of low birth weight and anemia.

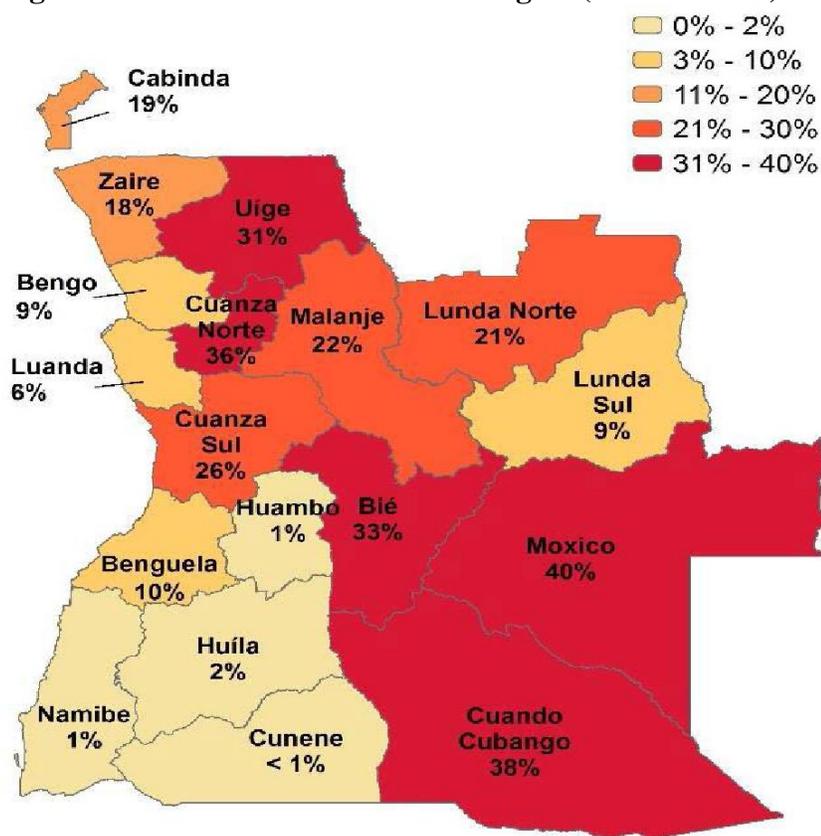
In 2016, 4,301,146 malaria cases (3,794,253 confirmed) were reported in the public sector, with nearly double the number of malaria deaths from the previous year (7,832 deaths in 2015 and 15,997 deaths in 2016) (NMCP 2016-2017). Although data from the Health Management Information System (HMIS) are unreliable, PMI believes that several factors played a key role in the reported upsurge in malaria cases in 2016. These include (1) health-seeking behavior for fevers or co-infections with yellow fever; (2) increased rainfall as a result of *El Niño*, and (3) stockouts of malaria treatments and diagnostics as a result of the Government of the Republic of Angola (GRA) not using the pooled procurement mechanism and not procuring commodities in a timely fashion.

In 2017, there were 4,500,221 suspected cases of malaria (3,874,892 confirmed) reported in the public health sector, with 13,967 reported malaria-related deaths. At the end of 2017, the country experienced reported increases in malaria cases in several provinces, which prompted the Ministry of Health (MoH) to conduct rapid assessments in these provinces to better understand the situational context and form a response plan to address the identified needs. Between December 2017 and March 2018, five provinces reported increases in malaria cases and malaria-related deaths. Given the unreliability of the HMIS data, it remains unclear if these reported increases reflected a true increase in malaria transmission. During the rapid assessments, the GRA identified that most, if not all, health facilities had a stockout of both RDTs and malaria treatment medicines. A registry review during this time revealed that patients were clinically diagnosed for malaria without having received a confirmatory test. Additionally, delayed care-seeking behavior and stockouts of severe malaria treatments may have contributed to the increase in reported malaria-related deaths.

Most (87 percent) of malaria cases in Angola are caused by the *P. falciparum* parasite, with a portion of cases caused by *P. vivax*, *P. malariae*, and *P. ovale* parasites (estimated at 7, 3, and 3 percent, respectively). Based on existing evidence, there are five anopheline species responsible for malaria transmission in the country: *An. gambiae* s.s., *An. funestus*, *An. melas* (in coastal areas), *An. arabiensis* and *An. pharaoensis* (in southern unstable mesoendemic areas). Secondary vectors of malaria, *An. rufipes* and *An. Coustani*, have been identified in Huambo and Zaire provinces.

The entire Angolan population is at risk for malaria, but there is significant heterogeneity in transmission, with hyperendemicity historically observed in the northeast provinces of Cabinda, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, and Uíge. In the north, the peak malaria transmission season extends from March to May, with a secondary peak in October to November. The central and coastal provinces (Benguela, Bie, Cuanza Sul, Huambo, Luanda, Moxico, and Zaire) are mesoendemic with stable transmission. The four southern provinces bordering Namibia have highly seasonal transmission and are prone to epidemics. Figure 1 depicts the prevalence of malaria among children less than five years of age according to the 2015/16 DHS, which varied between from less than 1 percent in Cunene to 40 percent in Moxico. Although the transmission zones were unchanged from the 2011 MIS to the 2015/16 DHS, with hyperendemicity in the northeast, the DHS report presents a new prevalence data table and map which indicate that changes have occurred over the past four years. These survey results indicate Bie, Cuanza Norte, Cuando Cubango, Moxico, and Uíge have the highest prevalence, suggestive of a provincial shift in malaria endemicity.

Figure 1. Malaria Transmission in Angola (2015/16 DHS)



3. Country health system delivery structure and Ministry of Health organization

The GRA has recently been investing in health infrastructure, expanding the health data network, improving the quality of primary care facilities, and expanding community health. There is, unfortunately, much more to do to improve the health care system and reduce morbidity and mortality. It is estimated that only 45 percent of the population has access to public health facilities (PDNS, 2013)¹. There are major disparities among provinces in terms of public investment levels, and people travel longer distances to access health facilities in the easternmost provinces. Furthermore, there is notable disparity between urban and rural inhabitants' access to care. Service delivery is also affected by an unbalanced distribution of human resources. The Angolan supply chain system is compromised because of the GRA's limited capacity to adequately manage the national supply chain system, and this managerial weakness contributes to frequent stockouts of commodities. Poor infrastructure, coupled with frequent stockouts, negatively impact the quality of service delivery. Other contributing factors to low access to public healthcare include cultural beliefs and reliance on traditional healers and the preference for purchasing medicine from private drug sellers without medical consultation.

The Angolan National Health System has three levels of care: primary care, in which basic care is provided through health posts, health centers, and municipal hospitals; secondary care, in which care is provided through general (provincial) hospitals; and tertiary care, in which specialized care is provided through central hospitals in the capital city of Luanda and in Benguela. The public health network is composed of a total 2,775 health units. It is reported that 2,442 of these units are operational: 1,675 health posts, 431 health centers, 75 maternal and child health centers, 166 municipal hospitals, 25 provincial hospitals, 12 central/national hospitals, 24 specialized health centers (1 in Huambo, 8 in Huila, and 15 in Luanda), and 28 non-classified health facilities. The GRA has prioritized increasing human resources for health, tripling the number of physicians between 2005 and 2009. However, there is still a critical shortage and inequitable distribution of health workers.

The MoH currently has four levels of administration: the national, provincial, municipal, and health facility. The national level includes the National Directorate of Public Health of the MoH (where the NMCP is located), where national guidelines and norms are elaborated, adapted, and/or adopted, and the national technical direction is set. At the provincial level, the *Direcção Provincial da Saúde* (DPS) (Provincial Health Directorate) is responsible for coordinating all health activities in the province and providing oversight to provincial hospitals. The municipal level provides technical and operational directives to municipal hospitals, local health centers and posts. The administration of each municipal health facility is expected to provide direct supervision for the day-to-day operation of the health unit. Each facility depends on the municipality for budget and procurement. In reality, mismanagement has negatively impacted the availability of budgetary resources at the municipal level.

The GRA recognizes the need to extend health services to the community level by adopting integrated community case management (iCCM). The NMCP has been leading a process to develop a community approach using *Agentes de Desenvolvimento Comunitário e Sanitário* (ADECOS) (community health and development workers). In 2014, the ADECOS national policy framework was jointly developed and approved by the Angolan Ministry of Territorial Administration (MAT) and the MoH. ADECOS are linked to municipal health centers, where integrated health teams are responsible for performing routine supervision. Under the supervision of MAT, the ADECOS receive three months of training on the provision of basic services, including testing and treating uncomplicated malaria cases using RDTs and ACTs. The main functions of the ADECOS are to increase community awareness of health prevention

interventions, such as basic malaria prevention activities (e.g., use of ITNs, early care seeking, and compliance with diagnostic outcomes), and to provide information on vaccinations, improved sanitation, and access to safe water.

In September 2018, the MAT rolled out the ADECOS project in 18 municipalities in 7 provinces. The aim was to initially train 1,080 ADECOS and expand to training 14,100 ADECOS by the end of 2018. To bolster sustainability of the ADECOS project, salaries and operational costs are covered by MAT. However, the shortage of funding additional salaries and operational costs and level of effort needed to coordinate this multi-sectorial intervention (specifically between MAT and MoH) could delay the planned expansion.

Several malaria stakeholders are supporting the MoH in the rollout of ADECOS throughout the country. The Global Fund's principal recipient for iCCM, World Vision, trained 720 ADECOS to provide malaria case management in 10 municipalities of three provinces (Malange, Moxico, and Lunda Norte). World Vision aims to train, support, and supervise a total of 1,080 ADECOS by the end of 2018. Additionally, the Bill and Melinda Gates Foundation (through World Vision) supports efforts to rollout an ADECOS project in two provinces in southern Angola (Cunene and Cuando Cubango). Through participation in the newly created iCCM Technical Working Group, PMI is working closely with the NMCP, MAT, MoH, Global Fund, and World Vision to coordinate geographic coverage and harmonize implementation in order to ensure that the ADECOS project is implemented in a standardized fashion. In April 2018, PMI, in collaboration with the MoH and MAT, officially launched the training of 120 ADECOS in four municipalities in the provinces of Lunda Sul and Zaire.

4. National malaria control strategy

The general objective of the National Malaria Strategic Plan for 2016-2020 is to reduce malaria-related morbidity and mortality by 60 percent by 2020, from 2012 baseline figures.

Prevention of malaria: The NMCP's strategy for malaria prevention has four main components: ITNs, prevention of malaria in pregnancy, spraying (indoor and outdoor), and larviciding. The GRA strategy calls for two approaches for ITN distribution: mass campaign distribution to achieve universal coverage and routine continuous distribution to maintain coverage. A phased mass campaign aims to increase ITN access and use for 15 of the 18 provinces by the end of 2018. Three provinces (Benguela, Huila, and nine municipalities in Uige) were covered by PMI in 2016 and, therefore, will be due for ITN distribution in 2019. Routine distribution of ITNs occurs through the following channels: antenatal care (ANC) clinics and the expanded program for immunization (EPI), and outreach services for communities with no or little access to health services, such as mobile municipal health units and municipal health days.

In addition to distributing ITNs to pregnant women to help prevent malaria in pregnancy, national policy calls for provision of IPTp with SP at all health units with ANC services. The target is that by the end of 2020, at least 80 percent of pregnant women with access to ANC and targeted for IPTp receive at least three doses of SP.

The NMCP strategy calls for indoor and outdoor residual spraying to be implemented in targeted areas of epidemic risks and low transmission. However, only small-scale outdoor spraying is being

implemented. Larviciding is financed exclusively by the GRA with technical support from the Cuban government.

Malaria case management: In accordance with WHO guidelines, Angola's National Strategic Plan recommends that all suspected cases of malaria be diagnosed parasitologically, using either microscopy or RDTs. Only confirmed malaria cases should be treated with an ACT. The country has three alternative first-line ACT treatments: artesunate-amodiaquine (AS-AQ), artemether-lumefantrine (AL), and dihydroartemisinin+piperazine (DP). National treatment guidelines for severe malaria recommend (in order of preference) injectable artesunate, intramuscular artemether, and injectable quinine. Malaria case management is provided at both the health facility and community level.

It is estimated that 45 percent of the Angolan population has access to health facilities. As previously mentioned, the MOH and MAT are extending health services at the community level, including malaria case management, through the ADECOS project. The ADECOS project a community development approach implemented by community workers who provide education, information and basic support related to health, water and sanitation, iCCM and other community development initiatives. The ADECOS curriculum includes the iCCM treatment strategy.

Monitoring and evaluation and epidemiologic surveillance: The NMCP has developed a costed Monitoring and Evaluating (M&E) Plan described in the National Strategic Plan for Malaria Control (2016-2020). At the national level, after more than a year without an M&E Focal Point, the NMCP hired two M&E officers in late 2016. At the municipal level, there is a malaria municipal supervisor who regularly collects data and transmits them to the national program, through the provincial level. The GRA is working to strengthen its epidemiology surveillance system. PMI supported the GRA in convening an electronic health management information systems workshop which aimed to develop a District Health Information System 2 (DHIS2) roadmap to outline partner support for the national rollout of DHIS2 in Angola. The National Epidemiological Surveillance System collects weekly reports on clinically diagnosed cases of malaria from the four epidemic-prone provinces in the south—Cuando Cubango, Cunene, Huila, and Namibe. However, since not all districts report on a regular basis and there are delays in releasing reports to the NMCP, these weekly data are currently of limited value for detecting and containing malaria epidemics.

Procurement and supply management: The National Program of Essential Drugs revised the content of national essential drugs kits both for health posts and health centers in 2012. Antimalarial drugs, including ACTs, rectal artesunate, and SP, are delivered to health facilities through these drug kits; RDTs and injectable artesunate are individually distributed. The number of kits received by each health facility and the frequency of reception are based on consumption and availability. Municipal, provincial, and central (national) hospitals are accorded budgets and are responsible for procurement of their health commodity needs. Stockouts of malaria commodities at all levels are common.

The *Central de Compras e Aproveitamento de Medicamentos e Meios Médicos* (CECOMA) (Central Procurement Agency for Medicines and Medical Supplies) is the part of the Angolan MoH that has responsibility for the acquisition, storage, and distribution of drugs and medical supplies in Angola. CECOMA has a central warehouse located in Luanda.

Due to previous theft of large quantities of PMI-funded commodities from the central warehouse, PMI uses a parallel system to distribute its commodities. In Angola, PMI continues to observe capacity gaps

in the GRA's public service delivery that are compounded by excessive bureaucracy, inefficient fiscal procedures, and generally poor financial management. The Global Fund also uses a separate parallel system for the warehousing and distribution of malaria commodities in Angola. Both PMI and the Global Fund are committed to working with the MoH to strengthen the Angolan supply chain so that all commodities can eventually be distributed via the national system. However, this has been challenging because integrating vertical health programs with parallel logistics systems that manage commodities is a complex and gradual process requiring administrative efficiencies, staff capacity, and financial resources, all of which are currently limited in the context of Angola.

5. Updates in the strategy section

Not applicable.

6. Integration, collaboration, and coordination

Funding for malaria control in Angola is provided by the GRA, private partners (e.g., UNITEL, ExxonMobil Foundation, and Chevron), PMI, the Global Fund, the Bill and Melinda Gates Foundation, and J.C. Flowers. While the GRA has historically also received malaria contributions from the World Bank, WHO, UNICEF, Japan International Cooperation Agency, Cuban Government, Spanish Cooperation, Global Alliance for Vaccines and Immunizations, and private partners, PMI and the Global Fund are currently the only significant donors for malaria in Angola. The Bill and Melinda Gates Foundation started support in 2017 to cover border areas in the southern provinces.

The GRA Global Fund grant began in July 2016 and ended in June 2018. The new Global Fund Round 12 grant, covering July 2018 to July 2021 for a total funding level of \$23 million, includes financial resources to hire at least three advisors: a data manager, a supply chain logistician, and a financial manager. Within the past eight months, the MoH has recruited a full-time Global Fund Grant Coordinator, who is responsible for the overall coordination and management of the Global Fund malaria grant and a Supply Chain Logistician and Malaria Program Manager, both of whom are embedded in the NMCP to help build institutional capacity. In addition, the Global Fund grant supports 18 provincial malaria control supervisors (typically health technicians) who work with the GRA malaria supervisors in the municipal health directorate staff. They are responsible for institutional support in planning, implementing, and managing malaria activities at these levels.

The overall GRA budget for health in 2018 is \$1.8 billion (3.63 percent of the overall national budget). Of this total, the National Endemic Diseases Program, including the malaria program, receives approximately \$29 million (excluding salaries). These funds are used for commodity procurement, larviciding, training and supervision, capacity building of health personnel, and general operational costs. National hospitals in Luanda, provincial hospitals, and some municipal and provincial governments receive budgets directly from the GRA, part of which contribute to malaria prevention and treatment at the sub-national level.

The GRA has financial resources to contribute to malaria control and prevention, as well as other important health priorities. In 2013, the GRA approved the PNDS, which outlines a strategy to improve the health system from 2012-2025. Within the PNDS framework, the GRA costs program areas and can allocate more resources to disease prevention. These resources, in conjunction with the decentralization process, afford an opportunity for the GRA, especially at municipal levels, to assume more ownership

and financial responsibility for its national malaria control program. The PNDS was costed with technical support from PMI. All municipalities have developed a municipal health development strategy designed to be funded by the Ministry of Finance, enabling them to plan health activities independently at the provincial level. However, the first years of implementation of this process have been hampered by poor management and lack of funding.

NMCP Coordination: The NMCP works in close collaboration with other departments at the National Public Health Directorate, such as Surveillance and Emergency Response Units and the Reproductive Health, Maternal and Child Health, and Immunization Departments on implementation of malaria in pregnancy interventions and integrated management of childhood illness. Coordination between the NMCP and other offices under the MoH – such as *Gabinete de Tecnologia da Informação* (GTI) (Office of Information Technology) and *Gabinete de Estudos, Planeamento e Estatística* (GEPE) (Office of Planning and Statistics) – is improving as various MoH departments are engaged to support the national rollout of DHIS2. The new Secretary of Social Communication is collaborating with the NMCP to increase malaria messaging. There is a continued effort to strengthen working relationships within these departments to coordinate efforts and maximize resources.

The Malaria Partners Forum, made up of all malaria stakeholders, including civil society organizations, was created in 2007 to help the NMCP coordinate partner activities and minimize duplication of efforts and resources. There are currently approximately 100 members, including the NMCP, PMI, WHO, UNICEF, local and international NGOs and faith-based organizations, bilateral and multilateral organizations, and private sector companies. Coordination of malaria activities remains weak at the provincial level and varies from province to province. In 2016, ten provinces in Angola established provincial malaria forums to coordinate the activities of aforementioned partners. In 2017, because of the delay in PMI activities and the reduction of donors at the provincial level, the provincial forums were inactive. However, one province (Cabinda), currently supported by Chevron, established a Provincial Malaria Partner’s Forum in April 2018.

Global Fund: In support of the universal coverage campaign to address coverage gaps, the Global Fund continues to work with the NMCP to redirect a portion of the ITNs funded by the previous Global Fund grant from routine distribution to support achieving universal coverage in the country. PMI coordinates closely with the Global Fund to plan the distribution of RDTs and ACTs and activities related to iCCM, supply chain, and health information systems strengthening.

Elimination 8 (E8): Angola is a member of the E8 countries along with Botswana, Mozambique, Namibia, Swaziland, South Africa, Zambia, and Zimbabwe. While the primary objective of E8 in Angola is supporting malaria elimination in Namibia through cross-border initiatives, E8 is committed to working in concert with other partners supporting malaria control activities, which include a district-level MIS, IRS, iCCM, and a Health Facility Assessment in Angola’s southern provinces. E8 activities are funded by the Bill and Melinda Gates Foundation. Angola is party to two trans-border initiatives for malaria control: the Trans-Kunene (with Namibia) and the Trans-Zambezi (with Botswana, Namibia, Zambia, and Zimbabwe).

World Bank: In 2017, the World Bank concluded a new \$100 million loan to the MoH which focuses on health systems strengthening, including piloting results-based financing in Angola. The World Bank loan will support malaria-related interventions such as integrated management of childhood illness, IPTp, and ADECOS in seven provinces and 21 municipalities, some of which overlap with PMI. The

expenditure categories are \$65 million for improving quality of services in target provinces, \$35 million for strengthening system-wide health systems and \$10 million for M&E. PMI has been coordinating with the World Bank on activities related to municipal planning and budgeting, and supply chain and health information systems strengthening.

U.S. Government: PMI is supporting the national scale-up of DHIS2 in collaboration with PEPFAR, other donors and implementing partners. In collaboration with the U.S. Embassy’s Public Affairs Section, and the U.S. Global Development Lab, PMI technical assistance leveraged financial contributions to host a “Health Tech Camp” bringing stakeholders such as Unitel and GRA Information Communications Technology leaders together to define a framework for enabling the MoH electronic systems to “speak” to each other through an interoperable platform.

Private Sector: PMI continues to build upon its collaboration with the private sector through public private partnerships. There is increased engagement with ExxonMobil, Unitel, and *Banco de Fomento Angola*. PMI leveraged resources from these organizations to support iCCM implementation, as well as activities for the universal distribution campaign. To improve the reporting of malaria data and increase the reach of behavior- change messaging, PMI/Angola initiated a partnership with UNITEL, Angola’s largest mobile network operator. Signed in July 2017, the agreement details UNITEL’s commitment to provide free mass short message services to promote ITN use in the provinces covered by the campaign and the provision of free internet access for the transmission of malaria data sent from municipalities. PMI also approached several other local companies to leverage resources for the nationwide ITN campaign. As a result, the *Banco de Fomento Angola* and Angola Liquefied Natural Gas Company made small contributions of \$30,000 and 2,000 ITNs, respectively.

7. PMI goal, objectives, strategic areas, and key indicators

Under the PMI Strategy for 2015-2020, the U.S. Government’s goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity the long-term goal of elimination. Building upon the progress to date in PMI-supported countries, PMI will work with NMCPs and partners to accomplish the following objectives by 2020:

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80 percent reduction from PMI’s original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40 percent from 2015 levels.
3. Assist at least five PMI-supported countries to meet the World Health Organization’s (WHO) criteria for national or sub-national pre-elimination.¹

These objectives will be accomplished by emphasizing five core areas of strategic focus:

1. Achieving and sustaining scale of proven interventions
2. Adapting to changing epidemiology and incorporating new tools
3. Improving countries’ capacity to collect and use information
4. Mitigating risk against the current malaria control gains
5. Building capacity and health systems towards full country ownership

¹ http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

To track progress toward achieving and sustaining scale of proven interventions (area of strategic focus #1), PMI will continue to track the key household survey indicators recommended by the Roll Back Malaria Monitoring and Evaluation Reference Group (RBM MERG) as listed below:

- Proportion of households with at least one ITN
- Proportion of the population with access to an ITN within their households
- Proportion of children under five years old who slept under an ITN the previous night
- Proportion of pregnant women who slept under an ITN the previous night
- Proportion of the population that slept under an ITN the previous night
- Proportion of children under five years old with fever in the last two weeks for whom advice or treatment was sought
- Proportion of children under five with fever in the last two weeks who had a finger or heel stick
- Proportion receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs
- Proportion of women who received two or more doses of IPTp for malaria during ANC visits during their last pregnancy
- Proportion of women who received three or more doses of IPTp for malaria during ANC visits during their last pregnancy

8. Progress on coverage/impact indicators to date

A nationwide MIS was conducted between November 2006 and April 2007 with PMI and Global Fund support. This was the first nationwide health survey in more than 20 years in Angola. At the time, ACT and IPTp implementation had just begun; therefore, the figures reported for the proportion of children less than five years of age receiving an ACT and the proportion of women receiving two doses of IPTp can be considered accurate baselines for PMI. In the case of ITNs, where a large-scale campaign in seven provinces had occurred several months prior to the MIS, families interviewed were asked specifically when they had received their ITNs and an adjustment was made in the calculations to take campaign ITNs into account in estimating the baseline ownership of ITNs. In 2011, PMI contributed to a second nationwide MIS with an expanded sample size to provide up-to-date information on progress in malaria prevention and treatment activities.

The Angola 2015/16 DHS collected key indicator data in areas of demographics and population health including malaria, nutrition, HIV/AIDS, and family planning. The survey collected data on all-cause infant and child mortality rate, prevalence of malaria in children, anemia among children, possession of ITNs by household, use of ITNs by children and pregnant women, use of IPTp by pregnant women, and prevalence, diagnosis, and immediate treatment of children with fever. This DHS followed the national census of 2014. The results of this DHS were officially published in June 2017. Survey data for the major indicators used by PMI are presented in Table 1.

Table 1: Evolution of Key Survey Based Malaria Indicators in Angola from 2006 to 2016

Indicator	2006/07 MIS	2011 MIS	2015/16 DHS
% Households with at least one ITN	28%	35%	31%
% Population with access to an ITN	n/a	n/a	20.0%
% Children under five who slept under an ITN the previous night	18%	26%	22%
% Pregnant women who slept under an ITN the previous night	22%	26%	23%
% Population that slept under an ITN the previous night	n/a	n/a	18%
% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	n/a	n/a	51%
% Children under five with fever in the last two weeks who had a finger or heel stick	n/a	n/a	34%
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	n/a	28%	77%
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	3%	18%	37%
% Women who received three or more doses of IPTp during their last pregnancy in the last two years	n/a	n/a	19%
Under-five mortality rate per 1,000 live births	118	91	68
% Children under five with parasitemia (by microscopy , if done)	20%	10%	n/a
% Children under five with parasitemia (by RDT , if done)	21%	14%	14%

Malaria cases and deaths reported through the routine surveillance systems in Angola from 2006 to 2017 can be found in Table 2, in addition to evidence showing an increase over time in data completeness and in test positivity rates. From 2012 to 2017, the number of confirmed malaria cases increased (Figure 2) and the percentage of malaria cases found in children less than five years of age decreased (Figure 3).

Table 2: Evolution of Key Malaria Indicators Reported through Routine Surveillance Systems in Angola from 2006 to 2017

Indicator	2012	2013	2014	2015	2016-	2017
Total # Cases (Confirmed and Presumed)¹	3,031,546	3,144,100	3,180,021	3,254,270	4,301,146	4,500,221
# Confirmed Cases²	1,520,834	1,999,868	2,298,979	2,769,305	3,794,253	3,874,892
# Presumed Cases³	1,031,678	845,121	410,716	484,965	506,893	625,329
Total # <5 Cases⁴	1,173,358	1,201,408	1,189,891	1,231,732	1,531,695	1,588,112
Total # Malaria Deaths⁵	5,736	7,300	5,714	7,832	15,997	13,967
Data Completeness⁶	n/a	76%	82%	81%	80.0%	82.3%
Test Positivity Rate (TPR)⁷	46%	48.4%	44%	44%	53%	52%

¹Total # cases: Total number of reported malaria cases. All ages, outpatient, inpatient, confirmed and unconfirmed cases.

²# confirmed cases: Total diagnostically confirmed cases. All ages, outpatient, inpatient.

³# presumed cases: Total clinical/presumed/unconfirmed cases. All ages, outpatient, inpatient.

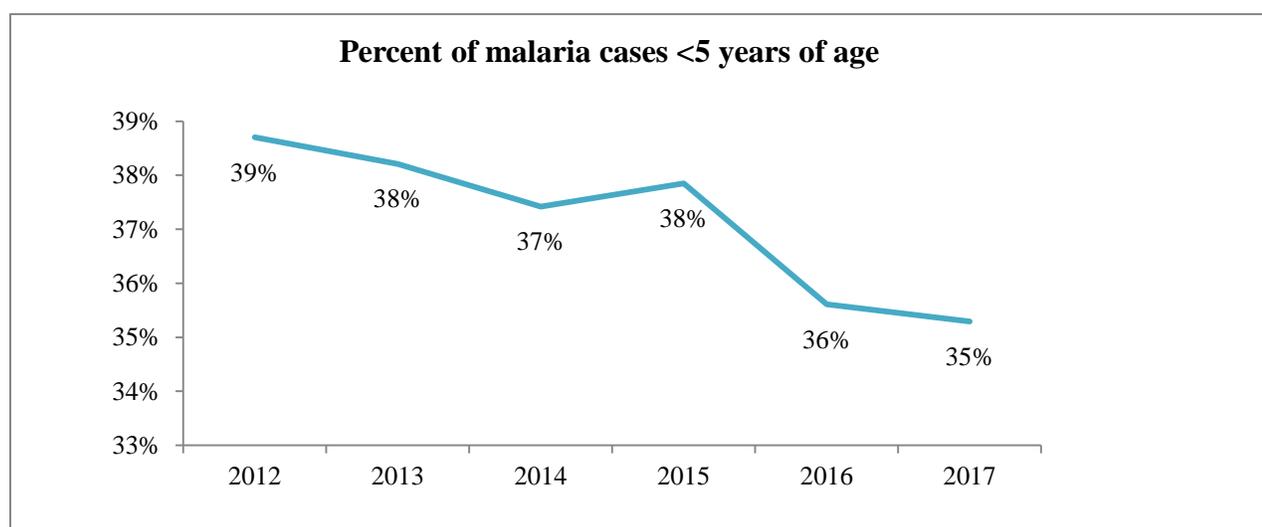
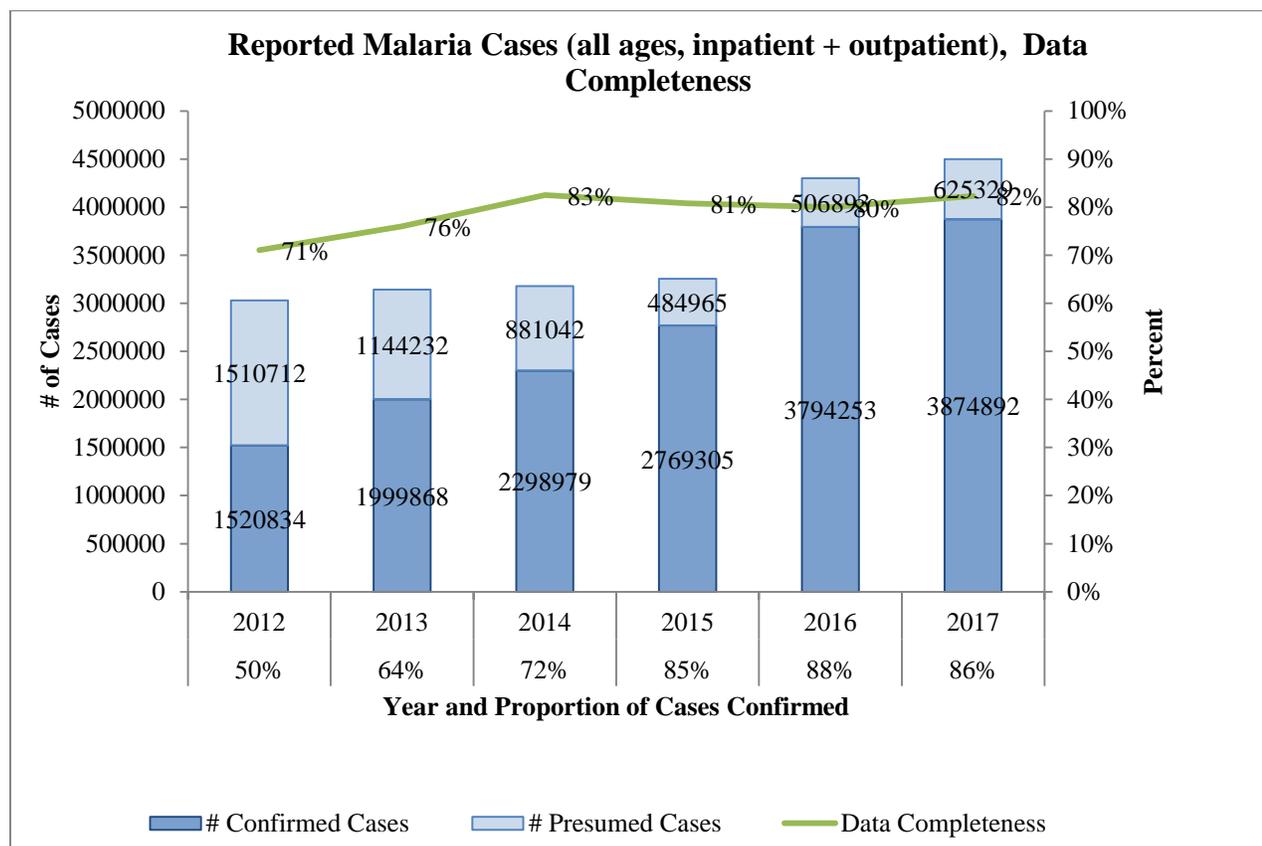
⁴Total #<5 cases: Total number of <5 cases. Outpatient, inpatient, confirmed, and unconfirmed.

⁵Total # Malaria Deaths Reported: All ages, outpatient, inpatient, confirmed, and unconfirmed

⁶Data 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)

⁷Test Positivity Rate (TPR): Number of confirmed cases (#2 above)/Number patients receiving a diagnostic test for malaria (RDT or microscopy)

Figures 2 and 3: Trends in Key Malaria Indicators Reported in Routine Surveillance Systems from 2012-2017



9. Other relevant evidence on progress

Findings from the 2016 Health Facility Survey in Huambo and Uige highlighted different case management practices at health facilities. In Huambo, only 28 percent of malaria cases seeking care in health facilities were appropriately treated with antimalarials compared to 60 percent in Uige. The survey highlighted the importance of continued training and supervision of healthcare workers. Preliminary findings were shared with Uige in 2016 and final results and recommendations were presented in-person to the Huambo province DPS and malaria supervisor. Final survey results were also published in the *Malaria Journal* in January 2017. Given a shift in geographic focus, PMI did not provide additional support to Huambo based on the findings. Recognizing the previous healthcare worker and supervision model did not yield long-term changes in clinical practice, future capacity building activities will include a mentorship component which will provide immediate corrective action and reinforce didactic trainings.

PMI continues to support therapeutic efficacy studies (TES) according to WHO guidance to conduct routine monitoring of antimalarial drug efficacy every two years in order to ensure effective case management and detection of resistance. Results from the 2013 and 2015 TES reported an efficacy of less than 90 percent for AL, specifically in Zaire province. Based on the 2015 findings, the NMCP was informed that further monitoring was warranted to confirm the possible existence of lumefantrine resistance in Zaire Province. During the 2017 TES, samples from the sentinel sites in Zaire Province underwent additional testing at the University of Cape Town Research Institute to further assess efficacy of the antimalarial lumefantrine. These findings were published in the *Malaria Journal* (see Table 11 for results).

III. OPERATIONAL PLAN

PMI's strategy for Angola supports most of the NMCP's strategic goals and priorities and complements the efforts of the GRA and other partners. In alignment with the National Strategy, PMI prioritizes malaria prevention and case management and distributing quality commodities for the effective diagnosis, treatment, and prevention of malaria.

From 2015 to 2017, PMI temporarily stopped support for vector control activities, specifically IRS and entomological monitoring. Given the GRA's increased engagement and commitment to advancing vector monitoring and control activities, PMI will restart support for entomological monitoring and insecticide resistance testing through capacity building at the national level and within select PMI focus provinces with FY 2018 funds. PMI does not support larviciding or outdoor spraying.

In September 2016, PMI/Angola successfully negotiated, through an extensive bilateral dialogue, a memorandum of understanding signed by the Angolan Health Minister, the U.S. Global Malaria Coordinator, and the U.S. Ambassador to Angola with clear expectations, benchmarks, and targets to be met by September 30, 2017. To facilitate the accomplishment of these expectations, PMI leadership and the U.S. Ambassador agreed to the formulation of a streamlined set of activities for the FY 2017 Malaria Operational Plan. Under this exceptional situation, the main emphases of FY 2017 resources were the universal ITN distribution campaign and supply chain improvement. At the conclusion of the timeframe of the memorandum of understanding, PMI conducted a meeting with the GRA to discuss outcomes. The MoH achieved 50 percent of the agreed targets within the 2016-2017 reporting period, demonstrating increased engagement and commitment.

With FY 2019 funding, PMI will continue to focus support for malaria treatment and prevention activities in all municipalities in six focus provinces in the north: Kwanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire. This represents an expansion from 24 to 61 municipalities in these six focus provinces. Despite the new malaria prevalence map from the 2015/16 DHS, PMI will continue focusing these northern provinces for several reasons, including: (1) these six northern provinces have historically constituted the hyperendemic transmission zone; (2) in typical years, northern provinces experience more rainfall than the southern provinces; (3) the 2015/16 DHS malaria prevalence results were likely affected by the increased rains in the south due to *El Niño*; (4) other partners such as E8 and the Global Fund, are active in the other 16 provinces; and (5) shifting geographic focus would prevent demonstration of the impact of recent USG investments in reducing morbidity and mortality and disrupt sustainability efforts. PMI will continue to work in concert with partners in other geographic areas to ensure synergies in implementation.

PMI will also continue to support capacity building at all levels of the health system across its interventions, and identify opportunities to provide demand-driven technical assistance to the GRA. Given the GRAs continued demonstration in increased country ownership, PMI and the GRA agreed to a gradual reduction in commodities support. As the collective donor community reduces its economic footprint in commodities procurement for Angola, PMI will continue to plan for buffer stocks and carefully monitor the GRA's capacity to procure sufficient quality-assured antimalarials in a timely manner.

1. Vector control

NMCP/PMI objectives

The NMCP's strategy for malaria prevention has three vector control components: ITN ownership and use, insecticide spraying (indoor and outdoor), and larviciding. The NMCP's goal, with the support of PMI and the Global Fund, is to cover 80 percent of the population with at least one vector control prevention measure (i.e., 80 percent of households own at least one ITN or houses treated with IRS; 80 percent of household owners to sleep under an ITN or in a house treated with IRS; and 80 percent of pregnant women and children less than five years of age sleep under an ITN or in a house treated with IRS). The national strategic plan supports two distribution channels for ITNs to reach the coverage goals: mass campaign distribution every three years and continuous distribution through routine ANC and EPI channels. Entomologic monitoring, implementation of IRS, and mass ITN distribution have been primarily supported by PMI through implementing partners. In the context of an integrated vector management strategy, the GRA supports a larviciding program and outdoor fogging, financed exclusively by the GRA with technical support from the Cuban Cooperation.

a) Entomologic monitoring and insecticide resistance management

As per the FY 2018 Malaria Operational Plan, during the 2019 calendar year, PMI will resume support for entomological monitoring in Angola, mostly through training technicians hired by the GRA and the elaboration of a standard operating procedure to collect and process samples in country. In collaboration with the NMCP and key partners supporting entomology efforts, PMI will train local GRA entomologists to establish monitoring at sentinel sites and implement monitoring activities in the six PMI-supported provinces. The trainings will cover the basic concepts and techniques to capture mosquitoes, with an emphasis on live-capture of *An. funestus* and forced oviposition. Evidence from PMI-supported entomological evaluations in other countries reflect that *An. funestus* larvae are extremely difficult to collect. Based on the adult collection results from the 2015/2016 longitudinal evaluation, *An. funestus* is the species that was mostly collected inside the houses and there is no data available on this species susceptibility profile to insecticides. Therefore, the plan to do live-capture and forced oviposition aims to obtain a baseline of the resistance profile of *An. funestus*. Additionally, training will focus on morphological identification of the main mosquito species invading houses and susceptibility bioassays.

Progress since PMI was launched

With minimal entomological capacity in country, PMI supported the development of a cadre of basic entomology technicians through trainings in field mosquito collection, mosquito identification and rearing techniques, and insecticide resistance testing using both the WHO susceptibility and CDC bottle assay. In 2014, PMI supported the construction of an insectary to support IRS-related entomologic monitoring and evaluation in Huambo. The insectary allows the rearing of mosquitoes, and staff can use the space to perform basic entomologic activities, such as mosquito morphological identification and basic susceptibility bioassays.

PMI also conducted longitudinal entomologic surveillance in the former IRS areas of Huambo and Huila in order to determine vector species inside houses, abundance, resting behavior, and mosquito malaria infection rates at six sentinel sites. PMI eventually added four more sentinel sites located in three municipalities in Huambo; Huambo (former IRS area), Caala (non-IRS area) and Bailundo (2014 IRS area). In Huila, there were two sentinel sites in Chibaone (former IRS) and another in a non-IRS

area. Monthly mosquito collections were performed with CDC light traps, pyrethrum spray collections, and pit traps. In Huila, densities of adult *Anopheles* were low in both sites, ranging from 0 –1.5 mosquitoes/house/day. The highest densities were found in Bailundo, ranging from 0 –11.4 mosquitoes/house/day, peaking in May and June. The GRA eventually began collecting entomologic indicators in areas where IRS was previously implemented.

PMI also supported insecticide resistance monitoring in Bailundo in Huambo, where IRS was conducted in 2014. The results indicated there was no resistance in *An.gambiae* s.l. to deltamethrin (a pyrethroid), bendiocarb (a carbamate), or fenitrothion (an organophosphate). In December 2014, PMI conducted training for provincial and municipal health authorities for insecticide resistance testing in Benguela, Cunene, Huambo, Huila, Luanda, Malanje, Namibe, Uige, and Zaire. These nine provinces span the three malaria transmission zones. PMI and the NMCP trained personnel from provincial, district health authorities, and the *Instituto de Investigação Agronomica* in Huambo. Thirty-four technicians were trained and then performed basic entomology work and engaged directly with provincial health directors at the DPS.

In February to March 2015, resistance testing was carried out in two phases: (1) an assessment of resistance levels of *Anopheles gambiae* s.l. to five insecticides recommended by the WHO for use in IRS and ITNs; and (2) a national susceptibility study in nine provinces (Benguela, Cunene, Huambo, Huila, Luanda, Malanje, Namibe, Uige, and Zaire) using the standard WHO bioassay tube test in adult mosquitoes reared from larvae captured in the field. Preliminary results of this study indicated the possible emergence of pyrethroid resistance in Angola, as most of the provinces showed decreased susceptibility of mosquitoes to deltamethrin and/or lambda-cyhalothrin. In the most recent IRS campaigns, pyrethroids were used in five provinces at different times. Full susceptibility was observed for bendiocarb and pirimiphos-methyl in all provinces. Fenitrothion was only tested in three provinces, but all mosquitoes tested had high susceptibility. Adult mosquitoes used in the susceptibility study were shipped to CDC/Entomology Branch in Atlanta for molecular studies, as there were no technicians trained in molecular biology in Angola to perform the necessary assays.

From April 2016 to August 2016, PMI carried out bimonthly entomological monitoring activities in three sentinel sites located in Cunene, Huambo, and Malanje. These sites were selected based on malaria endemicity and conversations with local public health staff. Assisted by seasonal workers hired to conduct regular entomological monitoring activities, PMI used ten CDC light traps inside ten houses and two outdoor traps in each sentinel site for one night. Prokopack[®] aspiration collections were also carried out in ten houses in each sentinel site. According to the morphological determination of ~5,500 mosquitoes captured, *An. funestus* was the predominant species found in houses in Huambo and Malanje, and likely responsible for transmission in the hyper endemic provinces where PMI focuses interventions. Insecticide resistance was not assessed in this study as mosquitoes died upon capture. Currently, little is known about the *An. funestus* species in Angola, and no baseline data on insecticide resistance exists in the country. Because *An. funestus* were found in abundance inside the houses, PMI will prioritize evaluation of insecticide susceptibility upon re-establishing entomological monitoring in Angola. To address the human resource gap, technicians will be trained to capture and preserve adult *An. funestus* mosquitoes, conduct forces oviposition, and rear specimens to perform bioassays.

Progress during the last 12-18 months

The decision in favor of re-establishing entomologic supported activities by PMI in Angola was based on demonstrated investment by the GRA. In particular, the GRA hired three Angola entomological

technicians, previously trained by PMI, as permanent personnel to support activities at the insectary and in the southern provinces of Angola. Currently, activities have been reactivated at the national insectary installed by PMI in Huambo.

A total of 3,629 *Anopheles* mosquitoes collected for the 2015 national susceptibility study were shipped to the CDC Entomology Branch for molecular and biochemical analyses. The objectives of this study were to verify the species identification within the main species complex and assess the presence of the widely distributed *kdr* DNA mutation (L1014) that confers pyrethroid resistance to several mosquito species and other insects. The molecular analysis identified at least 14 different mosquito species used in the susceptibility study, which has a direct implication on the interpretation of a susceptibility study performed with the “species mix” instead of a single species. The susceptibility profile should be determined specifically, as each species might respond independently to the selective pressure of insecticide-related interventions. Another finding was the significant geographical structure in the species distribution with the detection of *An. gambiae* in the northern provinces (Zaire, Luanda, Malanje, and Uije) and *An. arabiensis* in the southern/central ones (Cunene, Huila, Namibe, Benguela, and Huambo). The *kdr* analysis indicated that *kdr*-east and *kdr*-west mutations were absent in the *An. arabiensis* mosquitoes from the southern and central regions of the country. However, both east and west *kdr* mutations were detected in the *An. gambiae* specimens from the northern provinces. The *kdr*-east mutation was present in 0-25 percent of specimens, while the west mutation was found in 98-100 percent of the individuals evaluated from these four provinces. The results are being compiled in a manuscript that should be published later in 2018 or early 2019.

As PMI entomological monitoring and control activities were halted in the country in 2016, it is important to emphasize that the results mentioned above indicate the potential for pyrethroid resistance to develop in these populations, specifically in the *An. gambiae* populations from the northern region. Hence, the sole use of pyrethroid-impregnated ITNs as a strategy to prevent malaria transmission may be jeopardized by insecticide resistance.

PMI provided technical guidance in developing the Integrated Vector Control Strategy. The main feedback provided was on designing and implementing a routine monitoring strategy, including susceptibility of main vector species, with the aim of identifying hot spots of transmission and areas where implementing IRS could have a significant impact.

Plans and justification for proposed activities with FY 2019 funding:

PMI will support entomological monitoring in Angola, conducting entomological evaluations in February of each year, as previous evaluations suggest this month is the peak of vector activity. Initially, a baseline collection and evaluation will be conducted in sentinel sites. If the proposed monitoring infrastructure (capture and insectary processing) is successful, PMI will recommend carrying out intensity bioassays in those samples that present a level of resistance in the initial evaluation. Baseline and current data on the mosquito populations will be compared in subsequent yearly evaluations and correlated with the information obtained from PMI interventions in the six focus provinces. A long-term perspective would consider longitudinal entomological monitoring, adding more evaluations yearly, i.e., pre-post rainy season and more representative sentinel sites. To strengthen technical capacity at the central level, a PMI-funded seconded technical advisor will work in direct coordination with the NMCP and other entomology partners to establish vector monitoring systems in select PMI focus provinces through collecting and processing mosquitoes and larvae from six select sentinel sites (one per province). The technical advisor will oversee the activities, supervise the data collection, and maintain

regular contact with PMI to report issues, as well as coordinate activities to establish sustainable and continuous entomological monitoring in the six PMI-supported provinces.

Additional technical support will be provided through CDC entomology temporary duty. A CDC entomologist will travel to Angola to work with the MoH/NMCP for the requested basic entomological training by the NMCP to help strengthen malaria entomological capacity in country. This includes fortifying the insectary and its staff, providing additional technical assistance and training in various aspects of entomological monitoring at the central level and within selected focus provinces, and capturing adult *An. funestus* and performing bioassays to evaluate insecticide susceptibility.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

b) Insecticide-treated nets

Progress since PMI was launched

Since 2006, approximately 18 million nets have been procured and distributed in Angola through various partners, including the GRA, PMI, Global Fund, UNICEF, UNITAID, Japan International Cooperation Agency, Malaria No More, and ExxonMobil Foundation. In addition, nets are available in the commercial sector for full price. To date, PMI has procured and distributed approximately 13.4 million ITNs and distributed 2.6 million ITNs procured by other partners. Between 2010 and 2013, more than 5 million ITNs were procured and distributed with support from the Global Fund (Rounds 7 and 10), GRA, PMI, Japan International Cooperation Agency, and ExxonMobil. Distribution has been accompanied by strong social behavior change communication (SBCC) messaging to build and support a growing ITN-use culture in Angola.

The 2015/16 DHS provided updates on malaria control efforts in Angola. Key findings included:

- After an increase from 11 percent in 2006 to 35 percent in 2011, ITN ownership decreased to 31 percent by 2016
- 22 percent of all children less than five years of age slept under an ITN the previous night (a 4 percent decrease from the 2011 MIS)
- 61 percent of all children less than five years of age slept under an ITN among households with at least one ITN (no change from the 2011 MIS)
- 23 percent of all pregnant women slept under an ITN the night prior to the survey (a 3 percent decrease from the 2011 MIS)
- 68 percent of pregnant women in households with an ITN slept under an ITN (no change from the 2011 MIS)

A secondary analysis of data from surveys conducted in Angola found that while access to ITNs was low, use of these ITNs was high where ITNs were available. Data from the 2015/16 DHS showed an ITN use:access ratio of 0.89. Data from 2006 and 2011 surveys suggested a decline in ITN usage with increasing wealth, but in 2015-2016 the ratio of use:access remained relatively similar among wealth quintiles.²

² <https://www.vector-works.org/resources/itn-access-and-use/>

In spite of the considerable investment and effort over the past 12 years, Angola was found to be far from achieving universal coverage in 2015. After years of significant challenges with continuous distribution through the routine healthcare system, PMI decided in 2016 to focus ITN efforts exclusively on supporting a mass campaign. As such, PMI focused financial and technical support to assist the country with its first universal coverage campaign with the goal of ensuring at least 80 percent of the population is covered (using the rule of one ITN per two persons).

Progress during the last 12-18 months

PMI has been supporting the planning and implementation of a national mass campaign that aims to distribute nearly 9 million ITNs to protect more than 16 million people in 15 provinces. The campaign is being completed in four phases from 2017 to 2019 (see Table 3). PMI contributed 2 million ITNs for Phase 1 of the campaign, which covered five provinces and concluded in July 2017. Other partners, specifically Global Fund, contributed ITNs to cover gaps during the Phase 1 distribution. PMI contributed 796,257 ITNs for Phase 2 of the campaign, which covered two provinces and concluded in December 2017.

PMI supported a strategic review of past campaigns to assess bottlenecks and identify potential timesaving measures for more efficient distribution. Because of this review, the NMCP and PMI implemented a set of process improvement measures to include the creation of a well-coordinated timeline; the establishment of national coordination mechanisms (including subcommittees); private sector involvement; and the transportation of ITNs from the Luanda Port directly to municipal warehouses where they are pre-positioned for distribution. The most significant strategic shift was a substantial increase in the number of community agents (known as “*activistas*”) used for household registration and ITN distribution. While past campaigns deployed much smaller teams that completed household registration and distribution one municipality at a time, more than 4,600 community agents were hired and trained to carry out door-to-door household registration, interpersonal behavior change communication, and ITN distribution activities at fixed distribution points during Phases 1 and 2. Using this simultaneous distribution approach, between May and December 2017, PMI implementing partners were able to distribute approximately 3.2 million ITNs, reaching 2,859,846 households. This approach covered 151,630 pregnant women and 900,202 children less than five years of age.

PMI’s negotiations with the MoH resulted in the transfer of 800,000 Global Fund-procured ITNs, previously programmed for routine distribution, to the campaign. The PMI team brokered public-private partnerships to mobilize additional resources from Angolan and multinational corporations. The Angola Liquefied Natural Gas Company contributed 2,000 ITNs for Zaire Province and *Banco de Fomento Angola*, the second largest bank in the country, contributed \$31,000 to the campaign. PMI also signed an agreement with the mobile network operator UNITEL to leverage the company’s telecommunication infrastructure and technology, including short message service for the promotion of net use.

PMI continues to prioritize support for Angola in achieving universal coverage. PMI is supporting Phase 3 of the campaign, which began in May 2018 and is expected to cover five provinces, and Phase 4, which will commence in 2019 and cover the remaining provinces. However, achieving universal coverage will be challenging if the MoH does not fulfill its commitment to procure ITNs for the campaign. There is a gap of approximately 1.7 million ITNs. Under previous GRA leadership, the MoH committed to procuring 10 million ITNs in support of universal coverage. These ITNs did not arrive during Phases 1 and 2 distribution in 2017. Five million of the committed ITNs arrived in late 2017. However, the new MoH leadership was not fully oriented on the previous minister’s commitment and

these ITNs were sent directly to the provinces from the Luanda central warehouse for routine distribution, without technical consultation or guidance from PMI.

The MoH, through the Global Fund grant, has been supporting routine distribution. PMI is currently supporting the preparation of a field assessment of ANC/EPI ITN distribution channels for improving the routine distribution of ITNs. Findings from this field assessment will help update the National Strategy and the development of routine distribution implementation guidelines.

Table 3. ITN Distribution by Province, Angola 2017-2018

Phase	Date of Distribution	Province ¹	Population	# of children under 5	# of pregnant women	ITNs Distributed/ Needed
1	May –Aug 2017	Zaire	606,349	89,226	13,519	333,684
		Malanje	1,092,499	180,773	28,384	597,246
		Uige	334,670	60,955	9,365	186,351
		Kwanza Norte	509,109	79,161	12,618	285,252
		Kwanza Sul	1,720,325	262,066	41,786	990,944
	sub-total					2,393,477
2	Oct. – Dec. 2017	Cunene	1,121,748	156,873	30,860	529,444
		Namibe	568,722	71,148	15,098	266,813
	sub-total					796,257
3	May –Dec. 2018	Huambo	2,309,329	447,645	57,284	1,283,238
		Cuando Cubango	854,258	165,555	21,186	474,588
		Moxico	601,454	116,562	14,916	334,141
		Lunda Norte	972,183	188,409	13,205	540,102
		Lunda Sul	609,351	118,189	15,124	338,306
	sub-total					2,970,375
4 ²	TBD (2019)	Cabinda	801,374	TBD	TBD	489,729
		Bie	1,654,744	TBD	TBD	925,397
		Bengo	429,322	TBD	TBD	262,363
	sub-total					1,677,489
Total						7,837,598

1. The provinces where PMI support transportation and distribution of ITNs. ITN Coverage for Lunda Province is not included in this plan and is the responsibility of the MOH.

2. TBD based on available resources, including ITNs

Table 4. ITN Contribution for the Universal Coverage Campaign by Donor, Angola 2017-2018

Year	Donor	ITNs Procured	Distributed
2017	PMI	2,100,000	1,662,480
	Global Fund	800,000	730,997
2018	MoH	5,000,000	850,000
	PMI	1,500,000	878,408
	Global Fund	1,426,000	893,000

Figure 4. Universal Coverage Campaign of ITNs Phased Distribution Angola, 2017-2018

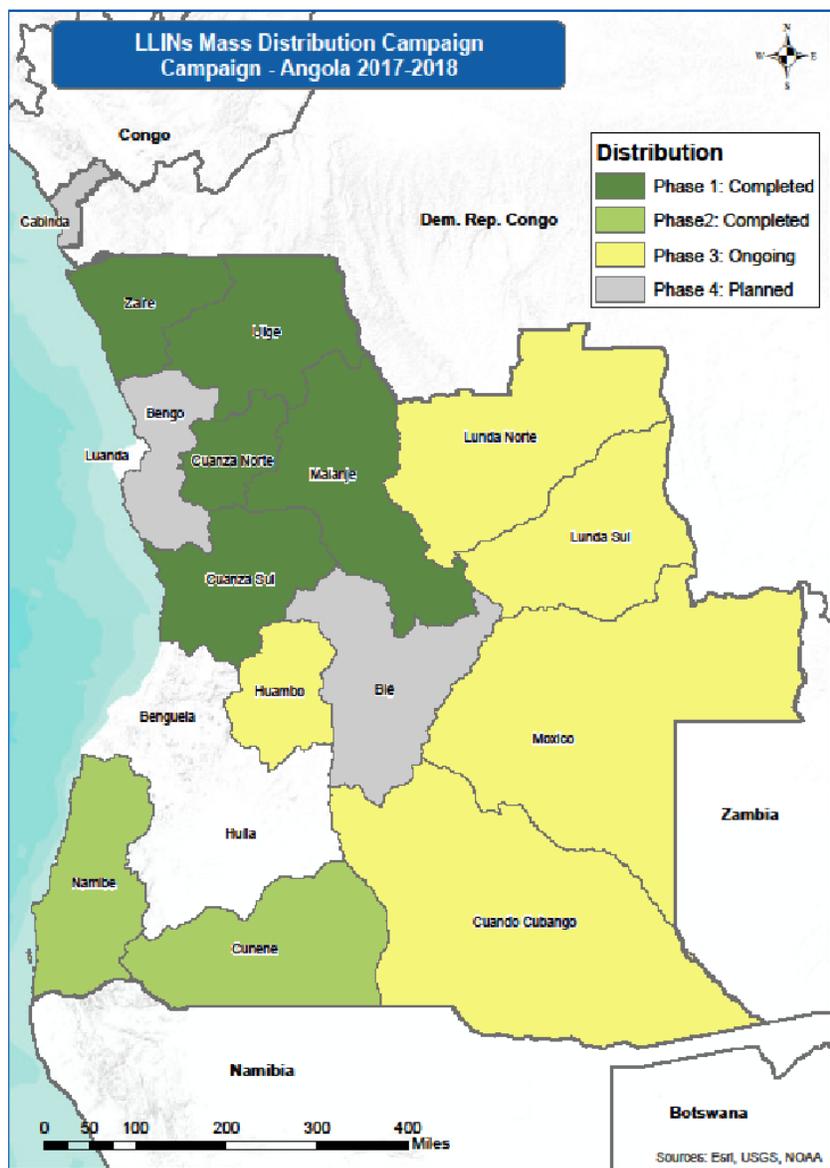


Table 5. ITN Gap Analysis

Calendar Year	2018	2019	2020
Total Targeted Population	29,250,009	30,175,553	31,127,674
Continuous Distribution Needs			
Channel #1: ANC ¹	1,247,220	1,333,759	1,456,775
Channel #2: EPI ²	666,608	778,529	1,070,792
<i>Estimated Total Need for Continuous Channels</i>	1,913,828	2,112,288	2,527,567
Mass Campaign Distribution Needs			
2018/2019/2020 mass distribution campaign(s)	Phase 3: Huambo, Cuando, Cubango, Moxico, Lunda Norte, Lunda Sul	Phase 4: Bie, Bengo, Cabinda	n/a
<i>Estimated Total Need for Campaigns³</i>	2,970,875	1,677,489	0
Total ITN Need: Routine and Campaign	4,884,703	3,789,777	2,527,567
Partner Contributions			
ITNs carried over from previous year	0	0	0
ITNs from MoH ⁴	5,000,000	1,901,060	2,527,567
ITNs from Global Fund ⁵	1,426,000	0	0
ITNs from other donors	0	0	0
ITNs planned with PMI funding ⁶	1,500,000	211,288	494,307
Total ITNs Available⁷	3,776,000	2,112,348	3,021,874
Total ITN Surplus (Gap)	(1,108,203)	(1,677,429)	494,307

1. ANC projections using the following formula = total population × rate of pregnancy(5.2%) × percent of women with access to ANC services (2018: 82%; 2019: 85%; 2020: 90%)

2. EPI projections using the following formula = total population × (4.3%) × rate of people with access to healthcare (2018: 53%; 2019: 60%; 2020: 80%)

3. Total number of ITNs estimated for the mass distribution campaign = sum of population in listed provinces divided by the target population by factor of 1.8

4. Out of the 5,000,000 MoH procured ITNs in 2018, 850,000 were used to support Phase 3 of the Universal Coverage campaign. The remaining 4,150,000 ITNs were allocated by the MOH for continuous distribution.

5. Out of the 1,426,000 GF ITNs, 893,000 were used to support Phase 3 in 2018. Negotiations underway to use the remaining ITNs for Phase 4 in 2019, but not yet committed.

6. PMI will only support continuous distribution in six focus provinces in 2019/2020. This support is to potentially offset a gap since Global Fund will not support vector control interventions under the new malaria grant.

7. In 2019, the Total ITNs available excludes the 5,000,000 ITNs procured by the MoH, as they could not be easily tracked as contributing to ANC, EPI, or the mass campaign.

Plans and justification for proposed activities with FY 2019 funding:

To maintain high ITN coverage rates after implementation of the mass campaign, there is a need to strengthen and supply continuous ITN distribution channels. PMI will procure and distribute approximately 500,000 ITNs for routine distribution (ANC and EPI) to fill 20 percent of the national quantification need. These nets will be distributed in the six PMI focus provinces.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

c) Indoor residual spraying

Progress since PMI was launched

PMI supported IRS in Angola with procurement, implementation, and technical assistance between 2005 and 2014. PMI has now transitioned out of supporting IRS, as the MoH has not prioritized IRS at the national level and shifted the responsibility for IRS to the provinces and municipalities, where there has been interest but no financial commitment. PMI has focused its efforts to support the MoH with its ITN coverage in areas that previously had IRS. PMI implementing partners also collected entomologic indicators in these areas.

PMI first implemented IRS with WHO in Cunene and Huila in 2005. Namibe was added in 2006, but, by 2008, both Namibe and Cunene were dropped and Huambo (previously a province with high transmission) was added. In 2010, Cunene was again added at the request of the NMCP to support Namibia's malaria pre-elimination efforts, which are part of the Southern African Development Community plans for the elimination of malaria in the region. IRS was focused in municipalities where there was the greatest movement of people between Angola and Namibia.

Since 2005, pyrethroids have been used in all spray campaigns, based on susceptibility testing. Table 6 shows a list of PMI-supported IRS activities during 2010-2014, including coverage and areas where IRS was used. In the areas where IRS was implemented, PMI tested for insecticide susceptibility annually. PMI used the WHO cone bioassay tests to determine quality of spraying activities and decay rates. Since there is not a susceptible colony of *Anopheles* mosquitoes in Angola, WHO cone bioassays were conducted with mosquitoes collected as larvae from the field, reared to adults and then used for the testing. This method of conducting cone bioassays is not ideal, as confounding factors such as insecticide resistance may make it difficult to interpret the cone bioassay data. These factors may have affected the results of wall bioassays in 2013, when mortality dropped to under 50 percent three months post spraying with deltamethrin in Bailundo. Cone assays immediately after spraying indicated that the quality of spray was adequate. Testing of insecticide potency at CDC confirmed that the quality of insecticide met the required specifications. However, insecticide resistance testing using the CDC bottle assay confirmed low levels of insecticide resistance to deltamethrin.

Table 6: PMI-supported IRS activities 2010 – 2014

Calendar Year	Provinces Sprayed*	Insecticide Used	Number of Structures Sprayed	Coverage Rate	Population Protected
2010	Cunene, Huambo, Huila	Lamdacyhalothrin	135,856	96%	649,842
2011	Cunene, Huambo, Huila	Deltamethrin	145,264	98%	689,668
2012	Cunene, Huambo, Huila	Deltamethrin	141,782	97.7%	676,090
2013	Cunene, Huambo, Huila	Deltamethrin	98,136	92.1%	419,353
2014*	Huambo (Bailundo Municipality only)	Deltamethrin	14,649	88.7%	58,370

**2014 was the final year PMI supported implementation of IRS in Angola.
Progress during the last 12-18 months*

Neither PMI nor the NMCP have implemented IRS since 2014. Entomologic monitoring has been done in areas previously covered by IRS. (See the Entomologic Monitoring section for more information on resistance monitoring in these areas.)

Plans and justification for proposed activities with FY 2019 funding:

PMI will be ready to provide technical assistance at the central level when the NMCP or the provinces return to implementing IRS and request assistance. In the meantime, no IRS specific activities are planned.

2. Malaria in pregnancy

NMCP/PMI objectives

The NMCP has a three-pronged approach to malaria prevention and control during pregnancy: IPTp, ITN use, and diagnosis and treatment of clinical illness in line with WHO recommendations. According to its strategic plan, the NMCP has the following objectives for malaria in pregnancy (MIP):

- By the end of 2020, at least 80 percent of pregnant women sleep under an ITN
- By the end of 2020, 80 percent of pregnant women will have access to prenatal consultations and those eligible for IPTp receive at least three doses of SP
- By the end of 2020, all laboratory-confirmed malaria cases should be treated at all levels of the health system, including the community level, in accordance with national policy guidelines (see below).

As per national policy, pregnant women receive ITNs at the first ANC visit. With regard to the treatment of uncomplicated malaria in pregnancy, the NMCP's policy is to administer oral quinine during the first trimester and ACTs during the two last trimesters of the pregnancy. For severe malaria, the first-line treatment is intravenous (IV) artesunate, with intramuscular (IM) artemether as second-line treatment and quinine IV as third-line treatment. However, since artesunate and artemether are often not available,

quinine IV is the treatment most often administered. Health facilities track malaria cases during pregnancy and report on a monthly basis.

The NMCP and the Reproductive Health Department have tried to improve the design and coordination of MIP activities. There is no national MIP working group, but the NMCP is currently working with partners to develop regional MIP workshops to support collaboration at the provincial and municipal levels for MIP activities. In 2014, PMI collaborated with the NMCP and the Reproductive Health and HIV Departments to review the new IPTp guidance adopted in 2013, which stipulates that IPTp be given to all pregnant women in areas of moderate to high malaria transmission at every scheduled ANC visit, except during the first trimester. The National Protocol for Malaria in Pregnancy was updated and a new training manual was developed. This policy currently applies to the entire country (see Table 7). The guidelines specify that IPTp starts at the 13th week of pregnancy and continues until the delivery date. MIP trainings and supervisions are integrated with malaria case management with the aim of achieving a national scale. Unfortunately, a national target for the training of health workers has not yet been set.

Progress since PMI was launched

Services provided at ANC visits include IPTp, iron folate (5 mg dose), and SBCC to promote prevention and treatment of MIP. However, most health centers do not provide ANC services and, therefore, do not provide IPTp. The 2011 MIS found that only 17.5 percent of pregnant women reported receiving at least two doses of IPTp during their last pregnancy, representing a significant increase up from 2 percent in 2007. The PMI-supported 2015/16 DHS showed an increase compared to the MIS 2011, reporting that 53.9 percent of pregnant women received the first dose of SP, 36.8 percent received the second dose of SP, and 19 percent of pregnant women received three or more doses of SP. The 2015/16 DHS found that 61 percent of pregnant women attended four or more antenatal visits and 45.6 percent of births occurred in a health facility. In terms of ITN use, the 2015/16 DHS also reported that 23 percent of pregnant women had slept under an ITN the night before the survey (compared to 26 percent recorded in the 2011 MIS). PMI has been training health providers in MIP since October 2011 in eight provinces: Benguela, Cuanza Norte, Cuanza Sul, Huambo (replaced with Bie midway through the project), Huila, Malanje, Uige, and Zaire. PMI has trained 2,077 nurses in MIP since 2011, representing 90 percent of the target.

In September 2016, PMI implemented a study on the opportunities and barriers for the efficient delivery of IPTp-SP in Angola. This study provided recommendations for improving MIP through interventions in policy development and dissemination; health worker training and supervision; improving malaria prevention with patients; and, supporting health systems development. The findings from this study, “Opportunities and Barriers for the Efficient Delivery of IPTp-SP in Angola, 2016,” are guiding PMI interventions for MIP. For example, in Angola, the patient health card is only used to facilitate screening and clinical monitoring of the pregnancy but is not used to support patient education. Another barrier identified from the study is that information conveyed from the patient-provider to the users is not effectively converting interactions into knowledge.

Progress during the last 12-18 months

Angola has adopted the 2016 WHO ANC Guidelines (see Table 8). In the context of the recommended eight ANC contacts schedule, MIP and IPTp are being addressed by the Department of Reproductive Health. Additionally, ANC registers have been updated to capture eight to nine contacts, although a few provinces are still piloting its introduction. Currently, the HMIS/DHIS2 has not yet been updated to capture these contacts because the use of the updated registers is not a nationwide practice.

In 2017, PMI trained 94 percent of the 396 ANC health workers in the PMI focus provinces in 24 municipalities targeted for MIP. The training focused on IPTp for MIP, as well as the management of malaria for pregnant women. However, the inconsistent supply of IPTp-SP makes demand creation and adherence to ANC visits challenging. Coverage of IPTp, as reported through the HMIS (which has been updated along with the ANC registers to capture each IPTp dose from one to four), has steadily increased in recent years, increasing from 31 percent in the first quarter 2016 to 35 percent one year later. This increase has continued for subsequent quarters of 2017, albeit at a more moderate rate.

PMI has aimed to minimize SP stockouts, which negatively impact the frequency of antenatal visits, through greater investments in supply chain strengthening at all levels (see Pharmaceutical Management Section) and by providing SP in the six hyperendemic PMI focus provinces. In support of the dissemination of SBCC messages that target pregnant women, PMI implementing partners are preparing a booklet to hand pregnant women during their first prenatal consultation when they also receive an ITN. PMI is also planning to support a field assessment of ANC/EPI ITN routine distribution channels. Findings from this field assessment will be used to update the National Strategic Plan for Malaria Control and the drafting of implementation guidelines for routine ITN distribution.

Table 7. Status of IPTp policy in Angola

Status of training on updated IPTp policy		Number and proportion of health workers trained on new policy in the last year	Are the updated IPTp guidelines available at the facility level?	ANC register updated to capture 3 doses of IPTp-SP	HMIS/ DHIS2 updated to capture 3 doses of IPTp-SP
Complete/Not Completed	Date completed				
Completed in select municipalities in six PMI focus provinces	May to September 2017	374 by September 30, 2017 in 6 PMI-supported provinces	Partially. Health workers trained received a copy of IPTp guidelines, but PMI training last year covered only 24 of 60 municipalities in 6 provinces	Yes, each dose from 1 to 4 are all captured	Yes, each dose from 1 to 4 are all captured

Table 8. Status of ANC guidelines in Angola

Status of 2016 WHO ANC guidelines adoption		Number and proportion of HCWs trained in new ANC guidelines in the last year	Updated adopted ANC Guidelines available at the facility level?	Additional IPTp contact added to ANC schedule at 13 weeks?	ANC register updated to capture 8-9 ANC contacts?	HMIS/ DHIS2 updated to capture 8-9 ANC contacts
Started/ Completed	Date completed (or expected)					
Started	2020	374 by September 30, 2017 in 6 PMI-supported provinces	Partially. Health workers trained received a copy of ANC guidelines	Yes	Yes, register updated and is still at pilot phase in few provinces	Not yet

Table 9. SP Gap Analysis for Malaria in Pregnancy

Calendar Year	2018	2019	2020
Total Population	29,250,009	30,175,553	31,127,674
Total Population of Pregnant Women ¹	1,521,000	1,569,129	1,618,639
SP Needs			
Total number of pregnant women attending ANC ²	4,806,361	5,099,668	5,454,814
Total SP Need (in treatments)	4,806,361	5,099,668	5,454,814
Partner Contributions			
SP carried over from previous years	0	0	0
SP from Government	2,758,851	3,034,304	3,436,533
SP from Global Fund	0	0	0
SP from Other Donors	1,166,667	654,243	0
SP planned with PMI funding ³	788,244	813,186	2,100,000
Total SP Available	4,713,762	4,501,733	5,536,533
Total SP Surplus (Gap)	(92,599)	(597,935)	81,719

1. Total population of pregnant women in Angola was obtained by taking 5.2% of the total national population, according to information from the Reproductive Health program of Angola.

2. According to the NMCP quantification: in 2018, 82% of pregnant women will receive SP1, 80% SP2, 78% SP3 and 76% SP4. In 2019, 85% will receive SP1, 82% SP2, 80% SP3 and 78% SP4. In 2020, 90% will receive SP1, 85% SP2, 82% SP3 and 80% SP4.

3. PMI will fill the gap for SP to avoid stockouts.

Plans and justification for proposed activities with FY 2019 funding:

In FY 2019, PMI will procure SP to cover the remaining national gap (Table 9). PMI will distribute SP for its six focus provinces and the surplus will be stored at the CECOMA warehouse and distributed by the MoH based on the needs of other provinces. The GRA will use the national quantification to plan its procurements. Given that, historically, the MoH's procurement and distribution of SP nationwide has been very inconsistent, PMI seeks to maximize the benefits of the MIP training supported in PMI focus provinces by ensuring that SP is readily available in these provinces. By ensuring that SP is available when health workers are trained, adherence to IPTp guidelines can be significantly improved.

PMI will continue capacity building efforts aimed at increasing IPTp rates in Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire by promoting best practices. Training will focus on accurately implementing the updated IPTp protocols based on WHO 2016 recommendations and appropriate management of malaria in pregnancy, and PMI will work with the NMCP and other partners – specifically E8 and Global fun – to ensure non-PMI focus provinces receive appropriate training. PMI will support health facilities to continue to strengthen ANC services, maintain and expand support for training and supervision, and promote early and regular ANC attendance through mobilization led by community health workers. PMI support will focus on supportive supervision, on-site training as needed, as well as activities aimed at improving awareness and facilitating behavior change related to malaria prevention. PMI will also support the scaling up of community awareness for IPTp, and quality improvement to increase provision of IPTp at every ANC visit, as per the national guidelines. PMI will work to ensure that the latest national IPTp guidelines are available in health facilities for health workers

providing ANC services. PMI will continue to collaborate with the NMCP and the Reproductive Health Department to strengthen prevention, diagnosis, and treatment of MIP at the health facility level. This will involve supporting two annual regional workshops for dissemination, harmonization, data sharing, and discussing challenges for MIP implementation and routine distribution of ITNs. The participants will be the 18 provincial malaria supervisors, the 18 provincial reproductive health supervisors, and the central staff for malaria and reproductive health.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

3. Case management

NMCP/PMI objectives

PMI is helping the NMCP to achieve its 2020 objectives:

- All suspected cases at health facilities and in the community will be tested for malaria prior to treatment
- All confirmed malaria cases should be treated in accordance with national policy guidelines at all levels of the health pyramid, including the community level

The NMCP recommends that malaria testing be done by using RDTs or microscopy. The national guidance requires that RDTs be conducted in the consultation room and microscopy in a laboratory. Health posts and health centers generally follow national guidance. However, in hospitals, all malaria tests (RDTs and microscopy) are conducted in a laboratory. Recently, with the introduction of malaria testing at the community level, ADECOS were authorized and trained to conduct RDTs and treat positive cases of uncomplicated malaria for children less than five year of age in the community. Recently, the NMCP announced a policy shift to increase the use of microscopy for diagnosis in hospitals and health centers across the country. This has been reflected in the national quantification and has been noted in donor plans and budgets (see Table 12). PMI will work with the NMCP and other donors to assess the feasibility, details, and timeline of the implementation of this policy shift to ensure that appropriate and quality diagnostic tools remain available at all levels of the health system.

All operational units, including ADECOS, are required to report whether a test was conducted or not and results. The NMCP recommends the inclusion of RDT and microscopy quality assurance coverage during twice-yearly supervision visits. The NMCP also recommends three first-line antimalarials for the treatment of uncomplicated malaria: artemether -lumefantrine, artesunate-amodiaquine, and dihydroartemisinin-piperaquine. The recommendations are the same for pregnant women in the second or third trimester. For those pregnant women in the first trimester, oral quinine (with or without clindamycin) is recommended. For severe malaria, IV artesunate is recommended in facilities able to administer IV medications. In lower level facilities, IM artemether is recommended. Although IV quinine is the third-line option for treatment of severe malaria, it is the most commonly used treatment due to unavailability of IV artesunate or IM artemether. For pre-referral treatment of severe cases, the guidelines recommend rectal artesunate suppositories for children less than six years of age. However, few health workers have been trained in the use of rectal artesunate suppositories and it is not provided to ADECOS for treatment at the community level. For *P. vivax* and *P. ovale* infections, a course of primaquine in addition to an ACT is also recommended, except during pregnancy (see Table 10).

The GRA, recognizing the need to extend health services to the community level, has adopted iCCM. In 2014, a national policy framework referred to ADECOS as a key platform for iCCM. This policy was jointly developed and approved by the Ministry of Territorial Administration (MAT). Currently, the main objectives of the ADECOS are to increase community awareness of health prevention interventions, such as basic malaria prevention activities (e.g., use of ITNs, early treatment-seeking, and compliance with diagnostic outcomes), as well as vaccination, improved sanitation, and access to safe water. MAT's implementation of the ADECOS program began in September 2016 in 18 municipalities in seven provinces, with a target of 1,080 ADECOS trained initially and 14,100 trained by the end of 2018. Each ADECO strives to cover 50 families comprised on average of seven people. The MAT's three-month long ADECOS curriculum includes limited training on providing basic services, including testing with rapid diagnostic test and administering ACTs for uncomplicated malaria. Severe malaria cases should be referred to the nearest health facility. ADECOS are linked to municipal health centers, where integrated health teams are responsible for performing routine supervision. Salaries and operational costs of the ADECOS are paid by the MAT.

The NMCP has been leading the process to pilot a community approach, using ADECOS as part of the health system. The NMCP is planning a scaled approach for ADECOS health interventions. After a year and a half of testing and treating malaria at the community level, the implementation process is currently being evaluated. If results are satisfactory, ADECOS will be trained for the diarrhea component and, after a defined period of implementation, another evaluation will be conducted. If results are satisfactory, the pneumonia component will then be piloted. At this early stage, the supervision is implemented monthly. Since the beginning of the process, 1,080 ADECOS have been trained with different funding sources: the Global Fund trained 720 ADECOS, some of which are in municipalities located in the PMI focus provinces of Malanje, Uige, and Lunda Norte; E8 trained 210 ADECOS; and PMI has trained 120 ADECOS. ADECOS trained by the Global Fund and PMI focus their testing and treating of malaria to children less than five years of age, while ADECOS trained by E8 test and treat children and adults given the E8 objective of eliminating malaria in Namibia by reducing the importation of malaria along border provinces.

Currently, there is no national policy on private sector case management for malaria. Antimalarials of all kinds—including monotherapies and drugs for severe malaria—are available in private outlets.

Table 10. Status of Case Management Policy and Implementation in Angola

Status of Case Management Policy in Angola according to <i>Directrizes e normas de conduta para o diagnóstico e tratamento da malária, 2ª edição, 2017</i>		Currently being implemented (yes/no)? Plans to modify the recommendations?
What is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria*?	Three types of ACTs: AL or AS +AQ or DHA+PPQ; Health workers can use any one that is available in the HF	Yes, being implemented No plan to modify recommendations
What is the second-line treatment for uncomplicated <i>P. falciparum</i> malaria*?	Oral quinine + tetracycline/doxycycline/clindamycin	Yes, being implemented No plan to modify recommendations
What is the first-line treatment for severe malaria?	Artesunate (IV or IM)	Yes, being implemented No plan to modify recommendations
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester*?	Oral quinine	Yes, being implemented No plan to modify recommendations
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters*?	Artemether-lumefantrine, artesunateamodiaquinedihydroartemisinin-piperaquine	Yes, being implemented No plan to modify recommendations
In pregnancy, what is the first-line treatment for severe malaria?	Artesunate (IV or IM)	Yes, being implemented No plan to modify recommendations
Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?	Yes. artesunate IV/IM or rectal, artemether IV/IM, quinine IM	Yes, being implemented No plan to modify recommendations
Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?	No	No plan to modify recommendations
If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administering to those ≥ 6 years)	Yes, for children under 6 years	Yes, being implemented in an inconsistent manner

*Provide recommended treatments for *P. vivax* if these are also in a country's guidelines.

Progress since PMI was launched

PMI has supported the NMCP's transition from clinical diagnosis of malaria to laboratory confirmation with RDTs or microscopy for all suspected malaria cases (i.e., patients with fever). Since 2006, PMI has procured more than 29 million ACTs, 15 million RDTs, and 260 microscopes and malaria microscopy kits.

From 2011 to 2016, PMI conducted malaria case management training in eight provinces: Benguela, Cuanza Norte, Cuanza Sul, Huambo (Bie subsequently replaced Huambo as one of the eight provinces), Huila, Malanje, Uige, and Zaire. These sessions reached:

- 837 doctors (exceeding by 22 percent the total goal targeted) in one-day sessions focusing on ACTs, RDTs, and severe malaria treatment
- 7,097 nurses (94 percent of the total targeted) in three-day sessions focusing on malaria case management fundamentals and 3,420 nurses (77 percent of the total targeted) in a one-day refresher of case management fundamentals
- 1,148 laboratory technicians (exceeding the total targeted during the project life) in 10-day sessions focusing on microscopy and RDT use, and 1,439 laboratory technicians representing 96 percent of the total targeted in two-day refresher sessions

In addition to these structured educational sessions, PMI also supported supervisory visits to each healthcare facility in target provinces. The supervisory team is usually composed of a member from the DPS and a member from the municipality, both of whom have received three days of basic training on being a supervisor (e.g., how to use a checklist for malaria metrics). A total of 1,600 supervisory visits were conducted in the target provinces during 2011-2016.

In 2017, 85 supervision visits were conducted in PMI focus provinces using an updated supervision guide. The previous supervision guide was used at all levels of the health system. The updated version was simplified with the aim of reducing the length of the supervision and making it level- and facility-appropriate. A member from the national level is generally present for these visits. PMI has supported the training and mentorship of 11 national-level laboratory trainers and supervisors. The supervision guide was disseminated to all 18 provinces with the recommendation of NMCP for immediate use. PMI has supported its dissemination and use in its focus provinces; Global Fund and the NMCP are disseminating in the rest of the country. Some of the items evaluated during these visits include:

- Pharmacy: Malaria medication organization and availability
- Laboratory: Technician staffing and availability of reagents, properly functioning equipment and facility of use
- Personnel: Number of physicians, nurses, and other healthcare workers; ability of healthcare workers to adequately demonstrate the use of RDTs and ACTs
- Record-keeping: Log book availability and timeliness. The information is collected in the log book by the health worker attending the patient and will be used to inform the monthly report for the HMIS

Data from a 2016 Health Facility Survey³ indicate that supervision is not happening as often as the desired target of twice annually. In Uige, only 69 percent of healthcare workers received a supervisory visit in the last six months; in Huambo, the percentage was even lower, at 58 percent. The national guidelines recommend supervisory visits from the national level to the provincial level twice per year, from the provincial level to the municipal level on a quarterly basis, and from the municipal level to the health facility level on a monthly basis. PMI will work with the NMCP, particularly DPS' at the provincial levels, to evaluate roadblocks to supervision and focus on increasing the number of supervisory visits to improve the quality of case management.

Although data reported through the parallel NMCP reporting and recording system indicate that 85 percent of suspected cases were tested either by RDT or microscopy in 2014, it is likely that this data significantly overestimate the true testing rate. For example, the 2016 Health Facility Survey showed that only 31 and 70 percent of suspected malaria cases in Huambo and Uige, respectively, were evaluated with an RDT or microscopy. Challenges encountered in Angola include low access (45 percent) of the population to the public health sector; stockouts of RDTs and ACTs; poor capacity and low motivation of healthcare workers and laboratory technicians; and failure of healthcare workers to interpret correctly test results in order to prescribe needed treatment. Challenges specific to microscopy include a lack of laboratory-based training in universities (i.e., strictly textbook based); unreliable power supply; and stockouts of other supplies including equipment, slides, and reagents. PMI supported a TES in Angola in 2013, 2015, and 2017 (see Table 11: PMI-Funded TESs).

Progress during the last 12-18 months

PMI procured and distributed more than 338,000 ACTs and 2.8 million RDTs in FY 2017. To address poor service delivery in the public sector, PMI supported case management training for healthcare workers. During the last quarter of 2017, many Angolan hospitals reported an increase of 50 percent or more of malaria cases (both uncomplicated and severe) in the provinces of Huambo, Benguela, Lunda Norte, and Uige, and some provinces had an unexpected increase in malaria deaths compared to 2016 data (e.g., 20 percent increase in Huambo). PMI is currently investigating this upsurge with support from the Interagency Headquarters SM&E Working Group. Of the most likely factors contributing to the increase in the number of severe malaria cases and deaths is the recurring delay in the distribution of malaria commodities and constant stockouts in health facilities. In response to the increase of malaria cases in some provinces, PMI conducted case management training in Huambo, a non-PMI focus province, at the request of NMCP. At the same time, priority was given to ITN distribution in provinces experiencing an increase in malaria cases. The GRA responded by procuring more than 2.6 million ACT treatments and 2.6 million RDTs during the past 16 months.

In 2017, PMI supported the training of:

- 1,069 (of 2,772) health workers in case management with ACTs, which corresponded to 58 percent trained in PMI focus municipalities (955/1,634), and 10 percent trainees for non-PMI municipalities (114/1138) because the training was expanded to non-PMI municipalities
- 1,443 health workers in diagnostics with RDTs, which is 400 percent above the target because in Angola any health worker who receives case management and malaria in pregnancy training should be trained in diagnostics using RDTs

³ <https://malariajournal.biomedcentral.com/articles/10.1186/s12936-017-1843-7>

- 374 health workers in IPTp, which represents 137 percent of the target because the training was expanded to non-PMI focus municipalities
- 120 new ADECOS in Zaire and Lunda Sul (in a total of four municipalities) to test and treat uncomplicated malaria at the community level (60 per province, 30 per municipality)

Despite the revised national guidelines, injectable artesunate, as well as rectal artesunate, are currently only used in a limited number of health facilities due to limited supply and provider unfamiliarity with the products. PMI flagged as a concern the issue of underutilization of artesunate products for treatment and pre-treatment of severe malaria last year and is working with the NMCP and Medicines for Malaria Venture to assess severe malaria management. The goal is to encourage the NMCP to develop a plan for scaling up the use of artesunate products.

Table 11. PMI-funded TESSs

Completed TESSs			
Year	Site name	Treatment arms (PCR-corrected efficacy)	Plans for k13 genotyping
2013 ¹	Uige	AL (97%)/DP (100%)	Yes, PARMA network
	Zaire	AL (88%)/DP (100%)	
2015 ²	Benguela	AL(96.3%)/ASAQ (99.9%)	Yes, PARMA network
	Lunda Sul	ASAQ (100%)/DP (100%)	
	Zaire	AL (88.1%)/DP (98.8%)	
2017 ³	Benguela	ASAQ (100%)/DP (100%)	Yes, PARMA network
	Lunda Sul	AL (96.4%)/DP (100%)	
	Zaire	AL (95.5%)/ASAQ (93%)	
Ongoing TESSs			
N/A	n/a	n/a	n/a
Planned TESSs (funded with previous or current Malaria Operational Plan)			
2019	Benguela	TBD	Yes, PARMA network
	Lunda Sul	TBD	
	Zaire	TBD	

¹Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4291383/>

²Source: <https://malariajournal.biomedcentral.com/articles/10.1186/s12936-017-1712-4>

³Source: <https://malariajournal.biomedcentral.com/articles/10.1186/s12936-018-2290-9>

Table 12: RDT Gap Analysis

Calendar Year	2018	2019	2020
RDT Needs			
Total country population	29,250,009	30,175,553	31,127,674
Population at risk for malaria ¹	29,250,009	30,175,553	31,127,674
PMI-targeted at-risk population ²	5,850,002	6,035,111	6,225,535
Total number of projected fever cases ³	13,673,736	14,961,341	16,315,321
Percent of fever cases tested with an RDT ⁴	65%	60%	60%
Total RDT Needs	8,887,928	8,976,805	9,789,193
Partner Contributions (to PMI target population if not entire area at risk)*			
RDTs carried over from previous year	169,625	195,314	498,606
RDTs from Government	6,221,550	6,283,763	6,852,435
RDTs from Global Fund	691,368	1,383,003	3,382,437
RDTs from other donors	0	0	0
RDTs planned with PMI funding	2,000,700	1,613,330	1,339,064
Total RDTs Available	9,083,243	9,475,410	12,072,542
Total RDT Surplus (Gap)	195,314	498,606	2,283,349

1. Geographic coverage: In Angola, the entire population is at risk for malaria.

2. PMI Geographic coverage: PMI is covering 20% of the targeted population

3. The total number of projected fever cases represents the number of fevers based on the service coverage (public health facilities and iCCM) and the total number of fever episodes per year. The coverage in 2018 is 66% (56% for Public health facilities and 10% for iCCM); 2019 is 70% (58% facilities, 12% iCCM) and 2020 is 74% (60% facilities, 14% iCCM). The total number of fever episodes per year is based on the following population breakdown:

a. <5 years (17% of the population); 1.5 fevers/year

b. 5-9 years (17% of the population); 1 fever/year

c. 10-14 years (13% of the population); 0.63 fevers/year

d. > 14 years (53% of the population); 0.38 fevers/year

4. This line represents the percentage of cases which will be tested by RDTs, assuming that RTD-tested cases will reduce from 65% in 2018 to 60% in 2019 and 2020 due to a shift in NMCP priorities to increase the number of fevers tests by microscopy.

Table 13: ACT Gap Analysis

Calendar Year	2017	2018	2019
ACT Needs			
Total country population	29,250,009	30,175,553	31,127,674
Population at risk for malaria	29,250,009	30,175,553	31,127,674
PMI-targeted at-risk population ¹	5,850,002	6,035,111	6,225,535
Total number of projected fever cases	13,673,736	14,961,341	16,315,321
Total projected number of malaria cases ²	6,329,572	6,397,469	6,460,867
Total ACT Needs ³	6,329,572	6,397,469	6,460,867
Partner Contributions (to PMI target population if not entire area at risk)¹			
ACTs carried over from previous year	1,204,634	1,767,153	1,624,465
ACTs from Government	4,430,701	4,478,229	4,522,607
ACTs from Global Fund	511,391	819,713	1,808,074
ACTs from other donors			
ACTs planned with PMI funding	1,950,000	956,839	807,365
Total ACTs Available	8,096,726	8,021,935	8,762,511
Total ACT Surplus (Gap)	1,767,153	1,624,465	2,301,644

1. Geographic coverage: PMI target provinces represent 20 percent of the total population.

2. The number of total expected confirmed malaria cases by diagnostic method is based on the number of expected fever cases tested for malaria by diagnostic method times the projected positivity rates by diagnostic method. Expected fever episodes to be diagnosed in the Public sector and iCCM were multiplied by the proportion of malaria diagnoses by diagnostic method [2018 (65% for RDT, 35% for microscopy); 2019 and 2020 (60% for RDT, 40% for microscopy)] and the positivity rate [2018 (50% for RDT, 39.4% for microscopy); 2019 (47% for RDT, 36.4% for microscopy); 2020 (44% for RDT, 33% for microscopy)].

3. The total of ACTs corresponds to the needs based on the expected malaria cases without buffer stock.

Quantification of microscopes

PMI is not planning to procure microscopes.

Quantification of IV artesunate/IM artemether

Cases of severe malaria represent 8 percent of the expected total number of malaria cases. The 8 percent ratio is based on the calculation of the number of in-patients for malaria divided by the number of total cases of malaria. For 2020, this would result in 482,153 severe malaria cases in Angola. PMI is planning to support the GRA by procuring 93,008 vials of artesunate and 148,813 ampoules of artemether to support the treatment of severe malaria in the six PMI focus provinces.

Quantification of rectal artesunate

The MoH policy for rectal artesunate currently supports its use in children less than six years of age in peripheral health facilities, but current access to the product remains infrequent. PMI is not planning to procure rectal artesunate at this time.

Plans and justification for proposed activities with FY 2019 funding:

With FY 2019 funds, PMI plans procure approximately 1.3 million RDTs and 800,000 treatments of ASAQ for the public sector to support nationwide needs (see Tables 12 and 13). Ten percent of these malaria commodities will go towards supporting the ADECOS platform at the community level, while the MoH will provide commodities for the other diseases included in the care package (e.g., pneumonia and diarrhea). Both IM artemether and IV artesunate will be procured for use in referral centers and larger health centers.

At the health facility level, PMI will target resources to strengthen malaria case management, including three- to five-day trainings on supportive supervision for provincial- and municipal-level malaria supervisors in Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire, which together include 578 health facilities and serve 20 percent of the national population. Efforts will also support “training-of-trainers” workshops, provincial-level trainings for all 18 provinces and municipal-level trainings for 61 municipalities in the six PMI focus provinces. The municipal level malaria supervisors will be supported to provide regular supervision visits to health facilities on a quarterly basis. Training in laboratory diagnostics (RDTs and microscopy) and quality control will take place at provincial and municipal levels. Supervision visits to 18 provincial laboratories and 48 municipal laboratories will also be supported.

At the community level, in coordination with the Global Fund, PMI will continue to support the GRA’s iCCM initiative with ADECOS by including new municipalities within provinces that have previously received support. Recipients of training will include senior ADECOS trainers on iCCM and M&E. Funds will also go towards essential supportive tools such as thermometers, registration books for data collection, backpacks, raincoats/boots, and cellphones for ADECOS.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

4. Cross-cutting and other health systems strengthening

In order to successfully implement the aforementioned activities, PMI/Angola supports a number of activities that cut across and benefit insecticide- and drug-based prevention measures and case management activities. For example, the availability of high-quality commodities is necessary to ensure high ITN coverage and effective case management, and health-seeking behavior of individuals and communities is necessary to improve coverage of all interventions. In addition, the gains achieved in malaria control in Angola can only be sustained if there are strong health systems in place and robust local capacity. Hence, systems-strengthening and capacity building are intrinsic in all PMI activities. Cross-cutting health-systems strengthening activities are described below.

NMCP/PMI objectives

The NMCP is tasked with planning, supervising, and monitoring malaria activities throughout Angola. The NMCP sets standards, prioritizes the use of resources, and tracks progress. A continued lack of human resources at all levels inhibits progress. In recent years, the GRA decentralization process, whereby municipalities are responsible for a significant portion of planning, budgeting, and financial management of health resources has created additional challenges for the NMCP. PMI supports the NMCP to strengthen health systems at all levels in order to improve malaria program performance and ensure sustainability of PMI's investments. PMI's overall approach to health systems strengthening is through the provision of technical assistance to various levels of the GRA in the areas of areas of management, logistics, and entomology. Overall, there is an emphasis on strengthening malaria program management at the decentralized level.

Progress since PMI was launched

PMI has worked to strengthen human resource capacity and HMIS in the provinces of Huambo and Luanda through an integrated health system strengthening activity (co-funded by PEPFAR) from 2011 through 2016. This effort involved working closely with the MoH at the national, provincial and municipal levels with the aim of improving capacity for service delivery, leadership, management, and the supervision skills of health workers. From 2014 to 2015, PMI worked with selected municipalities to develop their strategies in line with the national health strategy, assisted with implementation of the National Health System Strategic Information Plan, and worked to improve effectiveness and efficiency of human resources at the municipal level.

PMI has invested in pre-service training of trainers and nursing school teachers with the aim of achieving quality improvement and higher standards in clinical practices. After the approval of the PNDS by the Angolan government, PMI provided significant technical assistance to cost the plan, as well as supporting municipalities in nine provinces to develop municipal health plans and associated budgets in standardized formats, using epidemiological data.

From 2012 to 2016, PMI trained a cadre of national, provincial, and municipal supervisors to conduct supportive supervision at health facilities in eight provinces (Benguela, Bie, Cuanza Norte, Cuanza Sul, Huambo, Malange, Uige, and Zaire). This support included supervision planning and tool development, health facility malaria report verification, and municipal- and provincial-level malaria reports and database management. In addition, PMI promoted the active review and discussion of monthly reports with municipal and provincial supervisors to foster problem identification and the exploration of

possible solutions. The focus has been on improving documentation in facility-held records so that the quality of the data available for analysis improves.

PMI has also worked to improve the capacity of staff of the MoH and the Inspector General on best practices and laws related to the regulation of medicines and challenges with regulating substandard and poor-quality medicines.

Progress during the last 12-18 months

PMI has supported three technical and management advisors to build human and institutional capacity at the NMCP and CECOMA: a Monitoring and Evaluation Technical Advisor, who is embedded with the NMCP staff and provides M&E support to increase the NMCP staff's ability to use report quality data for program and policy decision-making; a Supply Chain Manager, who is embedded with CECOMA staff and provides support and training on supply chain improvements, quantification, stock prioritization, and distribution services; and a Logistician, who is also embedded with CECOMA and provides technical assistance in supply chain logistics.

From 2016 to early 2017, PMI supported the MoH to develop and finalize an M&E Plan for the PNDS, and to examine both programmatic and financial progress. In March 2017, the plan was completed that includes concrete steps for implementation of M&E activities and will strengthen accountability for program performance and budget execution for PNDS at the central, provincial, and district levels. Continued technical assistance and strategic guidance will be provided by the Global Fund and WHO. The implementation of the National Health Accounts survey is expected to significantly increase the MoH's capacity to monitor GRA funding of the PNDS, as well as to allow for making decisions based on reliable and pertinent information.

To improve the management of the MoH's national Health Information Systems (HIS) and its many sub-systems, the PMI team worked closely with GTI and GEPE to establish a national HIS Technical Working Group led by the MoH. This group serves as the multi-stakeholder coordination mechanism and is tasked with advising the MoH for all national HIS-related efforts, including the DHIS2 and Open LMIS deployments, as well as mobile data collection platforms used by ADECOS. The PMI/Angola team also initiated the development of a costed DHIS2 implementation plan that aligned technical and financial resources. PMI supported a landscaping analysis of the Routine Health Information System to identify existing data flow processes, collection and reporting systems, and bottlenecks. These data will help inform recommendations to the NMCP and relevant stakeholders on data harmonization needed to improve reporting as MoH prepares to transition to the national reporting DHIS2 platform.

PMI worked to improve the implementation of national protocols for diagnosis and treatment, MIP, laboratory diagnosis, and data collection and management by providing facility-level supervisory and quality improvement visits conducted by key provincial and national level MoH officials. Eighteen national trainers received laboratory diagnostics refresher training. Training-of-trainers in malaria case management was rolled out for 54 national-and provincial-level healthcare workers.

PMI supported the participation of two NMCP staff at the 2017 American Society of Tropical Medicine and Hygiene Conference. At this conference, they were able to disseminate TES results and to benefit from professional development opportunities. PMI has also supported conference attendance by the CECOMA Director and the DNME Director to the Global Standard1 conference, and the GTI Director participated in the DHIS2 academy.

In view of the upsurge in reported increases in malaria cases, PMI worked with the Global Fund to convene the National Malaria Partners Forum to review data with provincial malaria supervisors and to support the development of provincial-level operational plans for increased malaria control activities.

Plans and justification

PMI will continue to work to build and strengthen systems for managing and monitoring malaria programs. An emphasis will be placed on strengthening the lower levels of the decentralized health system, to ensure that management improvements have a direct impact on the availability and quality of malaria services. PMI recognizes that healthcare quality improvements must be integrated into care and delivery in order to improve services and patient outcomes. Shifting the traditional training paradigm, PMI will reinforce clinical and laboratory trainings through mentorship and enhanced supportive supervision, providing individualized education opportunities to healthcare workers as they deliver services, allowing them to make immediate changes to improve their practices.

PMI will embed a Case Management Advisor in the NMCP to coach and mentor existing staff with the aim of making NMCP capable of functioning efficiently without external technical assistance within one or two years. PMI will also continue to support the National Malaria Partners Forum to facilitate national coordination of malaria activities.

As a strategy to improve the quality of services through accountability and local ownership, PMI will work in selected municipalities of the six PMI focus provinces to conduct health facility audits on a regular basis. These audits will gather staff from provinces and municipalities to health facilities to verify the implementation of national care and treatment protocols, as well as the availability of personnel, commodities, equipment, and standard operating procedures. PMI will aim to include at least one key representative from the local community where the health facility is located to help municipal and provincial authorities gain a better understanding of the community's perspective on the challenges and opportunities for improving the quality of care. Using a participatory process, the audits will conclude with a joint reflection session during which facility staff and community representatives, as well as municipal and provincial authorities, agree on short- and medium-term actions that they each can take to improve the quality of care.

a. Pharmaceutical management

NMCP/PMI objectives

PMI and the NMCP's goals are to prevent stockouts of ACTs, RDTs, medicines for severe malaria treatments, and other malaria-related commodities at public health facilities. To achieve this goal, PMI supports procurement of malaria commodities by the MoH to improve commodity security. PMI is committed to working with the National Directorate of Medicines and Equipment (DNME) and CECOMA to strengthen the GRA national distribution system to the point where it can assume in the near term the distribution of GRA- and donor-supplied malaria commodities.

Progress since PMI was launched

Pharmaceutical products entering Angola are required to be registered through the DNME before entry and distribution. The Department of Pharmaceutical Inspection within the MoH conducts border and post-marketing inspections. The GRA does not yet have a qualified central level laboratory or an adequate surveillance system to evaluate the quality of pharmaceutical commodities coming into

Angola. At present, all products that need to be tested are sent to laboratories in Portugal, South Africa, or Brazil because there is no in-country capacity for quality assurance testing. The DNME also has a Department of Pharmacovigilance established to track adverse reactions caused by medications. A PMI- and USAID-supported assessment of Angola's medicine regulatory system and supply chain identified several key concerns, including an insufficient legal framework, limited human resource capacity and an inadequate quality control system. Products purchased by the GRA are stored and managed at CECOMA.

Since 2009, PMI has supported a parallel supply chain system for PMI-procured commodities; all commodities are delivered directly to the provincial warehouses, thereby, bypassing CECOMA. The provinces assume responsibility for the ultimate delivery to the health facility level. Due to the limited availability of vehicles and fuel at the provincial level, delivery from the provinces to health facilities remains weak, with some provincial warehouses possessing expiring stocks while, at the same time, many health facilities experience stockouts. At the national level, proper quantification and forecasting of malaria commodities have been challenged by a lack of consumption data and a weak logistics management information system. Usually, commodities arriving at the provincial level are immediately sent to the facilities for use. Stocks therefore often arrive to the end user with a minimum of lost time at the warehouse, but there is little evidence to support that proper minimum and maximum stock levels are maintained at any level of the supply chain. Furthermore, distribution plans are often made in isolation of all stakeholders, including CECOMA, the DNME, and other donors. This has led to an oversupply of commodities in some provinces and unequal distribution in others. Stock levels in the country often fluctuate greatly depending on the timing of donor-procured commodities arriving in Angola. The process of delivering PMI-procured commodities directly to the provincial warehouses has proven to be more efficient than previous methods that went through CECOMA's central warehouse.

PMI-procured supplies are delivered to all provincial warehouses within two weeks of arrival in Angola. PMI supports end-use verification (EUV) surveys biannually to monitor stock levels and capacity for case management at the health facility level. PMI recognizes the need to engage in capacity building and the development of sustainable systems. Therefore, PMI supported supply chain strengthening activities at the health facility level in eight provinces, and at the municipal level in Huambo and Luanda. PMI continues to support technical assistance in quantification exercises of malaria commodities, which now includes seasonality needs. Two reviews of malaria commodities quantification were done based on NMCP targets, one in late 2017 and one in early 2018. These quantification exercises involved policymakers and included malaria commodities procured by all stakeholders. All quantification reports were shared with stakeholders, especially the NMCP and GEPE, in order to budget for the commodity needs.

PMI has been working closely with the NMCP to develop an operational strategy, standard operating procedures, and terms of reference for staff, tools for storage and distribution, performance indicators, tools for operations management, and a logistics management information system.

At lower levels, PMI has supported improved stock management at the provincial and health facility level. This includes training on stock management, provision of tools and job aids, and supervision. All training and supervision tools used are uniform and approved by the MoH, with PMI support, CECOMA and the DNME have developed annual work plans with the aim of leading to a comprehensive national supply chain strategy. Concurrently, PMI provided assistance to the NMCP in the elaboration of data-driven development of quarterly distribution plans to distribute more efficiently malaria commodities to

the provinces, as well as the development of a forecasting tool to project the future demand for malaria commodities.

Progress during the last 12-18 months

The governance of the supply chain and the management system still presents formidable challenges. During the past year, PMI was positioned to support the NMCP, DNME, CECOMA and GTI to improve the supply chain and its management system. With the arrival of the new GRA in November 2017, PMI was unable to continue its support because of the numerous changes in personnel at MoH. Over three-month period, PMI implementing partners were unable to move forward with planned activities outside of Luanda because the MoH's new leadership took a long time to restart its collaboration in the area of the supply chain. PMI continued to provide a significant portion of malaria commodities, jointly with the Global Fund. PMI also continued delivering PMI-procured commodities directly to the provincial level; however, PMI also has maintained its support to strengthen the national supply chain and address weaknesses at CECOMA. Given the personnel changes at MoH and a need to reorient new MoH leaders, implementing partners could not move forward with a number of activities as they had planned.

In spite of the slowdown of PMI activities caused by the change in government leadership, PMI has continued supporting some key activities at the central level. In October 2017, PMI supported the GRA in its adoption of Open LMIS to modernize and transform Angola's health supply chain. A national Technical Working Group was established and tasked with identifying how the health supply chain could move from a paper-based system to an automated, electronic logistics system. Health stakeholders and partners committed support and resources to ensure a successful OpenLMIS modernization program. In close collaboration with NMCP, PMI supported monthly reporting, stock monitoring, requisition creation, and a distribution plan. As a result of PMI-supported technical assistance in warehouse and stock management for the 18 provinces, national stockout rates declined from 22.7 percent in the first quarter of 2018 to 5.1 percent in the second quarter of 2018. PMI is supporting the supply chain system nationwide. Unfortunately, open LMIS is not yet functioning. Implementation of this activity was delayed by the new MoH administration, which has recently started working with the partners. Additionally, through PMI-supported TA, data quality assessments were done to improve the accuracy of reporting received from the provincial warehouses. These reports identified that the malaria commodity reporting rates improved between Q1 and Q2 reporting. PMI also trained 33 pharmacists from 12 national hospitals to improve their knowledge of data collection tools and proper reporting for NMCP and DNME.

Plans and justification for proposed activities with FY 2019 funding:

PMI will continue to support forecasting, quantification, and procurement planning for ACTs and RDTs, and will support CECOMA to institutionalize supply chain management functions and expand the identified supply chain best practices to health facilities. Support for malaria commodity logistics will continue to focus on monitoring the newly rolled out Open LMIS to ensure continued availability of ACTs and other malaria commodities at the health facility level. PMI will also support the harmonization and integration of supply chain indicators with the national malaria logistics indicators and logistics supervision tool. Over the next year, PMI will ensure more coordination and analysis meetings of malaria supplies procurement, as well as a field-based coordination approaches with a PMI focal point for each of its six focus provinces to aid in distribution plan elaboration, inventory, and stocks/warehouse management.

Assistance will emphasize sustainability and capacity building with two seconded technical advisors working directly with their GRA counterparts, creating the appropriate regulatory framework, and training a skilled cadre to strengthen the MoH distribution system and achieve a plan to transition to a level where it no longer needs outside assistance to operate efficiently. One Logistician will be embedded within CECOMA and one Case Management Advisor will be embedded with the NMCP. A transition plan, containing annual benchmarks to measure progress, will be developed for both of these positions. One priority will be to work with the NMCP, high level leadership within the MoH, the National Supply Chain team (CECOMA, DNME, PNME, and IGS), to develop and implement a plan to address the local procurement of quality-assured antimalarial drugs from the central level to the municipal level. PMI will strengthen technical assistance at the provincial level in its six focus provinces by providing staff to support the elaboration of distribution plans, inventory management, and warehouse management systems.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

b. Social and behavior change communication

NMCP/PMI objectives

PMI supported the NMCP in drafting the *Plano Estratégico de Comunicação para Mudança Social e de Comportamento (CMC) Sobre a Malária 2017 -2020* (SBCC Strategy) in 2015. The strategy, adopted in 2018 under the leadership of the new Secretary of State for Social Communications, outlines the NMCP's priorities and goals related to SBCC for malaria. This strategy conforms to RBM global best practices and defines roles and responsibilities of all key actors, identifies priority issues and gaps, and provides a basis for multi and bilateral assistance and inter-sectoral coordination. The strategy covers vector control (IRS, ITNs, and larviciding), case management, IPTp, and epidemic preparedness and response. It addresses misconceptions about malaria in Angola and seeks to improve knowledge about key behaviors essential to achieving sustained malaria control. The NMCP's objective is to have at least 80 percent of caregivers know the cause, signs, and symptoms of malaria, and at least one malaria prevention and one treatment measure by the end of 2020. The strategy includes target populations and overarching goals focused on increasing motivation; however, at this time, it does not look beyond extrinsic spheres of influence (such as self-efficacy and risk-perception) as drivers for sustainable behavior change. PMI will work with the NMCP and implementing partners to update the SBCC strategy to include additional goals and targets that will address ideational factors, in addition to refining behavioral and communication objectives for key malaria-related behaviors (current objectives listed in Table 14).

The NMCP's capacity to coordinate and monitor all malaria-related SBCC activities conducted by the NMCP, provincial governments, and other in-country stakeholders in Angola has been limited. The National Malaria SBCC Technical Working Group and a National Integrated SBCC Coordinating Committee were recently established this year. The roles and functions of the National Integrated SBCC Coordinating Committee are to coordinate activities across different departments within the MoH to ensure synergies in messaging and provide a platform to harmonize GRA and partners' activities.

Partners within the public and private sector support the MoH with SBCC activities. Specifically, UNITEL supported ITN distribution and use by providing free messaging on the importance of using

ITNs and their proper use and care. During Phases 1 and 2 of the campaign, UNITEL sent a total of 838,395 reminder messages for communities to use correctly the ITNs distributed in seven provinces.

Table 14. Behavioral and Communication Objectives for Key Malaria-Related Behaviors

Behavioral Objective	Baseline¹	Target
Increase the proportion of individuals who have access to and correctly and consistently use ITNs throughout the year to 80% by end of year 2020.	20%	80% of population
Communication Objective (s)	Baseline	Target
1. Create awareness about the ITNs distribution campaign		
2. Motivate families to sleep under the ITNs every night, with the focus on children under 5 years and pregnant women		
3. Discourage use of ITNs for non-intended purposes (i.e. fishing, covering gardens)		
4. Improve knowledge that ITNs protect from mosquito bites		
Behavioral Objective	Baseline	Target
Increase proportion of eligible pregnant women with access to ANC services that complete at least three doses of IPTp to 80% by end of year 2020.	13% ² 26% ³	80%
Communication Objective (s)	Baseline	Target
1. Motivate pregnant women to go for ANC services at least 3 times during the pregnancy		
2. Improve knowledge that pregnant women are at a higher risk to contract malaria and improve knowledge about preventative treatment (SP)		
Behavioral Objective	Baseline	Target
Increase proportion of suspected malaria cases presented at health facilities that are confirmed by laboratory diagnostics to 100% by end of year 2020.	n/a	100%
Communication Objective (s)	Baseline	Target
1. Improve knowledge of malaria symptoms and necessity to seek timely diagnosis and treatment		
2. Motivate caregivers of children under 5 years in their behavior to seek diagnosis and treatment within 24 hours of fever onset		
Behavioral Objective	Baseline	Target
Increase proportion of treated malaria cases in accordance with the national policy to 100% by end of year 2020.	n/a	100%
Communication Objective (s)	Baseline	Target
1. Improve knowledge that every fever is not malaria		
2. Motivate healthcare workers to consistently adhere to national treatment protocol		

1. 2015-2016 DHS+

2. Percentage women with no education received three or more doses of SP.

3. Percentage women with secondary education or higher received three or more doses of SP.

Progress since PMI was launched

Low perception of malaria risk and poor practices related to malaria have historically been a barrier to malaria control in Angola. For example, only 27 percent of women interviewed in the 2011 MIS identified mosquitoes as a source of malaria, and only 30 percent knew that malaria can be prevented by using a mosquito net. The 2015/16 DHS found 23 percent of pregnant women and 22 percent of children

less than five years of age sleeping under an ITN. Although access to ITNs remains low (31 percent household ownership in the DHS), a recent secondary analysis of data from surveys conducted in Angola found that ITN use is high across Angola among those who own an ITN. SBCC remains an important intervention, alongside improving access, to ensure the success of vector control interventions.

Since its inception in 2005, PMI has supported a variety of SBCC activities aimed at supporting demand for and uptake of key malaria control interventions in Angola. From 2006 onward, PMI launched several SBCC activities in the key malaria intervention areas (ITNs, MIP/IPTp, and case management) and provided support for the development and dissemination of new SBCC materials for information, education, and communication. This has largely focused on ITN use and care, improving ANC attendance and IPTp uptake, and instilling prompt care-seeking behavior.

With the launch of the ITN campaign in 2013, the NMCP and partners developed a specific SBCC effort focused on improving ITN use. These SBCC activities included municipal health days, house-to-house visits, and radio programs. SBCC activities were coordinated and targeted at the provincial level and programmed to reflect the variation of malaria transmission levels in Angola. Key messages at the community level, via radio, included the promotion of correct ITN use, importance of malaria prevention during pregnancy, and the importance of prompt diagnosis and treatment of malaria with ACTs. Activities included community outreach using face-to-face discussions; drama shows on malaria; mobile videos; training of health and community workers; radio spots; and printed messages for flyers and those that accompany packaged ITNs and ACTs.

In early 2015, a PMI-supported study in the provinces of Bengo, Malanje, and Uige investigated local perceptions, practices, and treatment-seeking behaviors for malaria among women with children less than five years of age. The results of the study showed misperceptions about the causes of malaria, financial conditions, reliance on traditional medicines, perceptions of risk, and limited social support as barriers to seeking prompt care and treatment for malaria.

In the 2016 Health Facility Survey⁴, approximately 80 percent of health workers received training in case management in both provinces. In Huambo, 28 percent of patients with uncomplicated malaria were appropriately treated and 60 percent in Uige. Additionally, 85 percent of caretakers were able to recite correctly how to give prescribed medication, thus suggesting appropriate counseling skills among those trained.

Using SBCC strategies that were developed based on study findings in 2015, PMI reached 105,131 people through interpersonal communication skills churches and home visits to promote ITN use and general malaria transmission messages. Radio programs and songs were also aired to target audiences in Bie and 84 percent of people surveyed recalled a malaria prevention message. PMI also distributed pamphlets, posters (information, communication, and education materials) with ITN use promotion, and general malaria transmission messages, targeting both health workers and communities. PMI reached 97,366 people in health facilities and 300,491 people through community outreach. Messages included sleeping under a mosquito net; prevention of malaria in pregnancy; use of mosquito net and

⁴ <https://malariajournal.biomedcentral.com/articles/10.1186/s12936-017-1843-7>

IPTp promotion; knowledge of malaria symptoms and creating treatment demand; knowledge of severe childhood malaria symptoms; and adherence to RDT results by health workers.

Survey results after the SBCC campaign conducted by one PMI implementing partner revealed an increase from 26 to 76 percent of participants knowing that sleeping under a mosquito net can prevent malaria. Furthermore, after the campaign, the proportion of survey respondents that slept under an ITN the previous night increased from 7 to 87 percent.

Progress during the last 12-18 months

Recent SBCC activities in Angola have focused on supporting net use and care in correspondence with the three phases of the national universal coverage campaign conducted in 2017-2018.

- Pre-campaign: Inform the community about the campaign and encourage households to accept registration workers, redeem the vouchers at the fixed distribution points
- During the campaign: Mobilize the community about malaria and the benefits of using mosquito nets for prevention and educate people on how to hang and use nets
- Post-campaign: Reinforce the knowledge on malaria transmission, the benefits of using mosquito nets, and motivate the use of ITNs and how to take care of nets
- Placement of radio spots at the provincial and municipal levels to promote the use of ITNs
- 30 Provincial Health Supervisors and 750 traditional leaders were trained in malaria counseling messages to promote ITN use
- Support the ITN campaign in seven provinces with PMI partners training 26 trainers-of-trainers of activists, 891 ITN communication activists, 31 provincial health officers, 356 traditional leaders, 32 ADECOS supervisors, and 200 faith-based organization volunteers in SBCC techniques to encourage ITN use
- Monitor SBCC activities and provide supervision guidance nationally at the municipal level
- Train malaria supervisors in the of SBCC activities related to the ITN mass campaign and post-campaign.

Plans and justification for proposed activities with FY 2019 funding

SBCC is used at the community level in the six PMI focus provinces to improve prevention of MIP by promoting ANC attendance and education on the importance of ITN use and receiving at least three doses of IPTp. SBCC investments planned with FY 2019 funding will be focused on building community understanding and commitment to improving health through participation and ownership of prevention and case management activities.

While past SBCC activities have focused solely on the community, based on findings from the 2016 Health Facility Survey, PMI plans to support training of health workers to improve compliance with protocols and interpersonal communication during case management using FY 2018 funds and continuing with FY 2019 funds. PMI will continue to work to improve the interpersonal relationships between health workers at all levels with their clients, thereby increasing their impact. As the ADECOS approach is expanded to new areas and they expand their roles, PMI will support ADECOS by providing training in critical communication skills to influence behavior change. ADECOS will also be provided with tested messages to promote preventive behaviors and increase treatment compliance.

Similarly, PMI will support facility-based health workers to improve their interactions with patients, utilizing stronger interpersonal communication skills to improve compliance. In addition, PMI will

support SBCC messaging and outreach to promote demand for malaria testing prior to requesting treatment. This will include developing and conducting training for outreach workers, improving communication skills, distributing materials to motivate the use of ITNs by identifying and promoting positive deviant behavior. This activity will also support SBCC at the community and facility levels to build a net culture. PMI will support reach and recall studies. These studies will help to measure the percentage of people exposed to an SBCC campaign and the messages. Reach and recall studies will seek to assess effectiveness and impact of SBCC to improve the design of future messages and activities. These studies will help measure the percentage of people exposed to and influenced by the SBCC campaign and message recall. They will be conducted on a representative sample of the target population who will respond to a short questionnaire. PMI will also conduct an assessment to identify messages that could help remedy the low acceptance of IPTp uptake in pregnant women in three focus PMI-supported provinces.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

c. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

The Angola National Health Management Information System (NHMIS) provides paper-based routine health data. However, due to inaccurate and unreliable malaria reporting in the HMIS, the NMCP established a parallel National Malaria Surveillance System (NMSS) after the onset of the Rollback Malaria Initiative 1999 and Malaria African Presidents commitment in Abuja in 2000. Furthermore, in an effort to detect epidemics in certain provinces, in 2010, with the financial and technical support of PMI and WHO, the NMCP created an enhanced regional malaria surveillance system referred to as the Malaria Early Warning System (MEWS) in the four southern epidemic prone provinces (Cunene, Huíla, Kuando Kubango, and Namibe). MEWS-trained personnel use NMSS data from communal, municipal and provincial level selected health facilities denominated “MEWS sites” to develop the third quartile epidemic thresholds on monthly and a weekly basis. The HMIS and Diseases’ Programs meet on quarterly, semestral, and annual basis through the “data harmonization meeting” to compare and harmonize data collected by their respective systems (Table 15). The NMCP is aware of these limitations and has developed a plan to strengthen M&E, described in the 2016-2020 National Strategic Plan for Monitoring and Evaluation. The main M&E objectives of the NMCP’s plan are, by 2020:

- Establish an efficient epidemiology surveillance, monitoring and evaluation system in all 18 provinces
- Develop capacity to detect and respond to epidemics within two weeks in 16 epidemic-prone municipalities
- Report by the end of 2020, that all provinces are providing data in a timely manner and in accordance with the data collection protocol
- By the end of 2020, municipalities are able to detect epidemic risks in less than two weeks and respond appropriately

As per the Angola PNDS, the MoH is transitioning from paper-based to technology-enabled health information systems in order to improve data quality and allow for better resource allocation and faster detection and response to epidemics. As a first step in the transition process, in 2016 the MoH adopted the DHIS2 platform for monthly service delivery data reporting, informed by the findings of a PMI-

funded pilot. A core area of strategic focus under PMI's current global strategy, and a priority for the NMCP, is strengthening surveillance, monitoring, and evaluation capacity and building a culture of data driven decision-making. Malaria data in Angola is collected through the HMIS and by the municipal and provincial malaria supervisors through a parallel system. While there is a culture of data collection at the health facility level, HMIS data reporting is often delayed and unreliable. Moreover, HMIS data often conflicts with data collected through the NMCP's parallel system. The country's PNDS stresses that the national health information system "does not integrate the subsystems, causing a deficiency in the management of health services and timely response to disease control, and response to epidemics [and] local gathering, processing, and transmission of data is not done adequately and in a timely manner". The NMCP is aware of these limitations and has developed a plan to strengthen SM&E, as described in the 2016-2020 National Strategic Plan for Malaria Control and the 2016-2020 National Plan for Monitoring and Evaluation.

Table 15. Surveillance, Monitoring, and Evaluation Data Sources

Data Source	Survey Activities	Year								
		2012	2013	2014	2015	2016	2017	2018	2019	2020
Household surveys	Demographic Health Survey (DHS)				x	x				(x)
	Malaria Indicator Survey (MIS)	x						x*		
Health Facility surveys	Health Facility Survey					x		x*	(x)	
	Support to HMIS	x	X	x	x	x	x	x	(x)	(x)
	Support to Integrated Disease Surveillance and Response (IDSR)								(x) *	
Other Surveys	Malaria Impact Evaluation			x						
	EUV	x	X	x	x	x	x	(x)	(x)	(x)
	Entomological surveillance and resistance monitoring	x	X	x	x			(x) *	(x) *	(x) *
	Baseline Cross-sectional Study to Monitor <i>P. falciparum</i> intensity in Southern Angola							x		
	Measurement and Learning Assessment							x*		
	Severe Malaria Assessment								x*	
	Implementation assessment of iCCM							x*		
	Net Use Survey									
TES	In vivo efficacy testing		X		x		x		(x)	

Asterisk denotes non-PMI funded activities, x denotes completed activities and (x) denotes planned activities

*E8 supported activity in the Southern Provinces

Progress since PMI was launched:

To strengthen routine data collection and reporting, PMI has provided training, supervision, data quality checks, and reporting tools to health facilities at the municipal and provincial levels since 2006. Over the past 11 years, the quality of data has improved in terms of both timeliness and completeness.

Population-based surveys: PMI has supported two MISs (2006/07 and 2011). The 2006/07 MIS provided baseline estimates of malaria control intervention coverage, and the 2011 MIS provided a follow-up after five years of implementing malaria control activities. Implemented by the *Instituto Nacional de Estatísticas*, Angola's first DHS (from 2015-2016), which was co-funded by PMI, PEPFAR, UNICEF and GRA, collected provincial-level data on the primary malaria indicators. The final report was released on June 30, 2017.

Impact evaluation: PMI and the MoH commissioned an impact evaluation, based on a before-and after-assessment, using a plausibility framework associating malaria control interventions with impact on directly measured outcomes, including changes in malaria control intervention coverage, malaria-related morbidity, and all-cause mortality of children less than five years of age during the period 2006–2011. Finalized in 2016, the impact evaluation found that despite major infrastructure problems caused by the 27-year civil war that ended in 2002, progress has been made in rolling out malaria control interventions, evidenced by the increases in ITN ownership and use and IPTp between 2006/07 and 2011. However, it is unlikely that the overall changes in the coverage of malaria control interventions in 2011 were high enough to impact all-cause mortality of children at a national level. Despite the overall low coverage of ITNs in 2011, multiple logistic regression analyses showed that household ITN ownership was protective of malaria parasitemia among children less than five years of age under programmatic conditions. If the implementation of malaria control interventions are to be further scaled-up and sustained in Angola, there is likely to be a larger decline in all-cause childhood mortality nationwide in the future.

End-use Verifications: PMI has implemented bi-annual end-use verification (EUV) surveys in recent years to assess the availability of key malaria medicines and commodities. The December 2016 EUV (the last survey for which findings are available) collected information from 47 health facilities in six provinces and found 63 percent had no ACTs and 42 percent stockouts of RDTs. PMI used results from this EUV to overcome some of the bottlenecks that were affecting CECOMA's ability to distribute MoH-procured ACTs to health facilities.

Field Epidemiology Training Program (FETP): PMI supported the first cohort of FETP trainees in FY 2012. FETP, collaboration between CDC, the *Agostinho Neto University*, and the MoH, training selected health personnel in field epidemiology. Participants acquire skills in data analysis, epidemiologic methods, and use of strategic information to make appropriate health decisions. Annually, PMI supports two students to do malaria field work. All of the FETP students in the program have participated in multiple investigations and responses to unexplained increases in reported malaria cases in different provinces across the country. In 2012 and 2013, FETP students participated in multiple suspected and confirmed reported increases in malaria across the country, and developed a "short course" on epidemic investigation and control that is provided at the regional level. Three of the nine members from the first FETP cohort have taken prominent positions in the MoH, including the Director of the Infectious Disease Department. Another former student was appointed to be a member of the national emergency response team.

Progress during the last 12-18 months

In early FY 2018, PMI coordinated a four-day workshop in collaboration with GTI and GEPE to draft the National Roadmap for DHIS2 (and OpenLMIS) which highlighted a national rollout by end of 2018 that will be supported by various stakeholders working in different provinces in the country. The MoH, donors, and partners worked together to synchronize efforts and avoid task duplication. Participants

identified the timelines and budget needs for developing the different components of DHIS2. During Q2, PMI convened a partners meeting to identify the financial resources each would contribute and a final version of the Road Map was shared with MoH and partners. The PMI target is to rollout DHIS at the municipal level in the six PMI focus provinces by the end of 2018; training and rollout was completed in one province in June 2018, a second training and rollout is currently underway, and a training plan is in place to rollout for the remaining four provinces by the end of 2018. Specifically, PMI implemented the following activities, with the aim to have a fully-functioning DHIS2 platform:

1. Conducted assessment of the DHIS2 pilot phase, reinforcing the need to create and improve validation rules for data quality assurance, import historic data from paper based to Excel forms so as to improve quality supervision, improve governance and regulation rules, etc.
2. Developed implementation plan for a PMI-funded project focusing on six provinces where PMI works with detailed budget needs and aligned chronogram with the general National Road Map and the MoH plan.
3. Provided technical support to MoH on:
 - a. Developing rules for DHIS2 user roles to improve administration of the platform
 - b. Cleaning current DHIS2 platform
 - c. Configuring MoH approved forms for data entry (new malaria form includes iCCM component, External Clinic Consultation, Emergency Room, Health Units, Clinical check-ins and check-outs, among others)
 - d. Coaching on the job to GTI-GEPE to develop malaria dashboards, presentations for local and international meetings on DHIS2
4. Hired and trained six IT people who will work in the six focus provinces, providing daily support to municipal and provincial health departments on DHIS2 data insertion, analysis, dashboard creation, etc.
5. Developed materials in preparation for the DHIS2 roll out user manual, supervisor manual, helpdesk support system (in progress); assessment of IT capacity and infrastructure in municipal health department (in progress).
 - a. In coordination with MoH, PMI initiated DHIS2 roll out in June 2018 in different phases, expecting to finish the roll out in all six provinces by September 2018.

Additionally, leveraging funds from the U.S Department of State, PMI coordinated a three-day Health Tech Camp on interoperability in March 2018, bringing together people from the MoH, donors and private sector to discuss concepts and strategies to connect DHIS2, Open LMIS and other private/public health digital systems, and achieve a well-integrated health information system. The Health Tech Camp helped to identify current problems of interoperability and draft a strategy to tackle them.

Three FETP students served as national level supervisors for the PMI 2017 TES. In February 2016, two FETP students served as field team supervisors during the PMI-funded Health Facility Survey. With the increase in the incidence of severe malaria morbidity and mortality in Luanda, a FETP student developed a protocol to look at risk factors for death among severe malaria cases in hospitals in a few municipalities in Luanda. These findings have been presented to the Thesis Committee at the *Agostinho Neto* University Department of Public Health for the students' master thesis. The FETP fellows have been instrumental in supporting various malaria assessments (e.g., TES and Health Facility Survey), whereby these data were used to inform central and provincial level program decisions and to guide the procurement of antimalarials. For example, the three rounds of TES supported by the FETP fellows have been crucial in helping Angola establish routine and systematic monitoring of ACT efficacy. After the

2013 and 2015 TES results, which showed decreased AL efficacy in one province, the NMCP began procuring larger quantities of ASAQ compared to AL. Since that period, the GRA has continued to enlist FETP fellows to support TES. This support to PMI for TES implementation by FETP fellows increases country ownership by providing a cadre of Angolan health officials to sustain survey efforts for the MOH.

Plans and justification for proposed activities with FY 2019 funding:

PMI will support the planning and implementation of the 2020 DHS, ensuring the inclusion of malaria-related outcome indicators. The GRA plans to fund at least 50 percent of this survey, and PMI plans to support up to 20 percent (or \$2 million) of the survey cost. To increase data access and improve quality, PMI will continue to support strengthening monthly malaria surveillance data reporting through the current HMIS while simultaneously rolling out DHIS2 in the six PMI focus provinces, as well as at the central level. Supporting a phased DHIS2 rollout at the municipal level in six provinces includes training for municipal and provincial level surveillance officers and malaria supervisors on the use and maintenance of the new DHIS2 system. Six trained system specialists will be based in each of the six provinces to provide ongoing technical support and perform data quality checks. Regular supervisory visits will occur to monitor overall progress of DHIS2 rollout and performance of newly trained staff. At the central level, PMI will continue providing on-the-job coaching to the NMCP DHIS2 focal point and GTI-GEPE staff on the malaria dashboards, data analysis, and reporting.

PMI is supporting the MOH phased transition from a paper-based to an electronic HMIS through the rollout of DHIS2. Routine malaria data is still reported through the MOH supported paper based-National Malaria Surveillance System as the MOH transitions to the DHIS2 reporting platform. However, MEWS is not currently operational due to a reduction in partners resources. In accordance with the national roadmap, and to complement other donor contributions, PMI's support focuses on DHIS2 implementation in the six PMI focus provinces in the north of Angola. As the MOH strives to create a data-driven and knowledge-based culture, PMI and other malaria stakeholders will continue to support the phased nation-wide rollout of DHIS2, during which PMI will support strengthening monthly malaria data reporting at the facility, municipal, provincial and central levels by training and supervision of M&E data collection staff. To improve data accuracy and timely reporting, PMI will reinforce data review meetings and feedback loops at the municipal and facility level. Multiple factors will determine the progress and timing for a nationwide introduction of DHIS2. However, with PMI support, the NMCP will have access to data through DHIS2, from the six focus PMI provinces by the end of 2018.

PMI will embed a technical advisor in the NMCP and CECOMA in the areas of case management, entomology and logistics, respectively, to strengthen capacity of the GRA staff in these key technical areas. In order to bolster country ownership and sustainability, PMI Angola will develop a capacity building, strengthening framework to monitor and measure increases in technical and management capabilities of the NMCP staff to oversee programs. Capacity building plans will include individual and organizational capacity building activities, output indicators to measure improved competencies and efficiencies, and outcome indicators to measure staff performance and effectiveness over time. The transition of responsibilities will be modulated at a pace to facilitate a sustained impact, according to country context and evidence of increased capacity over time. Individual-level capacity building efforts will be designed to demonstrate results for PMI and the NMCP health systems strengthening objectives, and will be routinely monitored and evaluated.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.

d. Operational research

NMCP/PMI objectives

Angola's national strategic plan through, the *Plano Nacional de Desenvolvimento Sanitario*, contains a priority list that guides decisions on operational research (OR) as follow:

1. Conduct a study for the introduction of the vaccine against malaria
2. Conduct parasitological, entomological and therapeutic efficacy studies biannually
3. Carry out diagnostic studies of differential febrile malaria suspect syndromes
4. Conduct knowledge, attitudes, and practices studies

Progress since PMI was launched

PMI continues to work with the NMCP to prioritize their national malaria operational research agenda. Other partners have supported OR studies, such as the Portuguese Institute for Development Assistance's study on the performance of microscopy and RDTs in the context of malaria prevalence and the French *Institut de Recherche pour le Développement*'s study on malaria over diagnosis and subsequent overconsumption of antimalarial drugs.

Progress during the last 12-18 months

Since the end of Angola's 27-year civil war in 2002, Angola has drawn Asian migrants seeking economic opportunities. The size of the population of Southeast Asian migrants in Angola is estimated to be one of the largest in Africa. Many of these migrants come from malaria-endemic and drug-resistant areas. In June 2016, the PMI OR committee approved a concept note to conduct a qualitative study assessing malaria prevention and care-seeking behavior in the Southeast Asian migrant population concentrated mainly in three provinces in the country. Discussion between the implementation partner and PMI has begun with the review of the protocol and discussion and timing of implementation. Planning is underway to implement this OR study between October 2018 and September 2019 (Table 16).

The NMCP submitted their concept note for next round of Global Fund funds in August 2017 for an amount of \$23 million over three years. Within the proposal, the NMCP recommends operational research (budgeted at approximately \$355,000) to update the epidemiologic profile by municipality instead of by province in order to better plan implementation of malaria control activities.

Table 16. PMI-funded Operational Research Studies

Completed OR Studies*			
Title	Start date	End date	Budget
None			
Ongoing OR Studies			
Title	Start date	End date	Budget
Malaria Prevention and Care-Seeking Behavior in Southeast Asian Migrant Populations in Angola	October 2018	September 2019	\$100,000

Plans and justification for proposed activities with FY 2019 funding:

No OR will be supported with FY 2019 funds.

5. Staffing and administration

Two health professionals serve as Resident Advisors (RAs) to oversee PMI in Angola, one representing CDC and one representing USAID. In addition, one or more Foreign Service Nationals work as part of the PMI team. All PMI staff members are part of a single interagency team led by the USAID Mission Director or his/her designee in country. The PMI team shares responsibility for development and implementation of PMI strategies and work plans, coordination with national authorities, managing collaborating agencies and supervising day-to-day activities. Candidates for RA positions (whether initial hires or replacements) will be evaluated and/or interviewed jointly by USAID and CDC, and both agencies will be involved in hiring decisions, with the final decision made by the individual agency.

The PMI interagency professional staff work together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementation malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

The PMI lead in country is the USAID Mission Director. The day-to-day lead for PMI is delegated to the USAID Health Office Director thus the two PMI RAs, one from USAID and one from CDC, report to the USAID Health Office Director for day-to-day leadership, and work together as a part of a single interagency team. Technical expertise housed in Atlanta and Washington complements PMI programmatic efforts.

The two PMI RAs are physically based within the USAID health office, but are expected to spend approximately half of their time with and providing TA to the NMCPs and implementing partners, including time in the field monitoring program implementation and impact.

The number of locally-hired staff and necessary qualifications to successfully support PMI activities either in Ministries or in USAID will be approved by the USAID Mission Director. Because of the need to adhere to specific country policies and USAID accounting regulations, any transfer of PMI funds directly to Ministries or host governments will need to be approved by the USAID Mission Director and Controller in addition to the U.S. Global Malaria Coordinator.

Please see Table 2 for a detailed list of proposed activities with FY 2019 funding.