

PRESIDENT'S MALARIA INITIATIVE

ANGOLA

Malaria Operational Plan FY 2018

TABLE OF CONTENTS

ABBREVIATIONS and ACRONYMS	3
I. EXECUTIVE SUMMARY	5
II. STRATEGY	9
1. Introduction	9
2. Malaria situation in Angola	10
3. Country health system delivery structure and Ministry of Health (MoH) organization	13
4. National malaria control strategy	15
5. Updates in the strategy section	17
6. Integration, collaboration, and coordination	18
7. PMI goal, objectives, strategic areas, and key indicators	20
8. Progress on coverage/impact indicators to date	21
9. Other relevant evidence on progress	24
III. OPERATIONAL PLAN	26
1. Vector monitoring and control	26
2. Malaria in pregnancy	39
3. Case management	44
4. Health system strengthening and capacity building	58
5. Social and behavior change communication	64
6. Surveillance, monitoring, and evaluation	68
7. Operational research	74
8. Staffing and administration	75
Table 1: Budget Breakdown by Mechanism	77
Table 2: Budget Breakdown by Activity	83

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
ASTMH	American Society for Tropical Medicine and Hygiene
CDC	Centers for Disease Control and Prevention
CDCS	Country Development Cooperation Strategy
CI	Confidence Interval
DHS	Demographic and Health Survey
DHIS2	District Health Information System 2
DP	Dihydroartemesinin+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>)
EPI	Expanded Program for Immunization
EUV	End-Use Verification
FELTP	Field Epidemiology and Laboratory Training Program
FBO	Faith-based organization
FSN	Foreign Service National
FY	Fiscal year
GAVI	Global Alliance for Vaccines and Immunizations
GHI	Global Health Initiative
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GRA	Government of the Republic of Angola
HMIS	Health Management Information System
iCCM	Integrated Community Case Management
IEC	Information, education, communication
IMCI	Integrated Management of Childhood Illness
INE	National Institute of Statistics of Angola (<i>Instituto Nacional de Estatística</i>)
IPC	Interpersonal communication
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
JICA	Japan International Cooperation Agency
LLIN	Long-lasting Insecticidal Net
M&E	Monitoring and Evaluation
MIP	Malaria in pregnancy

MIS	Malaria indicator survey
MoH	Ministry of Health
NGO	Non-governmental organization
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
OR	Operational Research
PCR	Polymerase Chain Reaction
PMI	President's Malaria Initiative
PNDS	National Health Development Plan (<i>Plano Nacional de Desenvolvimento Sanitário</i>)
PSC	Pyrethrum Spray Catches
QA/QC	Quality assurance/quality control
RBM	Roll Back Malaria
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
UC	Universal Coverage
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme

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% 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 Subregion 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.

Angola began implementation as a PMI focus country in 2005.

This fiscal year (FY) 2018 Malaria Operational Plan (MOP) presents a costed activity plan for Angola, based on the strategies of PMI and the National Malaria Control Program (NMCP). 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. The activities that PMI is proposing to support fit in well 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 to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. 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 2018 funding.

In September 2016, the Government of the Republic of Angola (GRA) and PMI signed a Memorandum of Understanding (MOU) aimed at strengthening bilateral cooperation on malaria prevention and control efforts in Angola. The bilateral MOU outlines agreed-upon performance milestones seeking to address corruption and institutional weaknesses through increased accountability and transparency. Newly elected President João Lourenço has expressed strong commitment to eliminating corruption in Angola. PMI will work closely with the new Administration to ensure that resources to control malaria in the country are used transparently and effectively.

The proposed FY 2018 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 re-establish its support for entomologic monitoring in FY 2018 in light of the GRA's new draft vector control strategic plan and imminent hiring of the PMI-trained entomological technicians. PMI will begin with targeted technical assistance to the GRA. The re-oriented focus of PMI in FY 2017 will be to support the GRA-funded entomology technicians to carry on entomologic monitoring support in the wake of the universal coverage campaign with insecticide-treated nets. To offset costs, in-kind, the NMCP will provide logistical and operational support for PMI-supported entomology activities. Entomologic monitoring support by PMI will include organizing the established insectary in Huambo. PMI will continue to provide technical feedback in the development of an integrated vector management strategy by the GRA as well as further technical assistance with site visits to support the entomological surveillance activities.

Insecticide-treated nets (ITNs): The goal of the NMCP, with the support of PMI and the Global Fund, is to ensure that 80% of households own at least one ITN, and that 80% of those that own an ITN sleep under the ITN, particularly pregnant women and children under five years of age. PMI will initiate activities to strengthen continuous ITN distribution through routine channels. In addition to procuring ITNs, PMI will support technical assistance for continuous distribution in the areas of quantification, distribution planning, supervision, and reporting in the six focus provinces.

Indoor residual spraying (IRS): No IRS activities are planned with FY 2018 funds.

Malaria in pregnancy (MIP): With FY 2018 funds, PMI will focus capacity building efforts on increasing IPTp rates in Cuanza Norte, Malanje, Uige, and Zaire provinces. 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 community health workers. PMI will also procure an amount of sulfadoxine-pyrimethamine (SP) to support IPTp.

Case management: PMI is helping the NMCP to achieve its objectives by 2020 that all suspected cases at health facilities or who seek care from a community health worker will be tested for malaria prior to treatment. With FY 2018 resources, PMI will procure RDTs, ACTs, and severe malaria drugs with the expectation that the GRA will contribute to fill the national gap in commodity requirements. PMI will also provide limited support for training and supervision for case management strengthening and laboratory diagnosis and quality control. In coordination with the Global Fund, PMI will expand support to the ADECOS initiative by supporting implementation and the procurement of RDTs and ACTs. To build institutional capacity building on case management, PMI will support a seconded technical advisor placed in the NMCP to provide technical support on case management, including integrated community case management (iCCM). FY 2018 funds will also go towards the implementation of the 2019 therapeutic efficacy study.

Health systems strengthening and capacity building: With FY 2018 funding, PMI will continue work to build systems and human capacity for managing and monitoring malaria programs. Provincial governments will also receive support to evaluate the cost-effectiveness and feasibility of iCCM for malaria control, including the planning and budgeting at the provincial and municipal levels. In close collaboration with provincial and municipal governments, PMI will conduct audits of the quality of services at health facilities. PMI will also continue to support two students to participate in the Field Epidemiology and Laboratory Training Program (FELTP) to focus on malaria activities, and support the Malaria Partners' Forum to assist the NMCP and provinces to coordinate malaria partners.

Social and behavior change communication (SBCC): FY 2018 funds will focus on increasing community understanding and commitment to improving health through participation and ownership of prevention and case management activities. PMI will work to improve the relationship between health workers at all levels with their clients, thereby improving their impact. As the ADECOS model of community health worker is expanded to new areas and broader coverage, PMI will support these staff to be trained, supervised, and mentored in critical communication skills to influence behavior change. ADECOS will be provided with tested messages to promote preventive behaviors and increase treatment compliance. Similarly, PMI will support facility-based health workers to improve their skills in interacting with patients, utilizing stronger interpersonal communication skills to improve compliance. Finally, in order to support these cadres of health workers to follow the appropriate case management guidelines it is important to ensure that patients, caretakers, and community members also understand the importance of appropriate diagnostics to successful treatment outcomes. PMI will support SBCC messaging and outreach to promote demand for malaria testing prior to requesting treatment. To track the performance of SBCC activities, PMI will support reach and recall studies.

Surveillance, monitoring, and evaluation (SM&E): With FY 2018 funding, PMI will continue to support malaria SM&E within the framework of the National Malaria M&E Plan described in the new National Strategic Plan for Malaria Control (2016-2020). Available funding will be targeted towards

improving the country's M&E capacity, data quality assurance, and using data for decision-making. This will include providing funds for an Malaria Indicator Survey in 2019 to collect malaria control indicators, funding a seconded staff member within the NMCP to strengthen SM&E capacity, and strengthening monthly malaria surveillance data reporting through HMIS at municipal, provincial, and central levels. PMI will also conduct a health facility survey to determine how well health workers are following their training in diagnosing and treating patients according to national policy.

Operational research (OR): There are no plans to fund additional OR studies with FY 2018 funds.

II. STRATEGY

1. Introduction

When it was launched in 2005, the goal of PMI was to reduce malaria-related mortality by 50% 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 Subregion 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 bold and ambitious goals 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.

Angola was selected as a PMI focus country in 2005 and activities were carried out nationwide until 2016. Given the limited progress made in malaria prevention and control up to 2016, PMI decided to transition to a subnational program—starting in fiscal year (FY) 2017. Except for very targeted national interventions, this approach concentrates PMI resources on six provinces (combining for a total population of 3.9 million) which together represent 28% of all malaria cases.

In September 2016, PMI/Angola successfully negotiated, through an extensive bilateral dialogue, a Memorandum of Understanding (MOU) signed by the Angolan Health Minister, the U.S. Global Malaria Coordinator, and the U.S. Ambassador to Angola with clear expectations and benchmarks to be

met by September 30th, 2017. To facilitate the accomplishment of these expectations, PMI leadership and the Ambassador agreed to the formulation of a very streamlined set of activities for the FY 2017 Malaria Operational Plan (MOP). Under this unusual situation, the main emphasis of FY 2017 resources was the universal ITN distribution campaign and supply chain improvement.

This FY 2018 MOP 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 international donors, and national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing 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 to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Angola, describes mixed 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 2018 funding.

2. Malaria situation in Angola

According to the final results from the 2014 population census conducted by the *Instituto Nacional de Estatística* (INE) (National Institute of Statistics of Angola), Angola has an estimated population of 25,789,024, of which 52% are women and 48% are men. The majority of the population (62%) is urban. The projected population for 2018 and 2019 is 29,250,009 and 30,175,553 respectively (INE). The country is divided into 18 provinces, 162 municipalities, and 559 communes.

Progress has been made in the fight against malaria in Angola, and data from the 2011 Malaria Indicator Survey (MIS) show an almost 40% decline in parasitemia among children under five years of age from the 2006-2007 MIS (from 21% to 13.5%). However, the more recent Demographic and Health Survey (DHS+) 2015-2016 showed no change from 2011 in parasitemia among children under five years of age (13.5%). Comparing the 2011 MIS and DHS+ 2015-2016, the mortality rate for children under five years of age has fallen by 25% over five years, and it is currently estimated at 68 deaths per 1,000 live births.

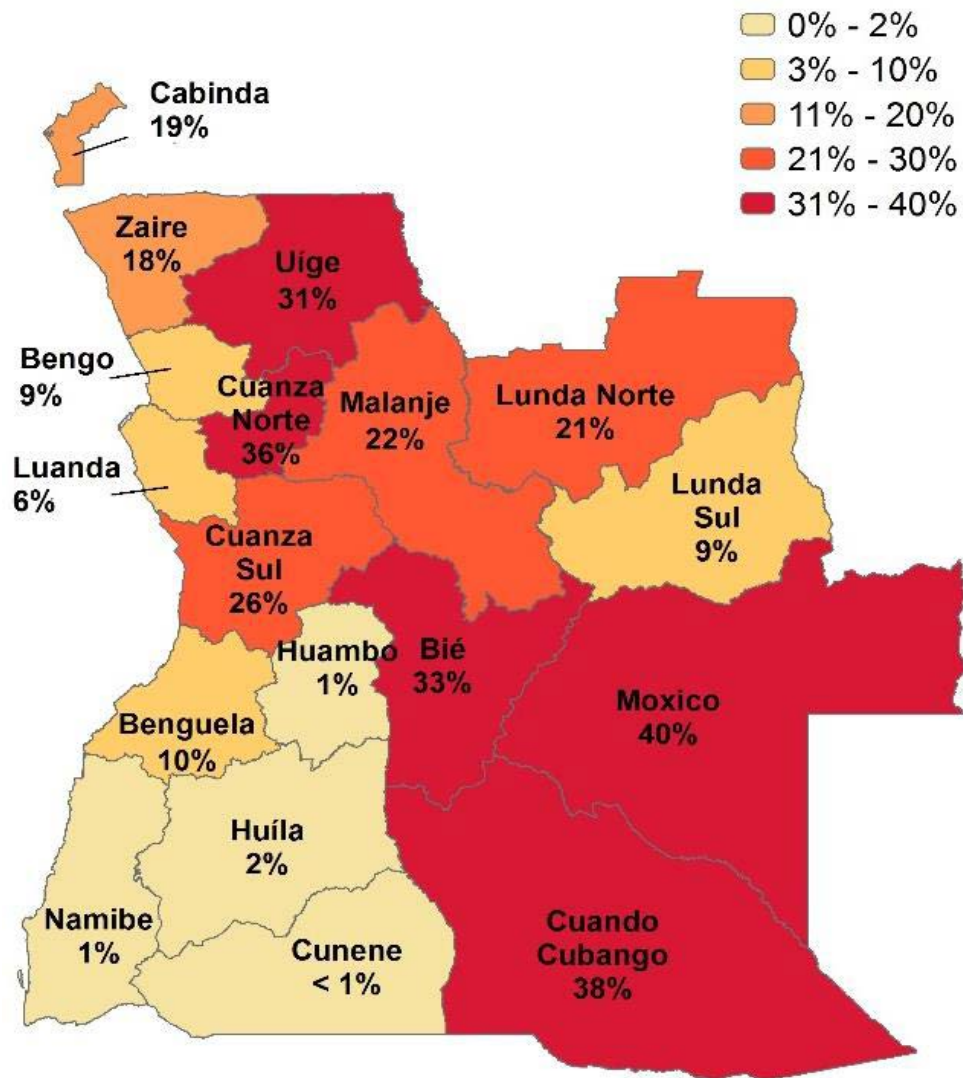
Nonetheless, malaria continues to be a major health problem and is the principal cause of morbidity and mortality in Angola. Malaria accounts for 35% of curative care demand, 35% of mortality in children, 40% of pre-natal mortality, 25% of maternal morbidity, and causes 60% of hospital admissions in children under five years of age and 10% of admissions of pregnant women (National Health Development Plan [*Plano Nacional de Desenvolvimento Sanitário*] PNDS 2013, annex 4). Furthermore, malaria is a leading cause of low birth weight, and anemia due to malaria is a major cause of morbidity and mortality in both children and pregnant women.

In 2016, there were 4,301,146 malaria cases (2,792,807 confirmed) reported in the public sector, with nearly double the number of malaria deaths from the previous year (7,999 deaths in 2015 and 15,997 deaths in 2016) (NMCP 2016-2017). Although health management information system (HMIS) data are unreliable, and while it is unclear how much of the 2016 resurgence might have been due to increased health-seeking behavior for fevers or to co-infections with yellow fever, PMI/Angola believes that several factors played a key role in the reported upsurge in malaria cases in 2016. These include (1) increased rainfall as a result of *El Niño*, and (2) stockouts of malaria treatments and diagnostics as a result of the GRA not using the pooled procurement mechanism (which inflates the costs of drugs) and not procuring commodities in a timely fashion. The first quarter of calendar year 2017 showed a return to a more typical number of cases. Between January and March 2017, a total of 867,649 malaria cases and 2,974 deaths were registered (compared to 1,392,051 cases and 4,255 deaths during the same period in 2016).

The majority of malaria cases are caused by *Plasmodium falciparum* (87%), with a portion of cases caused by *P. vivax*, *P. malariae*, and *P. ovale* (estimated at 7%, 3%, and 3%, respectively). Based on current evidence, there are five anopheline species responsible for malaria transmission in the country: *Anopheles 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 being observed in the northeast provinces: Cabinda, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, and Uige. In the north, the peak malaria transmission season extends from March to May, with a secondary peak in October-November. The central and coastal provinces are largely mesoendemic with stable transmission: Benguela, Bie, Cuanza Sul, Huambo, Luanda, Moxico, and Zaire. The four southern provinces bordering Namibia have highly seasonal transmission and are prone to epidemics. Figure 1, below, depicts the prevalence of malaria among children under five which varied between from less than 1% in Cunene to 40% in Moxico during the 6-month data collection period of the 2015-2016 DHS+. Although the 2015-2016 DHS lists the same transmission zones as the 2011 MIS (with hyperendemicity in the northeast), the survey report presents a new prevalence data table and GIS map which indicate that changes have occurred over the past four years. According to these new survey results, Bie, Cuanza Norte, Cuando Cubango, Moxico, and Uige would have the highest prevalence.

Figure 1. Malaria Transmission in Angola (DHS+ 2015-2016)



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). Angola is a member of the “Elimination 8” countries (along with Botswana, Mozambique, Namibia, Swaziland, South Africa, Zambia, and Zimbabwe).

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

The government has been investing in health infrastructure and working to expand the health network, emphasizing primary care facilities. It is estimated that about 45% of the population has access to public health facilities (PDNS, 2013)¹. However, 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 corruption and the GRA's limited capacity to adequately manage the national supply chain system contributes to frequent stockouts of commodities. Because of corruption the health system has poor infrastructure negatively impacting the quality of service delivery. Contributing factors to low access to public healthcare include cultural beliefs and reliance on traditional healers and preference of 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 Benguela. The public health network is composed of a total of 2,356 health units, including: (i) 1,650 health posts; (ii) 331 health centers; (iii) 43 maternal and child health centers; (iv) 165 municipal hospitals; (v) 25 provincial hospitals; (vi) 20 central/national hospitals, of which 15 are in Luanda, 2 in Benguela, 2 in Huambo, and 1 in Huila; (vii) 39 national level health facilities; and (viii) 83 non-classified health facilities. While the Government of the Republic of Angola (GRA) has prioritized increasing human resources for health (and the number of doctors tripled between 2005 and 2009), 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 central 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. The provincial level, which includes the *Direcção Provincial da Saúde* (Provincial Health Directorate [DPS]), is responsible for coordinating all health activities in the province and providing oversight to the general (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 and health staff, but each facility depends on the municipality for budget

¹ According to the WHO, access to health services is calculated as the percentage of population living within 5 km of a health facility (total number of health facilities per 10 000 population).

and procurement. Unfortunately, corruption and mismanagement have severely impacted the availability of budgetary resources at the municipal level.

The government recognizes the need to extend health services to the community level and to adopt 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) as part of the health system. In 2014, the ADECOS national policy framework was jointly developed and approved by the Angolan 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 7 provinces, with a target of 1,080 ADECOS trained initially (14,100 by 2018). MAT's three-month ADECO curriculum includes a limited training on providing basic services including testing with rapid diagnostic test (RDTs) and administering ACTs. Severe cases are to be referred to the nearest health facility. ADECOS are linked to municipal health centers, where integrated health teams will be responsible for performing routine supervision. Salaries and operational costs of the ADECOS will be covered by the Ministry of Territorial Administration. Roll out of ADECOS is likely to take longer than originally planned. One aspect of the ADECOS program that made this difficult is the fact that it is a multi-sectoral intervention; ADECOS will be tasked with assisting their communities in several aspects of development. However, that approval process may have been the most difficult hurdle to cross in getting the program going. The fact that the GRA has committed to having a cadre of ADECOS in the field in order to support the implementation of the Global Fund malaria grant is a positive sign. Global Fund principal recipient World Vision trained 313 ADECOS to provide iCCM services in 10 municipalities of three provinces (Malange, Moxico, and Lunda Norte). During the life of the 2016-2018 Global Fund grant, World Vision aims to train, support, and supervise a total of 1080 ADECOS. Through participation in the newly created iCCM technical working group, PMI is working closely with the NMCP, MAT, the Global Fund, and World Vision to coordinate geographic coverage and harmonize strategies in order to ensure that the national ADECOS program is implemented in a standardized fashion.

In 2013, the GRA approved the National Health Development Plan (PNDS), which outlines a strategy to improve the health system from 2012-2025. The PNDS was costed with technical support from PMI. As part of the PNDS all municipalities have developed municipal health development strategy which was designed to be funded by the Ministry of Finance, enabling them to plan health activities independently of the provincial level. However, the first years of implementation of this process have been hampered by poor management and lack of funding.

Prior to the interruption of the Global Fund grant in July 2015, the NMCP was composed of a core central technical group at the national level, including specialists responsible for epidemiology, parasitology, entomology, case management, malaria in pregnancy, monitoring and evaluation, and behavior change communication, as well as for administration and fund management with 40% of this staff previously hired by the Global Fund. Currently, the NMCP does not have the financial means to support the full staff previously supported by the Global Fund. The current Global Fund grant includes financial resources to hire at least three advisors: a data manager, a supply chain logistician, and a financial manager. However, none of these positions have been recruited for or filled by the MOH to date. In addition, there are 18 provincial malaria control supervisors (typically health technicians) and malaria municipal supervisors in the municipal health directorate staff who are responsible for institutional support in planning, implementing and managing malaria activities at these levels. Entomology core teams (34 technicians trained in entomology) have been created at provincial and municipal levels to conduct routine entomologic monitoring. A national insectary has been installed by PMI in the province of Huambo but has not been recently used because of the lack of human resources at the provincial level. PMI trained two basic entomologists with the aim that they will be funded by the provincial health system to maintain the insectary. A consultative reference group, the National Technical Committee for Malaria, has been constituted to provide technical assistance to the NMCP.

4. National malaria control strategy

The general objective of the National Malaria Strategic Plan (2016-2020) is to reduce malaria-related morbidity and mortality by 60% by 2020, from 2012 baseline figures. The Strategy includes the following objectives and targets:

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.

- (1) The GRA strategy calls for two approaches for ITN distribution: mass campaign distribution to achieve universal coverage (UC) and routine continuous distribution to maintain coverage. At the time of writing, the rolling mass distribution campaign, which started in 2013, was still underway, with mixed results; three provinces (Benguela, Huila, and Uige) are being covered by PMI in 2016. Routine distribution of ITNs occurs through the following channels: (i) distribution through antenatal care (ANC) clinics and the expanded program for immunization (EPI), and (ii) outreach services for communities with no or little access to health services, such as mobile municipal health units and municipal health days.
- (2) In addition to distributing ITNs to pregnant women to help prevent malaria in pregnancy, national policy calls for provision of IPTp with sulfadoxine-pyrimethamine (SP) at all health units with ANC services. The target is that by the end of 2020, at least 80% of pregnant women with access to ANC and targeted for IPTp receive at least three doses of IPTp with SP.

- (3) The NMCP strategy calls for indoor and outdoor residual spraying to be implemented in targeted areas of epidemic risks and low transmission. However, only outdoor spraying is being implemented, and on a small-scale, by other partners.
- (4) Larviciding is financed exclusively by the GRA with technical support from the Cuban government.

Malaria Case Management: In accordance with WHO guidelines, Angola’s strategic plan recommends that all suspected cases of malaria be diagnosed parasitologically, using either microscopy or RDTs. Only positively 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+piperaquine (DP). National treatment guidelines for severe malaria recommend (in order of preference) injectable artesunate, intramuscular artemether, and injectable quinine. Currently, malaria case management is only provided at the health facility level.

Since only 45% of the Angolan population has access to health facilities, the NMCP has extended malaria case management to the community level through the ADECOS program. The program is currently being piloted in two provinces supported by the Global Fund. PMI will support the roll-out of iCCM in other provinces using FY 2018 funds. The MoH approved the community case management policy for a pilot in some municipalities. The ADECOS program is a community development program consisting of workers at the community level providing education, BCC, and basic support related to health, water and sanitation, and other community development initiatives. The GRA is launching the ADECOS on a large scale, with support from the European Union. ICCM is not included in the standard package of services that ADECOS are trained to or expected to provide. However, both PMI and the Global Fund are supporting pilots of iCCM in different provinces, utilizing the ADECOS as a platform. The PMI pilot is not implemented in parallel, but is intended to inform future MOH strategies. We anticipate that the PMI pilot will provide examples of best practices and systems for quality assurance to the Global Fund-supported pilot. PMI will support an evaluation to determine the financial and operational feasibility of rolling out and scaling up iCCM.

Monitoring and Evaluation and Epidemiologic Surveillance: The NMCP has developed a 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. PMI supports an M&E Advisor who works with the NMCP’s M&E staff at the central and provincial level(s). 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. 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 for 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 still 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* (Central Procurement Agency for Medicines and Medical Supplies; CECOMA) is a part of the Angolan Ministry of Health (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 and three regional warehouses.

Due to theft of large quantities of PMI-funded commodities from the central warehouse in the past, PMI uses a parallel system to distribute its commodities. As reported in the FY 2016 PPR, capacity gaps in the GRA's public service delivery are compounded by excessive bureaucracy, inefficient fiscal procedures, **corruption**, and generally poor financial management. The Global Fund also uses a 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. The next MOU with the MOH will include accountability and transparency indicators to monitor improvements and highlight risk requiring immediate action from the U.S. Government.

5. Updates in the strategy section

- A March 2017 mid-year review of MOU completion by the Angola Mission and the MOH demonstrated that PMI is on target to meet nearly all of the U.S. Government's milestones, including those for procuring antimalarial drugs, RDTs, and 3.4 million mosquito nets. The review demonstrated that the GRA has improved their level of engagement and increased their contributions towards commodities compared to recent years, in addition to hiring two M&E staff. Since this review, the MOH has begun the procurement process for 1.1 million ITNs to support the first universal coverage campaign.
- At the time of writing, the ITNs the MOH committed to procuring have yet to arrive, and the amounts of RDTs and severe malaria medications procured by the MOH were much lower

than agreed. The MOH has not yet distributed the commodities they procured. MOH engagement on malaria control has improved significantly since 2015. After years of difficult cooperation, MOH and NMCP leadership now meet regularly with the PMI team, including monthly bilateral meetings to discuss progress made on the achievements of milestones outlined in the MOU, and to plan activities jointly. However, the U.S. Government continues to work closely with the MOH to encourage progress toward achieving the milestones set forth in the MOU.

- A phased nationwide ITN coverage campaign is underway covering 15 provinces throughout the country. Distribution for five provinces (Cuanza Norte, Cuanza Sul, Malange, Uige, and Zaire) will conclude by mid-July 2017. Phase 2 of the campaign will cover 2 provinces during the months of October-November 2017, and Phase 3 is expected to cover the remaining 9 provinces in March-April 2018. Sufficient quantities of ITNs are believed to be available for Phases 2 and 3 of the campaign. According to the Minister and the NMCP, half of the 10 million ITNs procured by the MOH is expected to arrive in August 2017.
- As a result of the successful PMI-funded pilot in Huambo, the MOH adopted the District Health Information System 2 (DHIS2) as its national platform for routine reporting of HMIS data. To ensure that every municipality, province, and vertical disease program is able to use the open-source platform for monthly reporting, PMI is working with PEPFAR, the European Union, the Global Fund, UNAIDS, and other partners to plan for a national DHIS2 deployment expected to begin in September 2017.
- Through the MOU, the GRA has demonstrated increased engagement and commitment. PMI plans to restart vector control activities, including strengthening capacity to conduct entomological monitoring and molecular testing at the central level and within the six PMI focus provinces.

6. Integration, collaboration, and coordination

Funding for malaria control in Angola is provided by the GRA, private partners (such as UNITEL, the ExxonMobil Foundation and Chevron), PMI, and the Global Fund. The consolidated Global Fund Round 7 and Round 10 grants ended in March 2015. The GRA has signed a new grant with the Global Fund which started in July 2016 and will end in June 2018. While the GRA has historically also received malaria contributions from the World Bank, WHO, UNICEF, Japan International Cooperation Agency (JICA), the Cuban Government, the Spanish Cooperation, the Global Alliance for Vaccines and Immunizations (GAVI), and private partners, PMI and the Global Fund are currently the only significant donors for malaria in Angola.

The overall GRA budget for health in 2017 is \$1.8 billion (4.21% of the overall national budget). Of this total, the National Endemic Diseases Program, including the malaria program, receives approximately \$4.1 million, not including salaries. These funds are used for commodity procurement, larviciding, training, and 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 then contribute to malaria prevention and treatment.

The GRA has financial resources to contribute to malaria control and prevention, as well as other important health priorities. Within the framework of the National Health Development Plan (PNDS), the GRA is costing program areas and allocating more resources to disease prevention. These resources, in conjunction with the potential for decentralization, afford an opportunity for the government, especially at the municipal levels, to assume more ownership and financial responsibility for its malaria control program. 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. Under the draft MOU (expected to be signed in July 2017), UNITEL commits to providing free mass SMS messages to promote ITN use in the provinces covered by the campaign. UNITEL will also provide free internet for the transmission of malaria data sent via mobile phones by ADECOS and via DHIS2 from municipalities.

The PMI team also approached several other local companies to leverage resources for the nationwide ITN campaign. As a result, Angolan Bank BFA and Angola LNG (liquefied natural gas) made small contributions of \$30,000 and 2,000 ITNs respectively.

NMCP Coordination

The NMCP works in close collaboration with other departments at the health directorate, such as Reproductive Health and Maternal and Child Health, on implementation of malaria in pregnancy interventions and Integrated Management of Childhood Illness. 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 civil society and other interested partners focused on malaria, was created in 2007 in order to help the NMCP coordinate partners' activities and minimize duplication of efforts and resources. Currently, there are about 100 members, including the NMCP, PMI, WHO, UNICEF, local and international NGOs and faith-based organizations (FBOs), bilateral and multilateral organizations, Angolan military forces, and private sector companies. The Malaria Partners Forum is also present in some provinces, but coordination of malaria activities remains weak at provincial level and varies from province to province. In 2016, ten provinces in Angola have established provincial malaria forums to coordinate the activities of partners.

Global Fund

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

Elimination 8 (E8)

While the primary objective of E8 is supporting malaria elimination in Namibia through cross-border initiatives, E8 is committed to working in concert with other partners supporting complementary activities in the southern provinces in Angola. E8 activities are funded by the Global Fund and the Bill and Melinda Gates Foundation.

World Bank

The World Bank's new \$100 million loan to the MOH focuses on health systems strengthening, and will pilot results-based financing in Angola. PMI/Angola has been coordinating with the World Bank on activities related to municipal planning and budgeting, and supply chain and health information systems strengthening.

Within the U.S. Government

PMI is supporting the national scale-up of DHIS2 in collaboration with PEPFAR and other donors and implementing partners.

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, towards 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% reduction from PMI's original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40% 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.²

² http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

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

To track progress toward achieving and sustaining scale of proven interventions (area of strategic focus #1), PMI will continue to track the key 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 households with at least one ITN for every two people
- 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 households in targeted districts protected by IRS
- 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

Activities funded with FY 2018 resources will contribute to monitoring these key indicators. Results from the DHS 2015-2016 will be used as baseline data to track progress and prioritize activities based on the trends. Additionally, data from routine reporting channels will be used regularly to track these indicators.

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, and so the figures reported for the proportion of children under 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. A DHS+ that incorporated malaria indicators was implemented in 2015-2016, following the national census of 2014. The results were officially published in June 2017.

Survey data for the major indicators used by PMI are presented in Table 1; these include baseline data from the 2006-2007 MIS, as well as results from the 2011 MIS and the 2015-2016 DHS+.

Table 1. Evolution of Key Survey-Based Malaria Indicators in Angola, from 2006 to 2016

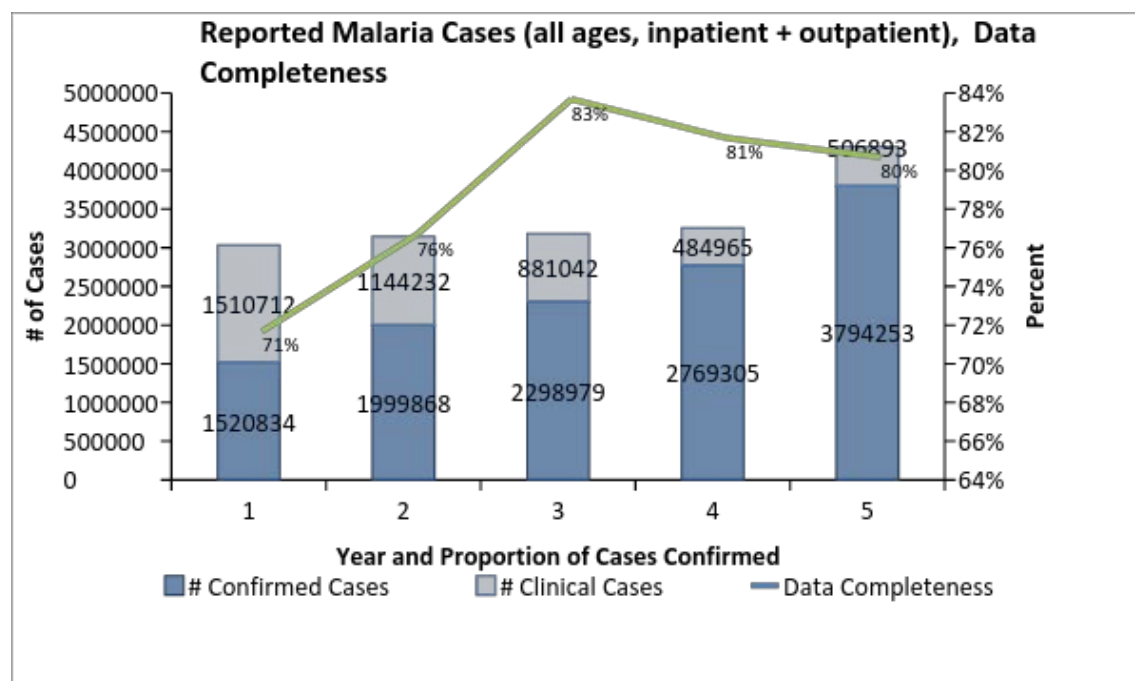
Indicator	2006-2007 MIS	2011 MIS	2015-2016 DHS+
% Households with at least one ITN	28%	35%	31%
% Households with at least one ITN for every two people	n/a	n/a	11%
% Children under five who slept under an ITN the previous night	18%	26%	22%
% Pregnant women who slept under an ITN the previous night	22%	26%	23%
% Households in targeted districts protected by IRS	n/a	n/a	n/a
% 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	n/a
% 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%
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%

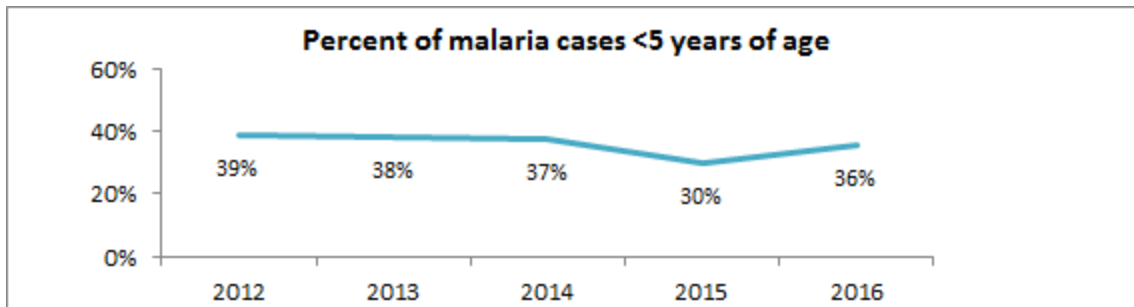
Table 2. Evolution of Key Malaria Indicators Reported Through Routine Surveillance Systems in Angola, from 2012 to 2016

Indicator	2012	2013	2014	2015	2016
Total # Cases	3,031,546	3,44,100	3,180,021	3,319,107	4,301,146
Total # Confirmed Cases	1,520,834	1,462,941	2,298,979	2,854,369	3,798,015
Total # Clinical Cases	1,510,712	1,144,232	881,042	464,738	504,311
Total # <5 Cases	1,713,358	1,201,408	1,189,891	1,250,039	1,531,695
Total # inpatient malaria deaths	5,736	3,712	5,714	8,581	15,997
Data Completeness* (%)	N/A	76%	82%	76%	82%
Test Positivity Rate (TPR)	46%	48%	44%	44%	53%

*Percentage of health facilities reporting each month

Figures 2-3: Trends in Key Routine-Based Malaria Indicators in Angola, from 2012 to 2016





9. Other relevant evidence on progress

The Angola 2015-2016 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 insecticide-treated nets 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.

Findings from the 2016 Health Facility Survey in Huambo and Uige province highlighted different case management practices at health facilities in both provinces. In Huambo, malaria cases seeking care in health facilities were not appropriately treated with anti-malarials, highlighting the importance of continued training and supervision of healthcare workers. These findings were published in *Malaria Journal* and presented to the DPS and malaria supervisor in Huambo Province. PMI presented recommendations to the DPS; however, given a shift in geographic focus, PMI could not provide additional support based on the findings. Recognizing the traditional healthcare worker training and supervision model does 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.

The 2015 Therapeutic efficacy study (TES) was conducted in three provinces: Benguela, Zaire, and Lunda Sul. Findings from this study were published in the *Malaria Journal* and presented at the 2017 ASTMH conference. All of the treatment failures were wildtype for the K13 marker of artemisinin resistance. These results confirmed the findings from the 2013 TES, which also showed an efficacy of less than 90% in Zaire Province. As such, the NMCP was informed that further monitoring is warranted to confirm lumefantrine resistance in Zaire Province. During the 2017 TES, which began in March 2017 and scheduled to end in August 2017, samples from the sentinel sites in Zaire Province will undergo additional testing at the University of Cape Town Research Institute to further assess efficacy of the anti-malarial lumefantrine.

In 2016, PMI supported a study examining opportunities and barriers for the delivery of IPTp services from the perspective of providers and patients in four provinces (178 health facilities): Huila, Huambo, Lunda Norte, and Zaire. The study found weak routine distribution of ITNs at ANC; greater availability and quality of services in the provinces that had previously received PMI support, and adequate overall collection of routine data on IPTp. Recommendations from the PMI study are informing national strategies to prevent malaria in pregnancy.

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. PMI prioritizes malaria prevention and case management, distributing quality commodities for the effective treatment and prevention of malaria, and supports capacity building at all levels of the health system. PMI does not support larviciding or outdoor spraying. From 2015-2017, 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 plans to support entomological monitoring and insecticide resistance through capacity building at the national level and within select PMI focus provinces with FY 2018 funds.

With FY 2018 funding, PMI will continue to focus support for malaria treatment and prevention activities in high prevalence provinces in the north: Kwanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire. Despite the new malaria prevalence map from the 2015-2016 DHS+, PMI will continue focusing on 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 2015-2016 DHS+ malaria prevalence results were likely affected by the increased rains in the south due to *El Niño*, and; 4) other partners such as E8, the Gates Foundation, and the Global Fund, are active in southern Angola.

In line with USAID Angola Country's Development Cooperation Strategy (CDCS), PMI will continue to emphasize capacity building and health systems strengthening across its interventions and identify opportunities to provide demand-driven technical assistance to the GRA. For example, PMI will continue to build the capacity of the MoH to provide quality malaria treatment services, conduct entomological monitoring; procure quality-assured antimalarial commodities, and manage its supply chain for health products.

1. Vector monitoring and 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% of the population with at least one vector control prevention measure (i.e. 80% of households own at least one ITN or houses treated with IRS, 80% of household owners to sleep under the ITN or in a house treated with IRS; and 80% of pregnant women and children under five years of age to sleep under an ITN or in a house treated with IRS). Entomologic monitoring of IRS and ITNs and their effect on the vector populations have been mostly implemented by PMI. The GRA-supported larviciding program targets the control of larval stages, but does not focus on

monitoring of adult insect populations. Larviciding is financed exclusively by the GRA with technical support from the Cuban Government.

Progress since PMI was launched

PMI conducted longitudinal entomologic surveillance in former IRS areas, for vector species, abundance, resting behavior, and mosquito malaria infection rates at a total of six sentinel sites in Huambo and Huila Provinces. Since May 2014, there have been four sentinel sites located in three municipalities in Huambo Province; Huambo (former IRS area), Caala (non-IRS area) and Bailundo (2014 IRS area). In Huila Province, there were two sentinel sites in the Chibaone Municipality in a former IRS area and the other in a non-IRS area. Monthly mosquito collections were performed with CDC light traps, pyrethrum spray collections (PSC), 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 Municipality ranging from 0 –11.4 mosquitoes/house/day, peaking in May and June.

With minimal entomological capacity in country, PMI supported developing a cadre of basic entomology technicians via field mosquito collection trainings; mosquito identification and rearing techniques; and insecticide resistance testing using both the WHO susceptibility and CDC bottle assay.

The GRA began collecting entomologic indicators in areas where IRS was previously implemented. PMI also supported insecticide resistance monitoring in Bailundo Municipality in Huambo, where IRS was conducted in 2014. The results indicated that 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 represent 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 in basic entomology monitoring techniques. These core teams performed basic entomology work and engaged directly with provincial health directors at the DPS.

Additionally, in 2014 PMI supported the construction of an entomology insectary to support IRS entomologic monitoring and evaluation in Huambo Province; this was the first insectary in Angola since the end of the civil war. The insectary can support the rearing of mosquitoes and staff can perform basic entomologic activities such as mosquito morphological identification and sample processing.

a. Entomologic Monitoring

Progress during the last 12-18 months

In February-March 2015, resistance testing field work was carried out in two phases:

- 1) an assessment of resistance levels of *Anopheles gambiae* s.l. to five insecticides approved by WHOPES for use in IRS and long-lasting ITN impregnation; 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.

For the assessment, only female *Anopheles* mosquitoes reared from larvae collected from different breeding sites and visually morphologically identified as *An. gambiae* s.l. were tested. Preliminary results of this study indicate the possible emergence of pyrethroid resistance in Angola, as most of the provinces show 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. Bendiocarb (carbamate class) and pirimiphos-methyl (organophosphate class) showed full susceptibility in all provinces where testing was conducted and could be good candidates for future vector control, particularly for IRS. Fenitrothion was only tested in three provinces.

A total of 3,629 *Anopheles* mosquitoes collected for the national susceptibility study were shipped to the CDC DPDM/Entomology Branch in July 2015 for molecular and biochemical analysis. Findings from the analysis were used to verify species identification within the main species complex, and assess the presence of the widely distributed *kdr* DNA mutation that confers pyrethroid resistance. Table 3 includes the results for 2,700 samples processed from seven out of nine provinces evaluated. At the time of writing the MOP, the remaining samples were still being analyzed.

The molecular analysis identified 14 different mosquito species in this study (Table 3), some of which have never before reported in Angola. This has a direct immediate implication on the interpretation of the susceptibility study performed with them, considering they were one species. The susceptibility profile should be determined specifically, as each species would respond independently to the selective pressure of insecticide-related interventions.

Table 3. Molecular Identification of Mosquito Species by Province in Angola, February-March 2015

Species detected by PCR	south			south-center		north				Total
	CUNENE	HUILA*	NAMIBE	BENGUELA [†]	HUAMBO	ZAIRE	LUANDA	MALANJE*	UIJE	
<i>An. gambiae</i>				3		95	307	301	326	
<i>An. arabiensis</i>	181	514	1	1	149		1	21		
<i>An. funestus</i>						1				
<i>An. rufipes</i>				3	136	9				
<i>An. coustani</i>					19	13				
<i>An. squamosus</i>	383									
<i>An. lesoni</i>						4				
<i>An. quadriannulatus</i>						1				
<i>An. coustani-like*</i>					8					
<i>An. theileri-like*</i>					6					
<i>An. vagus-like*</i>					6					
<i>An. philippinensis*</i>						1				
Unknown*			1	10		0				
No amplification*	55	85	0	0	24	9	54	54	2	
Total processed	619	599	2	17	348	133	362	376	328	2784
pending processing	0	0	478	359	0	0	0	0	0	837

Preliminary results of the molecular species identification of *Anopheles spp.* and the number of each species obtained in each surveyed province. * indicates that further analyses through DNA sequencing is required to unequivocally determine species. Samples pending processing are denoted in red.

The *kdr* analysis indicated that *kdr-east* and *kdr-west* mutations were absent in the *An. arabiensis* mosquitoes from Cunene, Huambo, and Huila, located in 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 of Luanda, Malanje, Uije, and Zaire. The *kdr-east* mutation was present in 0-25% of specimens, while the *west* mutation was found in 98-100% of the individuals evaluated from these four provinces. These results indicate the potential for pyrethroid resistance to develop in these populations, specifically in the *An. gambiae* populations from the northern region, and should be taken into account when planning new interventions for these regions (Table 4).

As PMI entomological monitoring and control activities had been halted in the country, it is necessary to report that the sole use of pyrethroid-impregnated LLINs as a strategy to prevent malaria transmission is being jeopardized by the insecticide resistance profiles observed in the *An. gambiae* populations from the northern provinces.

Baseline data on the insecticide resistance profile of *An. funestus* does not yet exist for Angola. In 2015, AIRS/PMI and the NMCP conducted a national susceptibility evaluation in nine provinces in Angola. Bioassays were carried out on adult mosquitos reared from larvae captured in each

province. Most mosquitoes were identified as *An. gambiae* and not *An. funestus* (as their larvae are very difficult to capture). A second study was done in 2016 to compare mosquito abundance around houses in select provinces in Angola. According to the morphological determination of ~5,500 mosquitoes captured, *An. funestus* was the species mostly found in houses in provinces in the North of Angola, and likely responsible for transmission. Unfortunately, technicians were unable assess these samples for insecticide resistance since these mosquitoes died from the "vacuum" capture methodology used to capture the adult mosquitoes. Currently, little is known about the *An. funestus* species in Angola due to limited human resources with the technical capacity to perform the field work and data on insecticide resistance in *An. funestus* for additional monitoring. Because *An. funestus* was found in abundance we propose prioritizing evaluating its insecticide susceptibility pattern, which is not yet known in that region. To address the human resource gap, technicians will be trained to capture and preserve adult *An. funestus* mosquitoes to be reared and perform bioassays. Building local technical capacity to collect and monitor for insecticide resistance in *An. funestus* is critical especially since data from the 2016 study indicate *An. funestus* was the species mostly found in homes in the northern provinces; where PMI focuses interventions in six hyperendemic provinces.

Table 4. *kdr* Mutation Screening Results from *An. arabiensis* and *An. gambiae* Mosquitoes Captured in 7 Provinces in Angola, 2015

		CUNENE	HUILA	HUAMBO	ZAIRE	LUANDA	MALANJE	UIJE
<i>An. arabiensis</i>	EAST susceptible	175	320	139	-	1	21	-
	WEST susceptible	176	320	138	-	-	20	-
	WEST resistant	-	-	-	-	-	1	-
	WEST RS (heterozygote)	-	-	-	-	1	-	-
<i>An. gambiae</i>	EAST susceptible	-	-	-	-	3	-	-
	EAST resistant	-	-	-	20	-	26	82
	WEST susceptible	-	-	-	-	-	-	-
	WEST resistant	-	-	-	95	304	303	293
	WEST RS (heterozygote)	-	-	-	-	3	-	-

From April 1, 2016 through August 31, 2016, PMI carried out bi-monthly entomological monitoring activities in three sentinel sites located in Cunene, Huambo, and Malanje Province. 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/Angola 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. PSC collections were performed in five randomly selected houses in each sentinel site per visit. From November 2015 through August 2016, 5,623 *Anopheles* mosquitoes were collected from all three sentinel sites. The majority of these mosquitoes were collected from indoor CDC light traps, followed by the PSC collection method. Mosquito identification was carried out using morphological identification keys. Out of all Anophelines

collected 90.6% were *An. funestus*, 4.9% were *An. gambiae s.l.*, and 4.6% were other Anophelines belonging to 11 different species, mostly *An. coustani* and *An. squamosus*. Three individual mosquitoes were unidentifiable. Molecular confirmation and identification to the species level is pending.

PMI decided to discontinue entomologic monitoring support for Angola in both FY 2016 and FY 2017 after the FY 2017 MOP planning visit in order to prioritize funding for the nationwide mass campaign outlined in the ITN section. Policy and regulations prevented registration of the PMI entomological implementing partner making entomological monitoring in country a challenge. This contributed to the perception that GRA was not invested in entomological monitoring of malaria vectors and contributed to PMI removing in-country entomological support.

Support for re-establishing entomologic support by PMI in Angola was based on demonstrated investment by GRA in entomological monitoring. In particular, PMI wanted to see that the three Angolan entomological technicians that were trained by PMI, would be hired as permanent personnel of the insectary based in Huambo, to perform entomological monitoring assessments on a national level.

Plans and justification

PMI will re-establish its support for entomologic monitoring using FY 2018 resources in light of the GRA's imminent hiring of the PMI-trained entomological technicians, a conditioned outlined in the MOU for PMI to restart entomology activities. PMI will begin with targeted technical assistance to the GRA both at the field and central level. The re-oriented focus of PMI will support the newly hired entomologic technicians to conduct entomologic monitoring support in the wake of the universal coverage campaign with ITNs. Entomologic monitoring support by PMI will include re-establishing the insectary in Huambo that has not been operational since PMI-support ended after the FY 2017 MOP planning visit. The MOH plans to expand the insectary with a second container. This would provide space in the insectary to separate colonies from insecticide resistance bioassay testing. Resources to expand the insectary with the second container, maintenance, and security would be provided by the GRA.

PMI will continue to provide technical support for entomologic monitoring in the collection and processing of mosquitoes and larvae at selected sites in the provinces where PMI supports other malaria control activities. The GRA continues to have entomological technical support from Brazilian, Cuban and Portuguese entomologists. PMI will work with the GRA to leverage its efforts in synergizing entomological support in country.

Proposed activities with FY 2018 funding: (\$265,000)

1. *Short-term technical assistance:* A CDC entomologist will travel to Angola to provide technical assistance to the GRA in entomological training to continue strengthening malaria entomological capacity in country; this includes organizing the insectary and providing refresher training on morphological identification, mosquito capture techniques, and establishing and training staff on

SOPs to assess the insecticide susceptibility of *An. funestus*. (\$35,000 including \$15,000 for a 2-week trip + \$20,000 for a 3-week trip)

2. *Long-term technical assistance*: Support to the GRA to cover trainings and *per diems*, field travel and recruitment of a local entomologist to provide technical assistance for vector control planning and coordination of entomological monitoring at the NMCP to include: monitor vector collection in select PMI-focus provinces, adapting specific methodology to capture adult mosquitoes, larvae and force oviposition, overseeing data collection and quality control of reports, and liaison to coordinate PMI entomology. (\$200,000)
3. *Supplies and reagents for insectary and field activities*: To support vector monitoring, identification of mosquito species, and insecticide susceptibility and bioassays. (\$30,000)

b. Insecticide-treated nets

Progress since PMI was launched

Since 2006, over 15 million nets have been distributed in the country through various partners. Multiple partners including the GRA, PMI, the Global Fund, UNICEF, UNITAID, JICA, Malaria No More, and the ExxonMobil Foundation have supported procurement and distribution of ITNs. In addition, there are nets available in the commercial sector for full price. PMI has procured and distributed 11.8 million ITNs and distributed 1.8 million ITNs procured by other partners since 2006. Between 2010 and 2013, 5,058,666 ITNs were procured and distributed through Global Fund Rounds 7 and 10, the GRA, PMI, JICA, and Exxon Mobil. Distribution has been accompanied by strong SBCC messaging to build and support a growing ITN culture in Angola.

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

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

In spite of 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 to focus ITN efforts exclusively on mass campaigns. PMI is postponing utilizing routine distribution systems until universal coverage has been reached through universal distribution campaigns, and a coherent national strategy to strengthen routine channels has been developed.

ITN durability was evaluated in Cuanza Sul and Uige Provinces beginning in 2011. DAWA Plus 2.0® campaign ITNs were randomly selected and evaluated for ownership, physical integrity and insecticidal activity over two years of use. Of the 268 households interviewed, ITN ownership decreased after two years post campaign: 70% (95% confidence interval (CI): 63-76%) and 55% (95% CI: 49-61%) retained at least one ITN after one year and two years, respectively. Of ITNs still at the household, hole damage was evident in 87% (95% CI: 78-93%) after one year and 88% (95% CI: 81-94%) after two years. Manufacturer specifications require deltamethrin concentrations of 80.0 mg/m². The median deltamethrin concentration among ITNs declined significantly from 45.7 mg/m² (95% CI 19.4–79.4) after one year to 27.9 mg/m² (95% CI 14.8–51.4) after two years (Kruskal-Wallis test, p=0.0007).

A recent secondary analysis of data from surveys conducted in Angola found that while access to ITNs is quite low, use of these ITNs is high across Angola where ITNs are available. During the 2011 MIS, 83% of nets were used the previous night, ranging from 63% (in Uige) to 100% (in Huambo). Differences by wealth quintile and residence were minimal overall, but when combined it can be seen that this indicator seemed to decline with increasing wealth in the urban areas, but not the rural areas. The analysis will be repeated when the more recent 2015-2016 DHS data set becomes available in July 2017; however, similar findings are expected. ITN distribution should be increased and SBCC should be continued throughout the country to maintain the very high use:access ratio here.

Progress during the last 12-18 months

To help Angola reach universal ITN coverage for the first time ever, PMI spent the last 12 months 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 16 provinces within eighteen months. Benguela and Huila (totaling 5 million people) were covered by provincial-level campaigns at the beginning of 2017, and are thus not included in the plans for this new nationwide mass campaign. The campaign uses a coordinated national approach—with simultaneous distribution in multiple provinces, rather than the province-by-province approach previously used. PMI contributes technical assistance in the areas of strategy development, macroplanning, microplanning, behavior change communication, household registration, ITN distribution, campaign monitoring, and process evaluation.

To improve campaign planning and implementation, PMI supported a strategic review of past campaigns to assess bottlenecks and identify potential time-saving measures for more efficient distribution. As a result 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. The most significant strategic shift is a drastic 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, this new national campaign has hired and trained more than 4,600 community agents to carry out door-to-door household registration, interpersonal behavior change communication, and ITN distribution activities in Phase 1.

Using this approach, PMI implementing partners were able to distribute 2.8 million ITNs in five provinces (Cuanza Norte, Cuanza Sul, Malange, Uige, and Zaire) during Phase 1 of the campaign. Whereas previous provincial campaigns were completed in 6-9 months, Phase 1 of this new national campaign lasted two months (May and June 2017). PMI contributed a total of 2 million ITNs to Phase 1 of the national campaign. Through PMI’s negotiations with the MOH, the 800,000 Global Fund-procured ITNs that were programmed for routine distribution were contributed to the campaign. The PMI team brokered public-private partnerships to mobilize additional resources from Angolan and multinational corporations. The natural gas production company Angola LNG contributed 2,000 ITNs for Zaire Province. Banco de Fomento Angola (BFA), the second largest bank in the country, contributed \$31,000. PMI signed an MOU with mobile network operator UNITEL to leverage the company’s telecommunication infrastructure and technology including SMS messaging for the promotion of net use.

Direct national coordination of the mass campaign by the NMCP has been lacking during Phase 1. This leadership gap has resulted in difficult situations for implementing partners who need to carefully juggle waiting for the NMCP to take the lead in activities and moving forward with activities with minimal NMCP involvement to ensure timely completion of activities. To motivate the NMCP to take ownership of the campaign, PMI worked to increase communication between all campaign stakeholders in the campaign, and organized a series of joint NMCP-PMI field visits to supervise campaign activities.

In preparation for Phase 2 of the mass campaign planned for October-November 2017, the PMI team successfully negotiated with the NMCP for the remaining ITNs from the Global Fund grant to be distributed as part of the campaign instead of through routine channels (as outlined in the grant). The U.S. Ambassador to Angola and PMI leadership reiterated this need to cover the ITN gap in their respective meetings with the Minister of Health. As a result of this advocacy, the Health Minister decided to procure 10 million ITNs - half of which are expected to arrive by early August 2017.

In addition to implementing a new mass national campaign, PMI completed a provincial campaign in Huila in 2017. As part of the campaign for Huila Province, PMI implementing partners distributed 1,065,573 ITNs to cover a population of nearly 1.6 million. The Huila campaign was completed in six months—between September 2016 and March 2017.

Commodity gap analysis

Table 5. ITN Gap Analysis

Calendar Year	2017	2018	2019
Total Targeted Population ¹	5,880,040	15,590,563	5,540,284
Continuous Distribution Needs			
Channel #1: ANC ²	1,184,185	1,247,220	1,333,759
Channel #2: EPI ³	634,121	666,608	778,529
<i>Estimated Total Need for Continuous Channels</i>	1,818,306	1,913,828	2,112,289
Mass Campaign Distribution Needs			
2017/2018/2019 mass distribution campaign(s)	Phase 1: Zaire, Malange, Cuaanza Norte, Cuanza Sul, plus previously uncovered municipalities of Uige and Huila	Phase 2: Cunene, Namibe Phase 3: Lunda Norte, Lunda Sul, Moxico, Cuando-Cubango, Huambo, Bengo, Bie, Cabinda, Luanda rural/peri-urban	Benguela plus Uige municipalities covered in 2016
<i>Estimated Total Need for Campaigns</i> ⁴	3,266,689	8,661,424	3,027,936
Total ITN Need: Routine and Campaign	5,084,995	10,575,252	5,140,224
Partner Contributions			
ITNs carried over from previous year	2,050	5,052,165	1,904,606
ITNs from MOH ⁵	5,000,000	5,000,000	
ITNs from Global Fund	1,652,110	1,427,693	
ITNs planned with PMI funding	3,483,000	1,000,000	211,228
Total ITNs Available	10,137,160	12,479,858	2,155,834
Total ITN Surplus (Gap)	5,052,165	1,904,606	(2,984,390)

1. The total targeted population was taken from this year's mass distribution campaign targets based on population estimates in those provinces/municipalities as well as NMCP's 2018 targets for the continued campaign next year accounting for provinces that have not yet been touched by the campaign. Year 2019 takes into account the INE projected population in the regions where the mass campaign took place during 2016 as the duration of use for the LLINs should be every 3 years.
2. ANC projections were performed using the following formula = total population X rate of pregnancy (5.2%) X percent of women with access to services
3. Whilst EPI projections used the following formula = total population X (4.3%) X rate of people with access to healthcare.
4. The total number of nets estimated for the mass distribution campaigns divided the target population by a factor of 1.8

nets per National Guidelines.

5. For the 10 million MOH-procured ITNs, based on conversations with the Health Minister, PMI expects that 5 million will arrive in 2017 and 2018 respectively; however, arrival dates and quantities for each shipment are yet to be confirmed.
6. It anticipated that the 2019 distribution to Uige and Benguela will be the MOH's responsibility with technical assistance from PMI.

Plans and justification

Helping Angola achieve—for the first time ever—universal coverage is PMI's number one priority for the country program. PMI will focus on successfully completing the 2017-2018 nationwide mass campaign by December 2018. However, achieving universal coverage will be challenging if the MOH does not fulfill its commitment to procure ITNs for the campaign. Phases 2 and 3 of the campaign will target the remaining 11 provinces not covered in Phase 1. An additional 836,304 ITNs will be procured with FY2017 funds for mass campaign distribution. Adding the 3.4 million ITNs procured with FY 2016 funds, PMI's contribution to the nationwide universal coverage campaign will total 4,483,000 nets. Findings and recommendations from a process evaluation conducted during Phase 1 of the campaign will be used to improve the implementation of Phases 2 and 3. Using lessons learned from Phase 1, the NMCP and PMI will review and validate all national tools and strategies to ensure that these can be used in future campaigns.

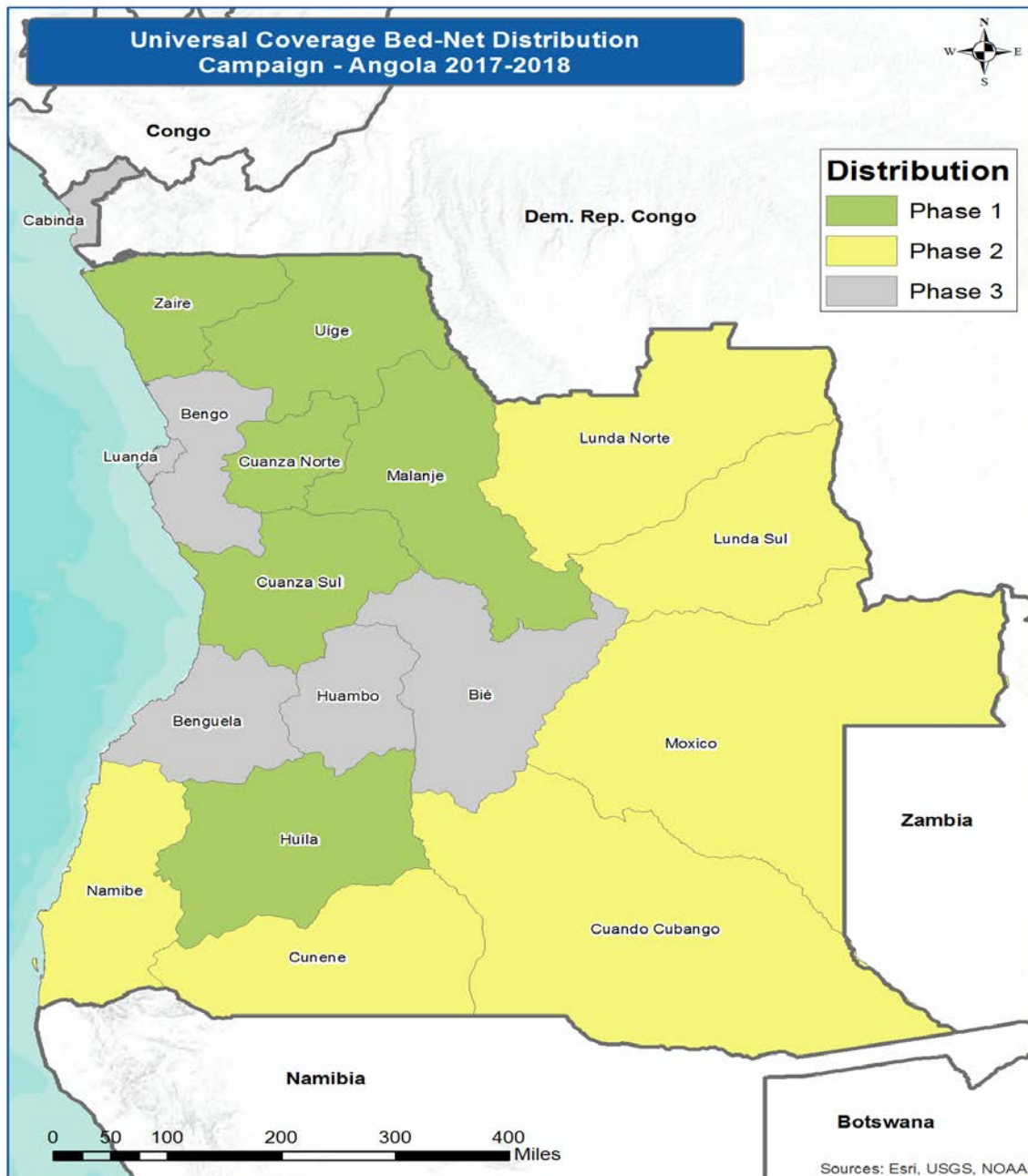
Starting in October 2017, Phase two of the campaign is expected to cover two provinces: Cunene and Namibe. The remaining nine provinces are expected to be covered in May 2018. The PMI team will continue negotiations with the MOH and the Global Fund to ensure that sufficient ITN quantities (about 6 million nets) are available for Phases 2 and 3 of the mass campaign. The MOH has informed the PMI team that 5 million ITNs will be available by September 2017 and the second tranche will follow next month. Timing of arrival of these MOH-procured ITNs will be important to ensure successful completion of Phases 2 and 3. The 2.2 million Global Fund ITNs currently programmed for routine distribution will only be needed for the mass campaign if the MOH-procured nets do not arrive in adequate quantities in advance of Phases 2 and 3.

Using findings and recommendations from an assessment of constraints to routine distribution, PMI will work with the NMCP and other malaria partners to develop national guidelines³ for routine ITN distribution. This PMI-funded technical assistance will entail activities such as an assessment of bottlenecks and identification of existing barriers in the routine system.

³ The government already has included in its national malaria control strategic plan the distribution of ITNs via ANC. However, the NMCP strategic plan is high level and lacks details on logistics, implementation, reporting, etc.

After the completion of the mass campaign, PMI will support technical assistance for continuous distribution in the areas of quantification, distribution planning, supervision, and reporting in the six focus provinces. PMI will procure 211,228 ITNs for continuous distribution in the six focus provinces. This quantity represents half (50%) of the estimated annual needs for continuous distribution at ANC and EPI.

Figure 4. Universal Coverage Campaign of Insecticide-Treated Nets Phased Distribution in Angola, 2017-2018



Proposed activities with FY 2018 funding: (\$3,197,493)

1. *Procurement of ITNs*: Procure approximately 211,228 ITNs for routine distribution to the six PMI focus provinces. (\$1,256,145)
2. *Distribution of ITNs*: Provide transportation from Luanda to municipalities for ITNs programmed for continuous distribution in the six PMI focus provinces. (\$1,641,348)
3. *Technical assistance for continuous distribution*: Support detailed distribution planning, supervision, logistical support for contribution distribution campaign in six provinces over a 12-month period. (\$300,000)

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 implementation support for IRS; 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 Provinces in 2005. Namibe Province was added in 2006, but, by 2008, both Namibe and Cunene were dropped and Huambo Province (previously a province with high transmission) was added. In 2010, Cunene was again added at the request of the NMCP, in support of Namibia's malaria pre-elimination efforts and as part of the Southern African Development Community plans for the elimination of malaria in the region. IRS was focused in municipalities where there was greatest movement 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 these areas where IRS was used, 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 have been 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. This was shown in 2013, when mortality dropped to under 50% at three months post-spraying with deltamethrin in Bailundo Municipality. 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 specification. However, insecticide resistance testing using the CDC bottle assay confirmed low levels of insecticide resistance to deltamethrin.

Table 6. PMI-Supported IRS Activities in Angola, 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

* In each province, only selected municipalities were sprayed, thus the whole province did not receive IRS.

** 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. Please see the Entomologic Monitoring section for more information on resistance monitoring in these areas.

Plans and justification

PMI will be ready to provide TA when the NMCP or the Provinces return to implementing IRS and request assistance. In the meantime, no IRS specific activities are planned.

Proposed activities with FY 2018 funding: (\$0)

No IRS activities will be supported with FY 2018 funds.

2. Malaria in pregnancy

NMCP/PMI objectives

The NMCP has a three-pronged approach to malaria prevention and control during pregnancy, including 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% of pregnant women sleep under an ITN.
- By the end of 2020, 80% 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 in accordance with national policy guidelines (see below) at all levels of the health pyramid including the community level.

Progress since PMI was launched

The 2011 MIS found that only 17.5% of pregnant women reported receiving at least two doses of IPTp during their last pregnancy, representing a significant increase up from 2% in 2007.

In 2013, in accordance with the new WHO guidelines, the NMCP adopted the new IPTp policy: 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. This policy currently applies to the entire country.

Services provided at ANC include IPTp, iron folate (5 mg dose)⁴, and BCC to promote prevention and treatment of MIP. However, most health centers do not provide ANC services and therefore do not provide IPTp. Nationally, 848 facilities provide ANC, out of a total of 2,350. The PMI-supported 2016 DHS showed an increase compared to the MIS 2011, and only 45.6% of births occurred in a health facility. The DHS also found that 53.9% of pregnant women received the first dose of SP, 36.8% received the second dose of SP, and 19% of pregnant women received three or more doses of SP.

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 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.

⁴ The GRA is still procuring the folic acid 5 mg despite the adoption of the new WHO IPTp policy and despite the advocacy by the stakeholders (WHO, UNICEF, USAID).

PMI and other stakeholders have always emphasized to the MOH that quantification exercises need to be conducted for folic acid of 0.4 mg for the pregnant women. The difficulty is that neither the NMCP nor the Department of Reproductive Health are involved in the MOH's procurement processes.

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 a total of 2,077 nurses on MIP representing 90% of the target, since 2011. In 2014, PMI collaborated with the NMCP, the Reproductive Health and the HIV departments to update the National Protocol for Malaria in Pregnancy and developed a new training manual based on the new policy adopted in 2013.

Progress during the last 12-18 months

The 2016 NMCP routine health system data indicate that of 850,053 pregnant women who made their first prenatal care visit, 31% received the first dose of IPTp, 21% the second dose, 11% the third dose, and 4% the fourth dose. While this is a slight increase from the 2011 baseline, it actually represents a decrease from the 2015 figure of 27%. The DHS 2015-2016 found that 61% of pregnant women have attended four or more antenatal visits, which is an increase compared to the MIS 2011, and only 45.6% of births. PMI addressed these weaknesses through greater investments in improving the supply chain at all levels (see Pharmaceutical Management section) and, also by providing SP in the six hyperendemic provinces (where PMI focused all its interventions) to reduce the level of stockouts at health facility level.

In 2016, PMI trained a total of 20 trainers on MIP; these trainers will in turn train 300 health workers by September 30, 2017. PMI shifted its geographic focus for improving clinical malaria services in Angola, and efforts to improve access to and quality of MIP services are focused in six provinces: Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire. Emphasis is placed on increasing the role of community health workers in encouraging women to access IPTp and on improving the quality of MIP services at the lowest level of health facilities in these provinces.

In September 2016, PMI realized 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*” will guide future PMI interventions for MIP.

Table 7. Status of IPTp Policy in Angola

Status of training on updated IPTp policy		Number and proportion of HCW trained on new policy in the last year if training on new policy is not yet completed	Are the revised guidelines available at the facility level?	ANC register updated to capture 3 doses of IPTp-SP	HMIS/ DHIS updated to capture 3 doses of IPTp-SP
Completed/Not Completed	Date (If completed, when, if not completed, when expected)				
Completed	2013	340 by September 30, 2017 (out of a total of 1,221 health workers are targeted for training in the 6 PMI focus provinces)	Partially	Yes	Yes

Commodity gap analysis

Table 8. SP Gap Analysis for Malaria in Pregnancy

Calendar Year	2017	2018	2019
Total population	28,359,634	29,250,009	30,175,553
SP Needs			
Total number of pregnant women attending ANC ¹	1,474,701	1,521,000	1,569,129
Total SP Need (in treatments)²	3,742,025	3,941,216	4,334,720
Partner Contributions			
SP carried over from previous year	100,250	0	0
SP from MOH	2,619,417	2,758,851	3,034,304
SP from Global Fund	0	0	0
SP from other donors	0	0	0
SP planned with PMI funding ³	0	788,244	813,186
Total SP Available	2,719,667	3,547,095	3,847,490
Total SP Surplus (Gap)	(1,022,358)	(394,121)	(487,230)

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 (RH) program of Angola.

2. According to the treatment guidelines of PNCM in 2015 for the management of malaria in Angola, four doses of SP 500/25 mg were assumed to be taken by each pregnant woman in the program.

3. PMI Angola will procure SP to meet 100% of the needs for the six PMI focus provinces

Plans and justification

This year PMI is committed to procuring SP for its geographic area (six provinces). The GRA will use the quantification to plan their procurements. Given that the MOH's procurement and distribution of SP nationwide is very inconsistent, PMI/Angola wants to maximize the benefits of the MIP training supported in PMI focus provinces by making sure that SP is readily available in those facilities. By ensuring that when health workers are trained and SP is available, 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 Provinces by promoting best practices. Training will focus on accurately implementing the updated IPTp protocols based on WHO 2012 recommendations and appropriate management of malaria in pregnancy.

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 community health workers.

PMI will continue to collaborate with the NMCP and Reproductive Health Division to strengthen prevention, diagnosis, and treatment of malaria in pregnancy at the facility and community level. PMI support will focus on supportive supervision, on-site training as needed, and quality improvement to increase provision of IPTp at every ANC visit, in accordance with national guidelines. PMI will ensure that the latest national IPTp guidelines are made available in health facilities for health workers providing ANC services.

Proposed activities with FY 2018 funding: (\$496,373)

1. *Procurement of sulfadoxine-pirimethamine*: Procure approximately 654,242 treatments for distribution to the six PMI focus provinces. (\$146,373)
2. *Training and supervision of healthcare workers*: In select provinces, while supporting supervisory structures and quality improvement practices. (\$350,000)
3. *SBCC to promote IPTp*: Through interpersonal communication (IPC) and outreach at the community level. (\$0 – costs covered under SBCC section)

3. Case management

a. Diagnosis and treatment

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 is committed to expanding access to ACTs, with the objective that all malaria cases seen in health facilities and the community be treated in accordance with national treatment guidelines by 2020. The NMCP equally 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 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. IV quinine is the third-line option for treatment of severe malaria, but is commonly used due to unavailability of IV artesunate or IM artemether. For pre-referral treatment of severe

disease, country guidelines recommend rectal artesunate suppositories for all ages (including adults) even though this is contrary to WHO guidelines, which specify pre-referral rectal artesunate should be restricted to children under the age of six. Additionally, very little, if any, training for rectal artesunate has been offered nationally. At this time, PMI does not plan to procure rectal artesunate, but will continue to be closely engaged to understand the plans for roll-out and scale-up and the implications for the WHO guidelines around age. For *P. vivax* and *P. ovale* infections, a course of primaquine in addition to an ACT is also recommended, except during pregnancy. The GRA has extended the health services to the community level and has adopted iCCM.

The NMCP has been leading the process to pilot a community approach using ADECOS as part of the health system. The main objectives of 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), vaccination, improved sanitation, access to safe water, as well as diagnose and treat the main causes of childhood fever, malaria, diarrhea and pneumonia. The planned three-month curriculum includes training on providing some basic services including testing with RDTs and administering ACTs. Severe cases are to be referred to the nearest health facility with a referral slip correctly filled. ADECOS will be linked to municipal health centers, where integrated health teams will be responsible for performing routine supervision. The NMCP is planning a scaled approach for ADECOS health interventions. After six months of testing and treating malaria at the community level, this intervention will be evaluated. If the results are satisfactory, the ADECOS will be trained for the diarrhea component and, after a defined period of implementation, another evaluation will be realized. If results are satisfactory, the pneumonia component will be piloted. At this early stage, the supervision will be on a monthly basis.

Table 9. Status of Case Management Policy in Angola

Status of Case Management Policy in Angola according to National malaria protocol: “Diretrizes e normas de conduta para o diagnóstico e tratamento da malária” de 2014	
What is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria?	Artemether-lumefantrine, artesunate-amodiaquine, dihydroartemisinin-piperaquine *Add primaquine to one of the previous treatments if <i>P. vivax</i> or <i>P. ovale</i>
What is the second-line treatment for uncomplicated <i>P. falciparum</i> malaria?	Oral quinine + tetracycline/doxycycline/clindamycin
What is the first-line treatment for severe malaria?	Artesunate IV/IM
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester?	Oral quinine
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters?	Artemether-lumefantrine, artesunate-amodiaquine, dihydroartemisinin-piperaquine
In pregnancy, what is the first-line treatment for severe malaria?	Quinine IV
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
Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?	No.
If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administering to those ≥ 6 years)	For all ages.

Progress since PMI was launched

PMI has supported the NMCP’s transition from routine clinical diagnosis of malaria to laboratory confirmation with RDTs and microscopy for all suspect malaria cases. Since 2006, PMI has procured over 28 million ACTs, 13 million RDTs, and over 260 microscopes and malaria microscopy kits. Since 2011, PMI has worked in concert with the NMCP to improve case management in Angola. PMI conducted health worker malaria case management training sessions 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 have reached:

- 1) 837 doctors representing 122% of the total targeted in one-day sessions focusing on ACTs, RDTs, and severe malaria treatment;
- 2) 7,097 nurses (94% of the total targeted) in three-day sessions focusing on malaria case management fundamentals and 3,420 nurses (77% of the total targeted) in a one-day refresher of case management fundamentals;
- 3) 1,148 laboratory technicians accounted for 125% during the project life in 10-day sessions focusing on microscopy and RDT use and 1,439 laboratory technicians representing 96% of the total targeted in two-day refresher sessions; and
- 4) 1,147 municipality warehouse managers representing 93% of the total targeted in three-day sessions and 1,606 accounted for 75% of the total targeted in one-day sessions focusing on commodity stocking and management fundamentals.

In addition to these structured educational sessions, PMI also supported supervisory visits to each healthcare facility in the 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 in FY 2016.⁵ A member from the national level is also sometimes present for these visits (PMI has supported the training and mentorship of 11 national level laboratory trainers and supervisors). Some of the items evaluated during these visits include, but are not limited to:

- 1) Pharmacy: Malaria medication organization and availability;
- 2) Laboratory: Technician staffing and availability of reagents, properly functioning equipment and facility of use;
- 3) Personnel: Number of doctors, nurses, and other healthcare workers; ability of healthcare workers to adequately demonstrate the use of RDTs and ACTs;
- 4) 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 realize the monthly report for the HMIS to inform evidence-based decision-making.

Data from a 2016 Health Facility Survey⁶ indicate that supervision is not happening as often as the desired target of twice annually. In Uige, only 69% of healthcare workers received a supervisory visit in the last six months; in Huambo, the percentage was even lower, at 58%. The national guideline recommends supervisory visits from the national level to the provincial level twice per year, from the

⁵ The supervisory visits were implemented based on the need of the health facility. If a health facility needs more supervision, the emphasis will be there.

⁶ <https://malariajournal.biomedcentral.com/articles/10.1186/s12936-017-1843-7/>

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 and in particular the DPS at the provincial levels to evaluate roadblocks to supervision and focus on increasing the number of quality supervisory visits to improve the quality of case management.

Although data reported through the parallel NMCP reporting and recording system indicate that 85% of suspect cases were tested either by RDT or microscopy in 2014, these data likely significantly overestimate the true testing rate. For example, the 2016 health facility study showed that only 31% and 70% of suspected malaria cases in Huambo and Uige, respectively, were evaluated with an RDT or microscopy. Challenges encountered in Angola include low access (45%) 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 test results to correctly prescribe 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, in many health facilities. PMI supported a therapeutic efficacy study (TES) in Angola in 2013 and 2015.

Progress during the last 12-18 months

PMI procured and distributed 2,969 million ACTs and 3,125 million RDTs in FY 2016. Less than half of tested Angolans seek care in the public sector, reportedly due to poor service delivery, among other factors. Therefore PMI is supporting case management training for healthcare workers to improve service delivery. PMI supported a pilot project to provide malaria testing and treatment in private pharmacies. The implementing partner has turned this pilot project into a social enterprise and continues to expand this activity after PMI support ended. In this model, private pharmacies buy RDTs and ACTs from the PMI implementing partner, and then sell a malaria test and treatment “service.” Patients pay a small fee and are administered an RDT, and if positive, the test becomes free if they purchase an ACT. Many private pharmacies have expressed their satisfaction with this approach, and the project is expected to transition to be self-sustaining later this year. During the first half of 2016, many Angolan hospitals reported an increase of 50% of confirmed malaria cases (both uncomplicated and severe) and an unexpected increase of 25% of deaths compared to 2015 data. Many of these reports originated from the capital city of Luanda, but other Angolan municipalities in other provinces experienced increases as well. Of the many possible attributable factors for the increase in the number of severe malaria cases and deaths, one of the most evident is an overall lack of malaria commodities and therefore lack or inappropriate case management. After this upsurge of cases, the GRA procured 3.3 million ACT treatments and PMI contributed an additional 500,000 treatments.

In 2016, PMI/Angola initiated a bilateral dialogue with the GRA based on the critical challenges the Angolan team faced in the recent past years. PMI/Angola, with the leadership of the U.S. Ambassador, has agreed with the MOH -through an MOU- on some benchmarks each party has to achieve by September 30th, 2017. The emphasis was placed on the procurement of malaria commodities, but case

management activities were also streamlined. The partial results of the MOU show that that the GRA has procured more ACTs and RDTs since June 2016 than it had in the past 3 years. However, corruption and the GRA not using the pooled procurement mechanism inflates the costs of drugs and has limited the GRA’s ability to procure enough commodities in a timely fashion.

Table 10. TES Studies

Completed TES Studies		
Year	Province	Year
2013	Uige, Zaire	AL, DP
2015	Benguela, Lunda Sul, Zaire	AL, AS-AQ, DP
Ongoing TES Studies		
Year	Province	Year
2017	Benguela, Lunda Sul, Zaire	AL, AS-AQ, DP
Planned TES Studies FY 2018		
Year	Province	Year
2019	Benguela, Lunda Sul, Zaire	AL, AS-AQ, DP

The 2013 TES⁷ conducted in Uige and Zaire Provinces found PCR-corrected efficacy of DP of 100% in both Uige and Zaire, and a PCR-corrected efficacy of AL of 97% in Uige and 88% in Zaire. Although there was molecular evidence of lumefantrine resistance in Zaire Province, all of the treatment failures were wildtype for the K13 artemisinin resistance marker. Angola participates in the PMI Antimalarial Resistance Monitoring in Africa (PARMA) network, whose laboratory evaluation demonstrated that all treatment failures were 36 wildtype for K13 (the mutation associated with artemisinin resistance), but all AL treatment failures had pfmdr1 haplotypes previously associated with decreased susceptibility to lumefantrine. The aforementioned TES and PARMA results indicate a parasite population sensitive to artemisinin derivatives. In 2015, the TES⁸ conducted in Benguela, Lunda Sul, and Zaire Provinces found that the 28-day microsatellite-corrected efficacy was 96.3% (95% CI 91–100) for AL in Benguela, 99.9% (95–100) for ASAQ in Benguela, 88.1% (81–95) for AL in Zaire, and 100% for ASAQ in Lunda Sul. For DP, the 42-day corrected efficacy was 98.8% (96–100) in Zaire and 100% in Lunda Sul. In general, all three of the partner drugs to the artemisinin derivatives were efficacious in sufficiently suppressing the initial malaria infection.

⁷<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4291383/>

⁸ <https://malariajournal.biomedcentral.com/articles/10.1186/s12936-017-1712-4>

Commodity gap analysis

Table 11: RDT Gap Analysis

Calendar Year	2017	2018	2019
RDT Needs			
Total country population ¹	28,359,634	29,250,009	30,175,553
Population at risk for malaria	28,359,634	29,250,009	30,175,553
PMI-targeted at-risk population ²	5,671,927	5,850,002	6,035,111
Total number of projected fever cases ³	11,279,252	11,933,946	13,877,753
Percent of fever cases tested with an RDT. ⁴	38%	48%	58%
Total RDT Needs	4,286,116	5,728,294	8,049,097
Partner Contributions			
RDTs carried over from previous year	159,275	5,946,725	2,758,899
RDTs from Government	2,571,670	3,580,184	5,245,791
RDTs from Global Fund	4,651,896	0	0
RDTs from other donors	0	0	0
RDTs planned with PMI funding ⁵	2,850,000	1,943,771	1,613,330
Total RDTs Available	10,232,841	11,470,680	9,618,020
Total RDT Surplus (Gap)	5,946,725	5,742,386	1,568,923

1. Total population figures are based on the final 2014 census data with a 2.7% annual increase.
2. PMI targeted population in 6 provinces corresponds to 20% of the total population
3. Based on the following population breakdown and number of fevers per age group:
 - a. <5 years (11.77% of the population); 1.5 fevers/year
 - b. 5-9 years (20.91% of the population); 1.0 fevers/year
 - c. 10-14 years (14.61% of the population); 0.63 fevers/year
 - d. > 14 years (52.71% of the population); 0.38 fevers/year
4. Assumes the following percentage of people will have access to public health facilities: 52% 2017; 53% in 2018; and 60% in 2019 and also assuming that the access to iCCM will be 4% in 2017, 5% in 2018, and 6% in 2019. This also assumes that 38%, 27%, and 35% of fevers will be assessed by RDT, microscopy, and clinically, respectively in 2017; that 48%, 28%, and 24% of fevers will be assessed by RDT,

microscopy, and clinically, respectively in 2018; that 58%, 30%, and 12% of fevers will be assessed by RDT, microscopy, and clinically, respectively in 2019.

5. RDTs planned with PMI funds are based on the assumption that PMI will cover 6 targeted provinces which represented 20% of the total projected fever cases attending the health facilities, 25% of the total projected fever cases attending the iCCM and a buffer stock of 15% of the needs at the national level. Those RDTs will be gradually reduced by 17% year after year due to the PMI Angola budget reduction.
6. In 2019, the large gap is due to the fact that PMI is only focused in 6 provinces with the aim to gradually reduce the acquisition of commodities by 17% per year. GRA and Global Fund will be expected to fill this gap.

Table 12: ACT Gap Analysis

Calendar Year	2017	2018	2019
ACT Needs			
Total country population ¹	28,359,634	29,250,009	30,175,553
Population at risk for malaria	28,359,634	29,250,009	30,175,553
PMI-targeted at-risk population ²	5,671,927	5,850,002	6,035,111
Total projected number of malaria ³ cases	4,849,853	5,625,424	6,081,231
Total ACT Needs	4,413,366	5,123,636	5,538,785
Partner Contributions			
ACTs carried over from previous year	215,881	1,248,781	863,535
ACTs from Government	2,648,020	3,074,181	3,323,271
ACTs from Global Fund	1,586,246	511,391	819,713
ACTs from Other Donors	536,000	0	0
ACTs planned with PMI funding ⁴	676,000	1,152,818	956,839
Total ACTs Available	5,662,147	5,987,171	5,963,358
Total ACT Surplus (Gap)	1,248,781	863,535	424,573

1. Total population figures are based on the final 2014 census data with a 2.7% annual increase.
2. PMI targeted population in 6 provinces corresponds to 20% of the total population
3. 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 and the projected positivity rates.
4. ACTs planned with PMI funds are based on the assumption that PMI will cover 6 targeted provinces which represented 18% of the total projected fever cases attending the health facilities and 25% of the total projected fever cases attending the iCCM. Those ACTs will be gradually reduced by 17% year after year due to the PMI Angola budget reduction.

Plans and justification

The NMCP and PMI participate in a national commodity quantification exercise annually, where the country's total need for RDTs and ACTs is estimated. PMI will procure 20% of that total required amount of RDTs and ACTs with FY 2018 resources for activities at the health facilities level, and will procure one quarter of ACT and RDT needs for activities at the community level. Consistent with PMI policy, the RDTs will be single-species *Plasmodium falciparum* tests. Based on recent TES results and cost comparisons, PMI will procure the ACT AS-AQ, a move supported by the NMCP; the TES demonstrated a reduced efficacy of AL (attributable to the lumefantrine and not the artemether component), while AS-AQ maintained high efficacy. The goal is for the GRA to fill at least half of the ACT and RDT gap, an objective that has been communicated to the GRA.

PMI will support two planning and coordination visits in preparation for the 2019 TES. PMI Angola follows WHO recommendation and PMI policy to implement a TES every two years to monitor efficacy of antimalarial medicines as a key component of malaria control.

The GRA plans to use IM artemether preferentially in peripheral health facilities, while reserving IV artesunate for larger hospitals with the capacity to provide IV treatment. While the GRA remains responsible for the procurement of severe malaria supplies, PMI plans to procure a limited amount aimed at covering the needs of the six PMI focus provinces, which represents approximately 20% of the total need of severe treatments to complement the GRA's continued efforts to procure quality-assured parenteral artemisinin derivatives. No rectal artesunate suppositories will be procured with PMI funding due to the current lack of training in this treatment modality.

Since expansion of access to RDTs and ACTs necessarily involves improving case management at the health facility level, PMI will continue to support training, supervision, and mentoring of healthcare workers and laboratory technicians. Capitalizing on the presence of provincial and municipal malaria supervisors, PMI will work to strengthen their capacity to train and supervise healthcare workers on malaria case management. This will involve training the supervisors on formative supervision and supporting them to be able to conduct regular, scheduled supervisions in health facilities in their areas. Similarly, PMI will support and train provincial-level laboratory supervisors to build their technical capacity to properly conduct trainings and formative supervisions, and provide them with logistical support to conduct regular, scheduled supervisions in laboratories in their areas. These activities will be focused in municipalities located in the provinces of Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire, although provincial supervisors from all 18 provinces will receive training. PMI will support the NMCP's plan to introduce iCCM through the ADECOS system, in Lunda Sul and Zaire (municipalities have yet to be determined) and possibly extend to other provinces within this geographic scope. In 2017, the GRA and the Global Fund started the implementation for iCCM in 10 municipalities in 3 provinces. A total of 46 trainers were trained in the provinces of Lunda Norte, Malanje, and Moxico; 313 ADECOS were trained and had started the implementation of RDTs and ACTs in 10 municipalities of the 3 provinces listed previously. A total of 3,438 patients were tested with RDTs in Malange and Moxico and 2,279 cases were treated with ACTs during a period of two months. PMI will

start the training of the ADECOs in the 1st quarter of FY 2018. This will include training existing ADECOS to incorporate iCCM into their activities, establishing supervisory systems to ensure quality control and logistics systems to ensure a secure supply of RDTs and ACTs. PMI will also support training of ADECOS in best practices for IPC and SBCC techniques (see SBCC section for details and associated costs). Salaries for ADECOS will not be supplied by PMI. Some deficiencies were noticed during this first phase of implementation. The lack of human resources at the NMCP was a challenge for the leadership of the implementation of this pilot. PMI is planning to have seconded staff at the NMCP to build NMCP capacity for the iCCM component and to reinforce the skills of the NMCP staff in the case management.

Proposed activities with FY 2018 funding: (\$5,792,356)

- 1) *Procurement of RDTs*: Procurement of approximately 1.6 million RDTs for the public sector. (\$855,065)
- 2) *Procurement of ACTs*: Procurement of approximately 957,000 treatments of ASAQ for the public sector. (\$602,808)
- 3) *Procurement of treatments for severe malaria*: Procurement of both IM artemether and IV artesunate to be used in referral centers and larger health centers, respectively. (\$359,483)⁹
- 4) *Therapeutic Efficacy Study (TES)*: Implementation of the 2019 TES. (\$320,000)
- 5) *Strengthen malaria case management*: Training and supporting formative supervision for provincial and health facility workers to improve malaria case management. This activity will include (\$2,000,000):
 - a) Training of trainers at the provincial and municipal level of malaria supervisors on conducting formative supervision. All trainings will be coordinated with the NMCP and will last three to five days. The geographic focus will be the provinces of Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Uige, and Zaire, which together possess more than 650 health facilities and 20% of the national population. (\$1,000,000):
 - b) Training of trainers for 18 provinces, 2 participants per province. (\$200,000)
 - c) Training of trainers for 48 municipalities (6 PMI provinces), 2 participants per province. (\$50,000)

⁹ Assumes 8% of 5.6M malaria cases are severe. Proportions and number of simple and severe malaria cases by group, including age groups and pregnant women, were based on 2016 data from the NMCP database, which compiles aggregate data reported by health facilities using the case definition of severe malaria (i.e. # of malaria cases hospitalized) from the National Diagnostics and Treatment Guidelines Malaria. Angola has yet to lose severe malaria medication due to expiration.

- d) Support to municipal level (malaria supervisors) to provide regular supervision visits to health facilities on a quarterly basis. Training of provincial supervisor, 1 supervisor in PMI's 6 focus provinces. (\$30,000)
 - e) Training of municipal supervisor, 1 supervisor in PMI's focus municipalities. (\$20,000)
 - f) Supervision visits to health facilities in 48 municipalities. (\$700,000)
- 6) *Diagnosis training and supervision: Laboratory diagnosis (RDTs and microscopy) and quality control (\$951,391)*
- a) Training of laboratory provincial supervisor in the 18 provinces. (\$100,000)
 - b) Training of municipal supervisor, 1 supervisor in PMI focus municipalities. (\$250,000)
 - c) Supervision visit to 18 provincial laboratories. (\$50,000)
 - d) Supervision visit to 48 municipal laboratories. (\$151,391)
 - e) Supervision to improve malaria diagnostics in the laboratory (on-the-job training) of trainers at the provincial level. (\$150,000)
 - f) Supervision to improve malaria diagnostics in the laboratory (on-the-job training) of trainers at the municipal level. (\$250,000)
- 7) *Institutional capacity building on case management: Seconded technical advisor placed in NMCP to provide technical support on case management, including iCCM. (\$400,000)*
- 8) *Expand support to iCCM/ADECOS activity: In coordination with the Global Fund, PMI will continue to support the GRA's iCCM initiative with ADECOS to include new municipalities within provinces that have previously received support. PMI will provide RDTs and ACTs; the MoH will provide commodities for the other diseases included in the care package (ex. pneumonia, diarrhea). (\$975,000)*
- Funding amount for iCCM will be used as follows:
- a) Training of senior ADECOS trainers on iCCM; training of senior ADECOS on M&E for iCCM (\$700,000)
 - b) Thermometers; registration book for data collection; ADECOS backpack, raincoats, boots; cellphones (\$275,000)

b. Pharmaceutical management

NMCP/PMI objectives

PMI and the NMCP's goals are to prevent stockouts of ACTs, RDTs, severe malaria treatments, and other malaria-related commodities at public health facilities. PMI is committed to working with the National Directorate of Medicines and Equipment (DNME) and the parastatal central medical stores (CECOMA) to strengthen the GRA national distribution system to the point that it can assume distribution of government- 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. At present, all products that need to be tested are sent to laboratories in Portugal or Brazil as there is no in-country capacity for in-depth quality assurance testing. The DNME also has a Department of Pharmacovigilance established to track adverse events from medications. A PMI and USAID-supported assessment of the medicines 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 the parastatal central medical stores, CECOMA. Since 2009, PMI has supported an augmented supply chain system for PMI-procured commodities; all commodities are delivered directly to the provincial warehouses, bypassing CECOMA. The provinces then assume responsibility for the ultimate delivery to health facility level. Due to the provincial authorities limited availability of vehicles and fuel, delivery from provinces to health facilities remains weak, with some provincial warehouses possessing expiring stocks while, at the same time, many health facilities experienced 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. The GRA does not yet have a qualified central level laboratory or an adequate surveillance system to systematically evaluate the quality of pharmaceutical commodities coming into Angola. Angola has a push system in which commodities that have arrived at the provincial level are immediately sent to the facilities for use. While this system has some benefits, in that stocks arrive to the end-user while minimizing lost time at the warehouse, there is little evidence 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 through the central medical stores. PMI-procured supplies are usually delivered to all provincial warehouses within two weeks of arrival in the country. PMI supports end-use verification (EUV) surveys biannually to monitor stock levels and capacity for case management at the 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 Provinces, which included strengthening their capacity for budgeting, planning, and M&E.

In late 2012, PMI assisted the NMCP to quantify and forecast malaria commodity needs for 2013 through 2015. In order to build capacity for the NMCP to conduct quantification routinely and independently, a five-day workshop was conducted to strengthen the understanding of quantification

methods and develop terms of reference for the national quantification technical working group. PMI has been working closely with the NMCP to develop an operational strategy, standard operating procedures, 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 budgets, with the goal of leading to a comprehensive national supply chain strategy. Concurrently, PMI provided assistance to the NMCP in the data-driven development of quarterly distribution plans to efficiently distribute malaria commodities to the provinces, as well as a forecasting tool to predict future demand for malaria commodities.

Progress during the last 12-18 months

In Angola, the governance of the supply chain and the management system is still challenging. During the last year, PMI has supported the NMCP, the DNME, and CECOMA to improve the supply chain and its management system. During the past year, PMI continued to provide a significant portion of malaria commodities jointly with the Global Fund. PMI continues the process of delivering PMI-procured commodities directly to the provincial level; however, PMI also maintained its support to strengthen the national supply chain and address weaknesses. To sustain an inclusive mechanism of forecasting and supply planning, PMI advocated for the establishment and implementation of a consensus-based national quantification mechanism for antimalarial commodities. The Malaria Quantification Technical Working Group recently began convening and is now fully operational. The Working Group uses a participatory, on-the-job, capacity building approach that includes improving the warehouse operation management system and tools, and optimizing warehouse layout to improve processes and efficiently utilize storage space. Technical assistance from the embedded advisors at CECOMA resulted in the development of distribution plans to avoid losing expiring ACTs, as well as monthly warehouse planning meetings, and the mapping of data flows for the national LMIS. These changes in CECOMA are being led and monitored by CECOMA leadership for ownership and sustainability through regular technical meetings. In order to obtain preliminary data on the quality of medications in the country, medications were collected in Luanda and sent to an accredited laboratory for testing. Although not nationally representative, the results of this baseline data gathering exercise were received and discussed with the General Inspection of Health (*Inspecção Geral da Saúde*) and DNME. In order to facilitate in-country quality testing, PMI supported a training workshop at DNME on the use of Minilabs® in Luanda in February 2017.

PMI supported a round of EUV surveys in December 2016, and a second one is ongoing. The ongoing survey includes six provinces: Cuanza Sul, Cunene, Cuando Cubango, Huambo, Luanda, and Uige. The most recent survey, which included 47 health facilities in 6 provinces, found low rates of ACT (58%) and RDT (42%) availability on the day of visit. The low proportion of staff trained in pharmaceutical

management (29%) was accompanied by widespread weaknesses in commodities management, including the lack of use of stock cards and poor commodity storage conditions in most facilities.

In 2017, PMI has trained 153 health workers in the provinces of Malanje and Zaire on warehouse management. In 2017, PMI conducted a national supply chain assessment with 100 sites visited in seven provinces. The report of this assessment was shared with the MOH and a workshop will be realized with the representatives of the Provincial Directorate of Health and with the different departments of the MOH involved in the supply chain to analyze together the findings of the assessment and to define the way forward.

Plans and justification

PMI will continue to strengthen supply chain, logistics, and pharmaceutical management including forecasting, quantification, training, supervision, and monitoring stocks and malaria commodity needs/gaps. PMI will work with the NMCP, MoH, and appropriate partners for improved supply and distribution plans to ensure that essential life-saving drugs, including RDTs and ACTs, reach the end user. Assistance will emphasize sustainability and capacity building with two seconded technical advisors working directly with their Angolan counterparts, creating the appropriate regulatory framework, and training a skilled cadre to continue to strengthen the MoH distribution system. Both technical advisors are placed at CECOMA to provide organizational capacity building and technical assistance on supply chain management. PMI is also supporting the MOH in the implementation of the logistics management information systems at all levels: national, provincial, municipal, and health facility. While the eventual transition to a single distribution system is prepared, PMI will continue to support a separate distribution system for PMI-procured commodities from the port to the provincial level. Milestones to gauge progress will be outlined in the next MOU which, among other things, will outline conditions for future PMI support.

Proposed activities with FY 2018 funding: (\$1,750,000)

1. *Logistical assistance and support:* For import, clearance, storage, distribution and management of RDT and ACT commodities. (\$300,000)
2. *Strengthen Ministry of Health antimalarial drug management system:* Strengthen pharmaceutical management related to antimalarial drugs including regular supervision, provincial training of pharmacist, help with printing of supply chain management forms. Strengthen capacity at NMCP to forecast demand and distribute commodities in line with prioritized needs. (\$650,000)
3. *Strengthen LMIS in target provinces:* Support the implementation of the logistics management information systems at national, provincial, municipal and health facility. Includes training and supervision of data collection staff. (\$400,000)

4. *Institutional capacity building on supply chain planning*: seconded technical advisors placed in CECOMA to provide organizational capacity building and technical support on supply chain improvements, as well as quantification, distribution, and prioritization. (\$400,000)

4. Health system strengthening and capacity building

PMI supports a broad array of health system strengthening activities which cut across intervention areas, such as training of health workers, supply chain management, health information systems strengthening, drug quality monitoring, and NCMP capacity building. Building capacity and health systems towards full country ownership is a core area under the strategic focus under the PMI Strategy 2015-2020.

NMCP/PMI objectives

The Angolan NMCP is tasked with planning, supervising, and monitoring malaria activities throughout the country. 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 Angolan decentralization process, whereby municipalities are responsible for a significant portion of planning, budgeting, and financial management of health resources have 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 government in the areas of coordination, budget and finance, HMIS, human and institutional capacity building, case management, and logistics and supply chain management, with a particular emphasis on strengthening malaria program management at the decentralized level.

Progress since PMI was launched

PMI worked to strengthen human resource capacity and HMIS in the provinces of Huambo and Luanda through an integrated health systems strengthening activity (co-funded by PEPFAR) from 2011 through 2016, working closely with the MoH at the national, provincial, and municipal levels with the goal of improving capacity for service delivery, leadership, management, and supervision skills of health workers to deliver quality care and services. From 2014-2015 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.

To improve service delivery, PMI has invested in pre-service training of trainers and nursing school teachers for quality improvement and standards-based clinical practices. After the approval of the PNDS by the Angolan government, PMI provided significant technical assistance to cost the plan, and supported municipalities in nine provinces to develop municipal health plans and associated budgets in standardized formats and based on epidemiological data.

From 2012 to 2016, PMI trained a cadre of national, provincial, and municipal supervisors to conduct supportive supervision at health facilities in 9 provinces (Benguela, Bie, Cuanza Norte, Cuanza Sul, Huambo, Malange, Uige, and Zaire). 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 projects promoted active review and discussion of monthly reports with municipal and provincial supervisors to foster analysis for problem identification and explore possible solutions. The focus has been on improving documentation in facility-held records so that the quality of the data available for analysis improves.

The Field Epidemiology and Laboratory Training Program began its first cohort in Angola in FY 2012. FELTP, a collaboration between CDC, the *Agostinho Neto* University, and the MoH, trains select 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 who focus on malaria for their field work; however, in Angola, all of the FELTP students in the program have participated in multiple investigations and responses to malaria outbreaks in different provinces across the country. In 2012 and 2013, the FELTP students participated in multiple suspected and confirmed malaria outbreaks across the county, 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 FELTP class have taken prominent positions in the MoH; one of which is currently working as the Director of the Infectious Disease Department. Another one was appointed to be a member of the national emergency response team.

PMI 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

During the period, PMI-funded HSS activities addressed key issues related to health financing, human and institutional capacity strengthening, leadership and governance, health information systems, and supply chain strengthening. PMI supported the secondments of three technical and management advisors to build human and institutional capacity at the NMCP and CECOMA. A Monitoring & Evaluation Technical Advisor is embedded with the NMCP staff to provide M&E support and increase the NMCP staff’s ability to use report quality data for program and policy decision-making. Two Technical Advisors are embedded with the CECOMA staff; a Supply Chain Manager and a Logistician, to provide support on supply chain improvements, quantification, stock prioritization and distribution.

From 2016 to early 2017, PMI supported the MoH to develop and finalize an M&E Plan for the PNDS, to examine both programmatic and financial progress. Completed in March 2017, the plan 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 provided by PMI and WHO for the implementation of the National Health Accounts survey is expected to significantly increase the MOH's capacity to monitor government financing of the PNDS as well as to make decisions based on reliable information on the quantity of financial resources used for health and their sources.

To gain additional practical experience in health systems research, three FELTP students served as national level supervisors for the PMI 2017 Therapeutic Efficacy Study which began in March 2016. In February 2016, two FELTP students served as field team supervisors during the PMI-funded Health Facility Survey completed in Huambo and Uige Provinces. With the increase in the incidence of severe malaria morbidity and mortality in Luanda Province, an FELTP student developed a protocol to look at risk factors for death among severe malaria cases in hospitals in a few municipalities in Luanda Provinces. These findings have been presented to the Thesis Committee at the *Agostinho Neto* University Department of Public Health for the students' master thesis.

To improve the governance of Angola's national Health Information Systems 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 eLMIS deployments as well as mobile data collection platforms used by ADECOS. The PMI team also initiated the development of a costed DHIS2 implementation plan aligning technical and financial resources. PMI supported a landscaping analysis of the Routine Health Information System in Angola to identify existing data flow processes, and collection system and reporting systems, bottlenecks. These data will help inform recommendations to the NMCP and relevant stakeholders on data harmonization to improve reporting as the country prepares to transition to the national reporting platform DHIS2.

To improve the implementation of national protocols for diagnosis and treatment, MIP, laboratory diagnosis, and data collection and management, PMI supported 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 was rolled out for 54 national and provincial level healthcare workers in malaria case management.

PMI supported conference attendance of two NMCP staff to disseminate TES results and to participate in professional development and networking opportunities at the 2016 American Society of Tropical Medicine and Hygiene Conference.

Plans and justification

PMI will continue to work to build and strengthen systems and human capacity 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 practice. PMI will support ongoing malaria control program development; human resource capacity building, monitoring, evaluation and quality improvements, and mentoring and supervisory activities.

In addition to continuing to second the M&E Advisor to the NMCP and the two advisors at CECOMA, PMI will embed a case management advisor at the NMCP to coach and mentor existing staff. FY 2018 funds will also continue to support the National Malaria Partners Forum to facilitate national coordination of malaria activities, in addition to FELTP program students with a focus on malaria activities. These activities are described under the SME and Pharmaceutical Management sections of the MOP respectively.

PMI support will be provided at the central and provincial level to evaluate the costs and feasibility of implementing iCCM. The results and analysis will provide evidence-based data for implementing, scaling-up, and maintaining iCCM activities that will be invaluable for assessment of cost-effectiveness and for making the case for municipalities to start investing part of their budgets on iCCM.

As a strategy to improve the quality of services through accountability and local ownership, PMI will work with provinces and municipalities to institutionalize routine health facility audits in selected municipalities of the six PMI focus provinces. These audits will bring 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. To help enhance the health system's responsiveness to the needs of the community, PMI will seek 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 challenges and opportunities for improving 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.

Proposed activities with FY 2018 funding: (\$830,000)

1. *Health Facility Audits:* In close collaboration with provincial and municipal governments, conduct annual audits of the quality of services at health facilities. SM&E experts will provide guidance on the appropriate methodology to institutionalize health facility audits. (\$350,000)

2. *Institutional capacity assessment of NMCP*: Support a voluntary, collaborative process to assess the NMCP's capacity to address the five areas of strategic focus under the PMI Strategy 2015-2020; and related recommendations guided by the findings to strengthen the NMCP. (\$150,000)
3. *Costing of integrated Community Case Management*: Support provincial governments to evaluate the cost-effectiveness and feasibility of supporting and/or expanding iCCM for malaria control; assist with planning and budgeting at the provincial and municipal level based on findings. (\$100,000)
4. *Field Epidemiology and Laboratory Training Program*: Continued support of two students in the Field Epidemiology and Laboratory Training Program to focus on malaria activities, additional funds for recruitment/retention of students, vector-borne outbreak investigations, and supplementary trainings and coursework related to malaria case management and improved epidemiologic monitoring sites. (\$200,000)
5. *National Malaria Partners Forum*: Continued support to National Malaria Partners' Secretariat to improve coordination of malaria activities at the municipal, provincial and national level(s). (\$30,000)

Table 13: Health Systems Strengthening Activities

HSS Building Block	PMI Technical Area	Description of Activity
Health Services	MIP	Strengthen malaria in pregnancy services at health facilities
	Case Management	Training, mentoring, supportive supervision for provincial, municipal, and health facility health workers to improve malaria case management and RDT use
		Training ADECOS on malaria prevention and treatment at the community level
Health Workforce	Health Systems Strengthening	Field Epidemiology and Laboratory Training Program
		Institutional capacity assessment of the NMCP
		Embedded staff to build capacity at the NMCP
Health Information	Surveillance, Monitoring, and Evaluation	Strengthen disease surveillance systems to improve decision-making, planning, forecasting, and program management
		Health Facility Audits

		Survey of availability of malaria commodities at the health facility level (end-use verification)
		Malaria Indicator Survey
	Entomological monitoring	Strengthen entomology capacity; molecular identification of mosquito species and insecticide resistance testing (<i>kdr</i> mutation detection)
	Operational Research	Qualitative study on malaria health-care seeking behavior and prevention practices among Southeast Asian migrant workers
Essential Medical Products, Vaccines, and Technologies	Case Management	Technical assistance for continuous distribution (distribution planning, supervision, reporting, logistics)
Health Finance	Health Systems Strengthening	Build the capacity of municipal and provincial governments to plan, prioritize funds, monitor, and supervise malaria programs
		Costing of iCCM
Leadership and Governance	Health Systems Strengthening	Strengthen national coordinating and regulatory bodies to direct and manage malaria resources, develop guidelines, and improve quality of services.
	Health Systems Strengthening	Support to Malaria Partners' Forum

5. Social and behavior change communication

NMCP/PMI objectives

PMI supported the NMCP to draft a strategy for malaria SBCC in 2015. While this strategy has yet to be adopted officially by the Ministry of Health, the document outlines the NMCP's priorities and goals related to SBCC for malaria. This strategy conforms to RBM global best practices. The strategy's main goals are to: define roles and responsibilities of all key actors; identify priority issues and gaps; and provide a basis for multi- and bilateral assistance and intersectoral coordination. The strategy covers four main malaria interventions: vector control (IRS, ITNs, and larviciding); case management; IPTp; and epidemic preparedness and response. The strategy also addresses misconceptions about malaria in Angola and seeks to improve knowledge in key behaviors essential to achieve sustained malaria control.

The NMCP's objective is to have at least 80% of caregivers know the cause, signs and symptoms of malaria, and at least one prevention and one treatment measure, by the end of 2020. The NMCP's capacity to coordinate and monitor all malaria-related SBCC activities carried out by the NMCP, provincial governments, and other in-country stakeholders in Angola has been limited.

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% of women interviewed in the MIS 2011 identified mosquitoes as a source of malaria, and only 30% knew that malaria can be prevented by using a mosquito net. The 2015 DHS found 23% of pregnant women and 22% of children under five sleeping under an ITN. Although access to ITNs remains low (31% household ownership in the 2015 DHS), a recent secondary analysis of data from surveys conducted in Angola found that, among those who own an ITN, use is high across Angola. SBCC remains an important intervention 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 and uptake of key 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 case management-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, given the variation of malaria transmission in Angola. Key messages at the community level, via radio, included 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, and mobile videos; training of health and community workers; radio spots; and printed messages together with those that accompany packaged ITNs and ACTs.

In early 2015, a PMI-supported study in the provinces of Bengo, Malanje, and Uige and investigated local perceptions, practices, and treatment-seeking behaviors for malaria among women with children under the age of five years. The results of the study showed the following as barriers to other malaria-related behaviors:

1. Misperceptions about the cause of malaria: Beliefs that malaria is due to various causes such as getting wet in the rain, eating bad food, etc.; and that malaria is an advanced stage of “*paludismo*”.
2. Financial conditions: Lack of financial resources for transportation prevents care seeking at a health facility. Poor access to health facilities.
3. Use of traditional medicines: Traditional practice of herbal baths and/or administration of paracetamol to treat fever. The use of health care facilities is limited.
4. Housing structure: Sizes of sleeping room – these are small and children play in them; sleeping under ITNs makes it hotter and suffocating; ITNs can easily catch fire from the candles used in the room.
5. Incorrect use of ITNs: Fears of allergies from the chemicals on the net.

The study also showed the following as facilitators of other malaria-related behaviors:

6. Risk perception: Awareness of severity of malaria, especially for children - child health and survival is the main concern.
7. Social Support: Husband and friends represent a potential source of support for behavioral change.
8. Free access to ITNs: Reliability on public health support.

Using SBCC strategies developed based on study findings, PMI reached 105,131 people through IPC with 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% of people surveyed recalled a malaria prevention message. PMI also distributed IEC 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 IPTp promotion
- Knowledge of malaria symptoms and creating treatment demand
- Knowledge of severe childhood malaria symptoms
- 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% 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%.

Progress during the last 12-18 months

Recent SBCC activities in Angola have focused on supporting net use and care, in correspondence with the national universal coverage campaign planned for 2017-2018.

PMI supported the creation of the Communication Subcommittee of Angola's Universal LLIN Distribution Campaign. Through workshops and ongoing technical assistance, PMI supported malaria partners in Angola to identify barriers to LLIN use and develop key SBCC messages and messages around repurposing and disposal of old nets. Challenges identified to be addressed through SBCC include:

1. A sense of fatalism and resignation that malaria, sickness, and death are inevitable; this prevents people from having a sense of self-efficacy that would lead them to take action.
2. The belief that one cannot sleep well under an LLIN, particularly because of perceived increased warmth.
3. People who live in houses with air conditioning believe that they do not have to sleep under nets; they believe that the lower temperature repels mosquitoes.
4. The belief that ITNs cause skin irritations.
5. Many people don't sleep under LLINs during the *casimbo* (cold season) when mosquito density are lower.
6. People do not sleep under nets when they sleep outdoors, especially in the hot season.
7. Many believe that only pregnant women and small children need to sleep under LLINs.
8. People who live in higher-income housing do not want to drive nails into the walls or ceiling to hang LLINs because they consider this damaging their homes.
9. During the last campaign, an unknown number of households did not receive LLINs because nets were stolen from storage and sold on the market.

Messages developed through this coordination are being utilized in SBCC outreach to accompany the national LLIN campaign.

Surveys of knowledge of malaria prevention completed before and after the SBCC activities accompanying ITN distribution campaigns in 2017 showed a significant increase in the population aware of the importance of sleeping under a net to prevent malaria – up to 72% after the campaign, from 28% before the campaign.

Plans and justification

SBCC investments planned for the 2018-2019 period 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/Angola plans to support training of health workers to improve compliance with protocols and interpersonal communication during case management with FY 2018 funds. PMI will work to improve the relationship between health workers at all levels with their clients, thereby improving their impact. As the ADECOS model of community health worker is expanded to new areas and broader coverage, PMI will support these staff to be trained, supervised, and mentored in critical communication skills to influence behavior change. ADECOS will be provided with tested messages to promote preventive behaviors and increase treatment compliance.

Similarly, PMI will support facility-based health workers to improve their skills in interacting with patients, utilizing stronger interpersonal communication skills to improve compliance. Finally, in order to support these cadres of health workers to follow the appropriate case management guidelines it is important to ensure that patients, caretakers, and community members also understand the importance of appropriate diagnostics to successful treatment outcomes. PMI will support SBCC messaging and outreach to promote demand for malaria testing prior to requesting treatment.

To track the performance of SBCC activities, PMI will support reach and recall studies. These studies help to measure the percentage of people exposed to an SBCC campaign and the messages they recall. The reach and recall studies will be conducted on a representative sample of the target population who will respond to a short questionnaire. The studies will typically take place 1-3 months after the end of the campaign.

Proposed activities with FY 2018 funding: (\$1,500,000)

1. *IEC/BCC outreach on MIP: At the community level (communities without ADECOS). (\$300,000)*
2. *Training of ADECOS on malaria prevention: At the community level in three focus provinces (e.g., communication strategies for improving ITN use culture, early diagnosis and treatment, and IPTp). (\$500,000)*
3. *ITN SBCC: Campaign to promote net use and care. (\$200,000)*
4. *Interpersonal Communication (IPC) case management training: Training of health workers to improve IPC during case management in all focus provinces. (\$100,000)*

5. *Care-seeking behavior SBCC*: To increase patient demand for malaria testing in all focus provinces. (\$300,000)
6. *Reach and recall studies*: To track the performance of SBCC activities. (\$100,000)

6. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

A core area of strategic focus under PMI's current global strategy, and a priority for the NMCP is strengthening surveillance, monitoring, and evaluation (SM&E) capacity and building a culture of data-driven decision-making. Malaria data in Angola is reported collected through the HMIS and by the municipal and provincial malaria supervisor 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 National Health Development Plan (PNDS) 2012-2025 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" (PNDS Projecto 51).

The NMCP is aware of these limitations and has developed a plan to strengthen SM&E, described in the 2016-2020 National Strategic Plan for Malaria Control and the Concept Note submitted to Global Fund. The main SM&E objectives of the NMCP's plan are, by 2020:

- 100% of the provinces report data according to national data collection protocol, and;
- Municipalities at epidemic risk detect malaria epidemics in less than 2 weeks and respond appropriately.

Per the PNDS, the MOH is transitioning from paper-based to technology-enabled health information systems in order to improve data quality and use for better resource allocation and faster detection and response to outbreaks. As a first step in the transition process, in 2016 the MOH adopted, the DHIS2 platform for monthly service delivery data reporting. This national shift was informed by the findings of a PMI-funded pilot.

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.

Population-based Surveys: PMI has supported two MIS (2006/2007 and 2011). The 2006/2007 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 INE, Angola's first-ever DHS+ 2015-2016, which was co-funded by PMI, PEPFAR, UNICEF and the GRA, collected provincial-level data on the primary malaria indicators. The Angola DHS, 2015-2016 final report was released on June 30th, 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 under five years of age during the period 2006–2011. Finalized in 2016, the impact evaluation found that despite major infrastructure problems caused by the civil war that ended in 2002, progress was made in rolling out malaria control interventions, evidenced by the increases in ITN ownership and use and IPTp in particular, between 2006/7 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 analysis showed that household ITN ownership was protective of malaria parasitemia among children under five years of age under programmatic conditions. If the implementation of malaria control interventions were 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.

Facility Surveys: PMI has implemented bi-annual End-Use Verification 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 6 provinces found 63% had no ACTs and 42% stock outs of RDTs. PMI used results from this EUV to unblock some of the bottlenecks were affecting CECOMA's ability distribute MOH-procured ACTs to health facilities.

Progress during the last 12-18 months

PMI investments focused on building a culture of using data to better target interventions and the allocation of resources. PMI also helped the MOH initiate the national process of transitioning from paper-based monthly reporting to DHIS2 platform.

To strengthen the NMCP's human and institutional capacity for data reporting and use for decision-making, a PMI-funded senior M&E advisor was seconded to the NMCP starting in March 2017. Prior to embedding the M&E advisor, PMI successfully negotiated via a bilateral MOU with the Health Minister that the NMCP should staff its M&E unit so that the advisor has counterparts to coach, mentor, and work closely with. In just a few months, the seconded M&E advisor has worked with the NMCP to revise the national malaria M&E strategy; provide substantive technical inputs in Angola's draft Global

Fund grant application (due for submission August 28, 2017); calculate malaria commodity quantification and forecasting for 2018; and, mapped the flow of malaria data and documented the current state of the national HMIS and surveillance systems.

In response to PMI's appeal for greater utilization and sharing of malaria data (and per the bilateral MOU), the NMCP's M&E unit began performing regular analyses of malaria data. Discussed at monthly meetings between PMI and the NMCP, these presentations have explored year-over-year and monthly trends, cross-province comparison of case, mortality, MIP, stock, and reporting completeness data. The fact that the NMCP has, to date, successfully conducted and presented their national data 10 months in a row, is a significant improvement; especially considering all the challenges that PMI had with obtaining access to timely malaria data in past years. To further improve data quality and promote use at decentralized levels, the NMCP has recently agreed to share its monthly analyses, as feedback, to provincial health authorities.

To address the dearth of service data and inform ongoing and future malaria programs, PMI conducted a health facility survey to assess the provision of malaria case management services in public health facilities in two provinces from February to March 2016. Data collection was conducted in 44 health facilities in Huambo and 45 in Uige. The study found shortages of ACT and severe malaria drugs in both provinces and identified a critical need for increasing the number of supportive supervisory visits to improve the quality of case management. Health workers in Huambo demonstrated difficulty in managing suspected cases: only 31% of suspected malaria cases underwent diagnostic testing. Only 28% of true malaria cases were treated appropriately with an antimalarial. Approximately 42% of health workers in Huambo Province and 31% in Uige had not received supervision within the last 6 months. Results from the survey were shared with the NMCP and with provincial health officials. PMI is working with the NMCP to evaluate roadblocks to supervision and focus on increasing number of quality supervisory visits to improve the quality of case management. Study findings were published in the May 2017 volume of the Malaria Journal. In 2016, PMI-funded implementing partner has conducted, in 4 provinces (178 health facilities), a survey examining opportunities and barriers for the delivery of intermittent preventive treatment of malaria in pregnancy services from the perception of providers and patients. Recommendations from this survey are expected to lead to improvements in how Angola collects information from pregnant women.

From 2016 to 2017, PMI supported a pilot DHIS2 implementation in three municipalities of Huambo Province. The pilot integrated a total of 1,203 monthly Malaria, HIV and Reproductive Health data reports from the three municipalities and resulted in a well-developed Angola DHIS2 platform ready for nationwide deployment. The 44 technicians trained at the different levels (National, Provincial and Municipal) are able to monitor and supervise existing data in the system, ie generating data maps, identifying missing data in the system, and creating informative dashboards. The trained technicians can consolidate the municipal or provincial data according to the desired criteria using the system. Coordination and supervision procedures were defined and await MOH approval by GEPE (the Office

of Studies, Planning and Statistics) and GTI (the Office of Information and Technology). PMI also supported the development of a national user guide and technical documentation manuals that describe specifications and options for installation, use and customization including data elements, indicators, and organizational units, as well as GIS and dashboarding functionalities.

As a result of the successful PMI-funded pilot in Huambo, the MOH adopted DHIS2 as the national software platform for HMIS reporting in early 2017. With funding from the Global Fund, EU, PEPFAR and other partners, the MOH plans to implement DHIS2 in all 18 provinces. The PMI team is now working with the MOH and other partners to establish a national coordination mechanism and to develop a detailed implementation plan outlining technical and financial contributions from all key partners for the nationwide roll-out of DHIS2 at municipal, provincial and central levels. Full implementation is expected to be completed by the end of 2019.

Table 14. Surveillance, Monitoring, and Evaluation Data Sources

Data Source	Survey Activities	Year								
		2011	2012	2013	2014	2015	2016	2017	2018	2019
Household surveys	Demographic Health Survey (DHS)					X	X			
	Malaria Indicator Survey (MIS)	X								(X)
Health Facility and Other Surveys	Health facility survey						X			(X)
	Rapid Urban Malaria Assessment (RUMA)								(X)	
	EUV survey	X	X	X	X	X	X	X	(X)	
Malaria Surveillance and Routine System Support	Support to national malaria surveillance system	X	X	X	X	X	X	X	(X)	(X)
	Support to HMIS	X	X	X	X	X	X	X	(X)	(X)
	Malaria Impact Evaluation				X					
Therapeutic efficacy	<i>In vivo</i> efficacy testing	X*	X*	X		X		X		(X)
Entomology	Entomological surveillance and resistance monitoring	X	X	X	X	X			(X)	(X)
Other	Long-lasting ITN durability monitoring	X	X	X	X					

*not PMI-funded

() Planned activities

Plans and justification

With FY 2018 funding, PMI will continue to support malaria SM&E within the framework of the National Malaria M&E Plan described in the new National Strategic Plan for Malaria Control (2016-2020). Funding will be targeted towards improving M&E capacity, reporting and data quality assurance. PMI will support the collection and analysis of routine data through HMIS support and outcome-level malaria prevention and control data through the MIS 2019 and Health Facility Survey. PMI will continue to second one SM&E advisor to the NMCP to work along an NMCP SM&E staff member for strategic planning, training, and implementation of SM&E activities.

PMI will continue to second one technical advisor placed in NMCP to provide organizational capacity building and technical support on M&E and HMIS strengthening. The Malaria M&E Advisor will be responsible for working with the NMCP leadership and the NMCP M&E counterpart to strengthen malaria M&E strategies and guidance, malaria surveillance, data quality and assurance, use of data for decision making, and reporting.

As in previous years, HMIS strengthening activities will target multiple levels of the health system. PMI will support quarterly provincial-level meetings of malaria focal person from each municipality with the DPS in PMI-focus provinces to review data and provide feedback on analyzed data. Significant resources will also be devoted to supportive supervision, coaching, and mentoring of health facility and municipal staff to improve data quality and reporting rates. The PMI implementing partners, in collaboration with provincial health officials, will train two to three staff per facility responsible for data collection in the more than 600 health facilities located in the focus provinces as well as five municipal level officials (per municipality) from the 48 municipalities. Five provincial health officials per province will also be trained. In addition to these trainings, PMI will support periodic visits of NMCP staff, along with the PMI seconded SM&E staff, to focus provinces to assess data quality, provide feedback on data collection, analysis and reporting. In the PMI-focus provinces, the Municipal Malaria Focal person will be supported to provide data focused supervision and on-the-job mentoring at all health facilities. With the cost of implementing activities in Angola, PMI could only target focus provinces at this time.

PMI will support a workshop for all provincial authorities (Directors and Malaria Supervisors) in Luanda hosted by the NMCP and PMI-counterpart. The workshop will present an opportunity for GEPE, which is responsible for the MOH, and NMCP to identify key challenges to improving data quality, as well as to highlight standards and best practices for strengthening HMIS data collection, analysis, reporting, and data driven decision making.

Continued support for the implementation of DHIS2 at municipal and provincial levels will seek to increase the availability of service delivery data, improve timeliness of reporting, and facilitate data use for decision-making. Access to the web-based platform will enable key decision-makers and managers from the MOH to monitor service provision and track outbreaks in cases for faster and efficient

response. Activities will include software installation and customization, training, and supervision at national, provincial and municipal levels. PMI will work closely with the GEPE, GTI, and DNSP to implement this DHIS2 implementation activity co-funded with EU, PMI and Global Fund.

Plans were originally made to fund the next MIS with FY 2017 funds; however, given the significant delays experienced in the finalization and publication of the 2015-2016 DHS+, the MIS will be supported with FY 2018 funds. The MIS will collect household level data on key malaria indicators, including provincial-level malaria prevalence, ITN ownership and use and use of ACTs and of MIP services. Moreover, as a follow-up to the 2016 survey conducted in Huambo and Uige, PMI will support a national health facility survey to assess the status of management of malaria cases and commodities in public health facilities. Implemented in partnership with the NMCP, this cross-sectional survey of randomly selected health facilities will be carried out in two provinces. Health facilities will be stratified by classification (hospitals, health centers and health posts) and transmission zones. In each health facility, purposively selected health workers will be interviewed based on malaria case management workload and patients will be randomly interviewed and will undergo a re-examination by a study clinician.

Proposed activities with FY 2018 funding: (\$3,115,000)

1. *Malaria Indicator Survey 2019*: Plan and implement national household survey to examine progress made on malaria-related outcome indicators. (\$2,000,000)
2. *Technical support for strengthening M&E*: One CDC TDY visit to provide assistance to in-country partners for M&E (including health facility audit). (\$15,000)
3. *Seconded staff to NMCP on surveillance/M&E*: Second an advisor to the NMCP to strengthen SM&E capacity by working with an identified NMCP counterpart. (\$200,000)
4. *HMIS strengthening*: Strengthen monthly malaria surveillance data reporting through HMIS (paper-based at health facilities and DHIS2 at municipal, provincial and central levels), and malaria data analysis and use for decision-making in target provinces. Includes training and supervision of data collection staff to improve data accuracy and timely reporting. Also includes support for data review meetings at municipal and provincial levels to inform decision-making. (\$900,000)
 - a) Training and supervision of health facility staff in data collection and reporting in the six PMI provinces (\$500,000)
 - b) Data review/data use meetings at provincial levels (\$90,000)
 - c) DHIS2 implementation at central level and in the six PMI provinces (including configuration, training, supervision, coordination, and equipment) (\$310,000)

7. Operational research

NMCP/PMI objectives

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

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 (KAP) studies

Progress since PMI was launched

There have been no previous OR studies funded by PMI within the last five years. However, PMI continues to work with the NMCP to prioritize their national malaria operational research agenda. OR supported through other partners, include the Portuguese Institute for Development Assistance's "Performance of microscopy and RDTs in the context of a malaria prevalence study in Angola: a comparison using PCR as the gold standard", and the French *Institut de Recherche pour le Developpement*, "Malaria over diagnosis and subsequent overconsumption of antimalarial drugs in Angola: consequences and effects on human health".

Progress during the last 12-18 months

Since the end of the 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 health care seeking behavior in the Southeast Asian migrant population concentrated mainly in three provinces in the country. Planning is underway to implement the OR study between October 2017-January 2018.

Table 15. PMI-funded Operational Research Studies

Completed OR Studies			
Title	Start date	End date	Budget
None			
Ongoing OR Studies			
Title	Start date	End date	Budget
None			
Planned OR Studies FY 2017			
Title	Start date (est.)	End date (est.)	Budget
Malaria Prevention and Care-Seeking Behavior in Southeast Asian Migrant Populations in Angola	October 2017	Jan 2018	\$150,000

Plans and justification

No OR will be supported with FY 2018 funds.

Proposed activities with FY 2018 funding: (\$0)

No OR activities are planned with FY 2018 funds.

8. 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, the PMI team includes a malaria specialist. 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, implementing 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 General Development Officer and thus the two PMI resident advisors, one from USAID and one from CDC, report to the USAID General Development Officer 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.

Proposed activities with FY 2018 funding: (\$2,382,387)

1. *CDC Staffing*: Support to CDC RA position including salary, benefits and ICASS. (\$1,000,000)
2. *USAID Staffing*: Support to salaries, benefits, and ICASS for 1 PSC or TCN (Resident Advisor) and 1 support staff (FSNs). (\$982,387)
3. *USAID Admin*: Administrative costs, program development and learning. (\$400,000)

**Table 1: Budget Breakdown by Mechanism
President's Malaria Initiative – ANGOLA
Planned Malaria Obligations for FY 2018**

Mechanism	Geographic Area	Activity	Budget (\$)	%
TBD - Vector Control IDIQ	Select provinces (Huambo, Lunda Sul, and Malange)	Entomologic monitoring and insecticide resistance management	200,000	1%
GHSC-PSM	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Procurement of ITNs	1,256,145	33%
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Distribution of ITNs	1,641,348	
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Procurement of SP	146,373	
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of RDTs	855,065	
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus	Procurement of ACTs	602,808	

	additional provinces if needed)		
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of injectable artesunate treatments for severe malaria	282,387
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of artemether treatments for severe malaria	77,096
	Nationwide	Logistical assistance and support for import, clearance, storage, distribution, and management of RDT and ACT commodities	300,000
	Nationwide	Strengthen Ministry of Health antimalarial drug management system	650,000
	Nationwide	Strengthen LMIS in target provinces	400,000
	Central Level	Institutional capacity building on supply chain planning	400,000

PSI/Projecto de Saúde para Todos	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Technical assistance for continuous distribution (distribution planning, supervision, reporting, logistics)	300,000	43%
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Strengthen malaria in pregnancy services at health facilities	350,000	
	Central Level and Zaire, Benguela, Lunda Sul	Therapeutic Efficacy Study (TES)	300,000	
	Zaire, Uige, Cuanza Norte, Malanje, Lunda Norte, Lunda Sul, plus training of supervisors from 12 additional provinces	Strengthen malaria case management	2,000,000	
	Zaire, Uige, Cuanza Norte, Malanje, Lunda Norte, Lunda Sul, plus training of supervisors from 12 additional provinces	Training and supervision on laboratory diagnosis (RDTs and microscopy) and quality control	951,391	
	National	Institutional capacity building on case management	400,000	

Zaire and Lunda Sul plus 2 additional provinces (TBD)	Expand support to iCCM/ADECOS activity	975,000
Zaire, Uige, Cuanza Norte, Malanje, Lunda Norte, Lunda Sul	Institutionilizing Health Facility Audits	350,000
Central Level	Institutional capacity assessment of NMCP and related capacity building and training	150,000
Zaire and Lunda Sul plus 2 additional provinces (TBD)	Costing of integrated Community Case Management	100,000
Nationwide	Support to Malaria Partners' Forum Secretariat	30,000
Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	IEC/BCC for malaria in pregnancy at the community level	300,000
Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Training of ADECOS on malaria prevention at the community level (e.g., communication strategies for improving net use culture, early diagnosis and treatment, and IPTp)	500,000
15 provinces	BCC campaign to promote ITN use and care	200,000

	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Interpersonal Communication (IPC) case management training	100,000	
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Care-seeking behavior SBCC	300,000	
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Reach and recall studies	100,000	
	Nationwide	Seconded staff to NMCP on surveillance/M&E	200,000	
	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	HMIS strengthening	900,000	
MEASURE DHS	Nationwide	Malaria Indicator Survey 2019	2,000,000	10%
CDC-IAA	National	Technical assistance to help strengthen malaria entomological capacity in country	35,000	6%
	National	Supplies and reagents for molecular biology laboratory development	30,000	
	Zaire, Benguela, Lunda Sul	Technical Assistance for Therapeutic Efficacy Study (TES)	20,000	

	Nationwide	Field Epidemiology and Laboratory Training Program	200,000	
	Nationwide	Technical support for strengthening SM&E	15,000	
	Nationwide	CDC staffing costs	1,000,000	
USAID	Nationwide	USAID staffing costs	982,387	7%
	Nationwide	USAID administrative costs / PD&L	400,000	
Total			20,000,000	100%

Table 2: Budget Breakdown by Activity
President's Malaria Initiative – ANGOLA
Planned Malaria Obligations for FY 2018

Proposed Activity	Mechanism	Budget		Geographic Area	Description
		Total \$	Commodity \$		
PREVENTIVE ACTIVITIES					
VECTOR MONITORING AND CONTROL					
Entomologic monitoring and insecticide resistance management					
Technical assistance to help strengthen malaria entomological capacity in country	CDC-IAA	35,000	0	National	A PMI entomologist will travel to Angola to provide technical assistance to the GRA for requested entomological training by the NMCP to help strengthen malaria entomological capacity in country; this includes fortifying the insectary and its staff as well as training molecular biologists with protocols for

					mosquito species and resistance marker identification. (One 2-week trip and one 3-week trip.)
Entomologic monitoring and insecticide resistance management	TBD - Vector Control IDIQ	200,000	0	Select provinces (Huambo, Lunda Sul, and Malange)	Monitoring of vectors in select provinces through collection and processing of mosquitoes and larvae from 6 select sites sentinel sites (one per province) and including 2 sampling collections per site, pre/during and post next distribution campaign.
Supplies and reagents for molecular biology laboratory development	CDC-IAA	30,000	30,000	National	Supplies and reagents for molecular biology laboratory development to support vector monitoring.
Subtotal Ento monitoring		265,000	30,000		
Insecticide-treated Nets					
Procurement of ITNs	GHSC-PSM	1,256,145	1,256,145	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Procure approximately 211,228 ITNs for routine distribution.

Distribution of ITNs	GHSC-PSM	1,641,348	0	Uige,Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Provide transportation from Luanda to municipalities for ITNs programmed for continuous distribution in the six PMI focus provinces over a 12 month period.
Technical assistance for continuous distribution (distribution planning, supervision, reporting, logistics)	PSI/Projecto de Saúde para Todos	300,000	0	Uige,Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Support detailed distribution planning, supervision, logistical support for continuous distribution campaign in 6 provinces over a 12 month period.
Subtotal ITNs		3,197,493	1,256,145		
Indoor Residual Spraying					
None		0	0		
Subtotal IRS		0	0		
SUBTOTAL VECTOR MONITORING AND CONTROL		3,462,493	1,286,145		
Malaria in Pregnancy					
Procurement of SP	GHSC-PSM	146,373	146,373	Uige,Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Procure 813,186 doses of SP to cover 100% of the projected needs of the 6 PMI provinces.

Strengthen malaria in pregnancy services at health facilities	PSI/Projecto de Saúde para Todos	350,000	0	Uige,Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Technical assistance for training, supervision, and tools development and distribution to improve health facility workers' understanding and compliance in administering IPTp, diagnosing and treating malaria in pregnancy, LLIN use in pregnant women and provision of tools to accurately track MIP services.
Subtotal Malaria in Pregnancy		496,373	146,373		
SUBTOTAL PREVENTIVE		3,958,866	1,432,518		
CASE MANAGEMENT					
Diagnosis and Treatment					
Procurement of RDTs	GHSC-PSM	855,065	855,065	Uige,Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of 1,613,330 RDTs for the public sector.

Procurement of ACTs	GHSC-PSM	602,808	602,808	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of 956,839 treatments of AS-AQ for the public sector.
Procurement of injectable artesunate treatments for severe malaria	GHSC-PSM	282,387	282,387	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of IV artesunate to be used in larger health centers. Procurement of injectable artesunate (112,058 vials); assumes 8% of 5.6M malaria cases are severe. Proportions and number of simple and severe malaria cases by group, including age groups and pregnant women, were based on 2016 data from the NMCP database, which compiles aggregate data reported by health facilities using the case definition of severe malaria (i.e. # of malaria cases hospitalized) from the National Diagnostics and Treatment Guidelines Malaria. Angola has yet to

					lose severe malaria medication due to expiration.
Procurement of artemether treatments for severe malaria	GHSC-PSM	77,096	77,096	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire (plus additional provinces if needed)	Procurement of IM artemether to be used in referral centers. Procurement of artemether (179,293 ampoules); assumes 8% of 5.6M malaria cases are severe. Proportions and number of simple and severe malaria cases by group, including age groups and pregnant women, were based on 2016 data from the NMCP database, which compiles aggregate data reported by health facilities using the case definition of severe malaria (i.e. # of malaria cases hospitalized) from the National Diagnostics and Treatment Guidelines Malaria. Angola has yet to lose severe malaria medication due to expiration.
Therapeutic Efficacy Study (TES)	PSI/Projecto de Saúde para Todos	300,000	0	Central Level and Zaire, Benguela, Lunda Sul	Implementation of the 2019 TES.

Technical Assistance for Therapeutic Efficacy Study (TES)	CDC-IAA	20,000	0	Zaire, Benguela, Lunda Sul	Training and implementation visits for the 2019 TES.
Strengthen malaria case management	PSI/Projecto de Saúde para Todos	2,000,000	0	Zaire, Uige, Cuanza Norte, Malanje, Lunda Norte, Lunda Sul, plus training of supervisors from 12 additional provinces	Training, support supervision for provincial and health facility health workers to improve malaria case management and RDT use. Includes: (1) Training of trainers at the provincial level of malaria supervisors on conducting formative supervision (provincial supervisors) from the all 18 provinces; (2) support to municipal level (malaria supervisors) in the 6 focus provinces to provide regular supervision visits to health facilities on a quarterly basis.

<p>Training and supervision on laboratory diagnosis (RDTs and microscopy) and quality control</p>	<p>PSI/Projecto de Saúde para Todos</p>	<p>951,391</p>	<p>0</p>	<p>Zaire, Uige, Cuanza Norte, Malanje, Lunda Norte, Lunda Sul, plus training of supervisors from 12 additional provinces</p>	<p>Training and supportive supervision for provincial laboratory technicians and supervisors to improve malaria diagnostics in the laboratory, i.e., Training of trainers at the provincial of laboratory technicians and supervisors on conducting formative supervision in the six focus provinces to municipal level, with participation from provincial supervisors from the other 12 provinces. Includes promotion of RDT use.</p>
<p>Institutional capacity building on case management</p>	<p>PSI/Projecto de Saude para Todos</p>	<p>400,000</p>	<p>0</p>	<p>National</p>	<p>Seconded technical advisor placed in the NMCP to provide technical support on case management, including iCCM.</p>

Expand support to iCCM/ADECOS activity	PSI/Projecto de Saude para Todos	975,000	0	Zaire and Lunda Sul plus 2 additional provinces (TBD)	Continue to support the GRA's iCCM initiative with ADECOS (community health workers) in selected municipalities. PMI will provide RDTs and ACTs; the MOH will provide commodities for the other diseases included in the care package (ex. pneumonia, diarrhea). Training and supervision will cover malaria, pneumonia, and diarrhea.
Subtotal Diagnosis and Treatment		6,463,747	1,817,356		
Pharmaceutical Management					
Logistical assistance and support for import, clearance, storage, distribution, and management of RDT and ACT commodities	GHSC-PSM	300,000	0	Nationwide	Provide assistance for commodity distribution from port, storage through customs, and distribution through to the provincial level.

Strengthen Ministry of Health antimalarial drug management system	GHSC-PSM	650,000	0	Nationwide	Strengthen pharmaceutical management related to antimalarial drugs including regular supervision, provincial training of pharmacists, help with printing of supply chain management forms. Strengthen capacity at the NMCP to forecast demand and distribute commodities in line with prioritized needs.
Strengthen LMIS in target provinces	GHSC-PSM	400,000	0	Nationwide	Support the implementation of the logistics management information systems at national, provincial, municipal, and health facility levels. Includes the deployment of eLMIS, and training and supervision of data collection staff.
Institutional capacity building on supply chain planning	GHSC-PSM	400,000	0	Central Level	Seconded technical advisors placed in CECOMA and the NMCP to provide organizational capacity building and technical support on supply chain improvements, as well as quantification, distribution,

					and prioritization.
Subtotal Pharmaceutical Management		1,750,000	0		
SUBTOTAL CASE MANAGEMENT		8,213,747	1,817,356		
HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING					
Institutionalizing Health Facility Audits	PSI/Projecto de Saúde para Todos	350,000	0	Zaire, Uige, Cuanza Norte, Malanje, Lunda Norte, Lunda Sul	In close collaboration with provincial and municipal governments, conduct audits of the quality of services at health facilities. The activity will also seek to include communities to increase accountability.
Institutional capacity assessment of NMCP and related capacity building and training	PSI/Projecto de Saúde para Todos	150,000	0	Central Level	Conduct a participatory institutional assessment of the NMCP. Support the implementation of recommended actions for strengthening the NMCP.

Costing of integrated Community Case Management	PSI/Projecto de Saúde para Todos	100,000	0	Zaire and Lunda Sul plus 2 additional provinces (TBD)	Support provincial governments to evaluate the cost-effectiveness and feasibility of supporting and/or expanding integrated community case management for malaria control; assist with planning and budgeting at the provincial and municipal level based on findings.
Field Epidemiology and Laboratory Training Program	CDC-IAA	200,000	0	Nationwide	Support two students in the Field Epidemiology and Laboratory Training Program to focus on malaria; additional funds to ensure recruitment/retention and supporting training in the epidemiologic monitoring sites (short course in epidemiology training).
Support to Malaria Partners' Forum Secretariat	PSI/Projecto de Saúde para Todos	30,000	0	Nationwide	Continued support to National Malaria Partners' Secretariat to improve coordination of malaria activities at the municipal, provincial, and national level(s).

SUBTOTAL HSS & CAPACITY BUILDING		830,000	0		
SOCIAL AND BEHAVIOR CHANGE COMMUNICATION					
IEC/BCC for malaria in pregnancy at the community level	PSI/Projecto de Saúde para Todos	300,000	0	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Use SBCC at the community level to improve prevention of malaria in pregnancy at the community level, through promotion of ANC attendance and education on the importance of ITN use and receiving at least three doses of IPTp in six focus provinces.
Training of ADECOS on malaria prevention at the community level (e.g., communication strategies for improving net use culture, early diagnosis and treatment, and IPTp)	PSI/Projecto de Saúde para Todos	500,000	0	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Includes developing and conducting training for outreach workers, improving communication skills, materials for distribution to incentivize ITN use by identifying and promoting positive deviant behavior.
BCC campaign to promote ITN use and care	PSI/Projecto de Saúde para Todos	200,000	0	15 provinces	SBCC at the community and facility levels to promote net use and continue to build a net culture.

Interpersonal Communication (IPC) case management training	PSI/Projecto de Saúde para Todos	100,000	0	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Training of health workers to improve IPC during case management in all focus provinces.
Care-seeking behavior SBCC	PSI/Projecto de Saúde para Todos	300,000	0	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	To increase patient demand for malaria testing in all focus provinces.
Reach and recall studies	PSI/Projecto de Saúde para Todos	100,000	0	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	To track the performance of SBCC activities
SUBTOTAL SBCC		1,500,000	0		
SURVEILLANCE, MONITORING, AND EVALUATION					
Malaria Indicator Survey 2019	TBD	2,000,000	0	Nationwide	Plan and implement national household survey to examine progress made on malaria-related outcome indicators.

Technical support for strengthening SM&E	CDC-IAA	15,000	0	Nationwide	One CDC TDY visit to provide assistance to in-country partners for M&E (including durability monitoring).
Seconded staff to NMCP on surveillance/M&E	PSI/Projecto de Saúde para Todos	200,000	0	Nationwide	Second an advisor to the NMCP to strengthen SM&E capacity by working with an identified NMCP counterpart and to provide organizational capacity building and technical support on M&E, data for decision making, and HMIS strengthening.
HMIS strengthening	PSI/Projecto de Saúde para Todos	900,000	0	Uige, Cuanza Norte, Lunda Norte, Lunda Sul, Malanje, Zaire	Strengthen monthly malaria surveillance data reporting through HMIS (paper-based at health facilities and DHIS2 at municipal, provincial and central levels), and malaria data analysis and use for decision-making in target provinces. Includes training and supervision of data collection staff to improve data accuracy and timely reporting. Also includes

					support for data review meetings at municipal levels to inform decision-making.
SUBTOTAL SM&E		3,115,000	0		
OPERATIONAL RESEARCH					
None		0	0		
SUBTOTAL OR		0	0		
IN-COUNTRY STAFFING AND ADMINISTRATION					
CDC staffing costs	CDC-IAA	1,000,000	0	Nationwide	Support to CDC RA position including salary and benefits.
USAID staffing costs	USAID	982,387	0	Nationwide	Support to salaries, benefits, and ICASS for 1 PSC or TCN (Resident Advisor) and 2 support staff (FSNs)
USAID administrative costs / PD&L	USAID	400,000	0	Nationwide	2% for Mission Administration and PD&L
SUBTOTAL IN-COUNTRY STAFFING		2,382,387	0		
GRAND TOTAL		20,000,000	3,249,874		