This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The final funding available to support the plan outlined here is pending final FY 2017 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.

USAID
FROM THE AMERICAN PEOPLE

U.S. PRESIDENT'S MALARIA INITIATIVE

PRESIDENT'S MALARIA INITIATIVE

MADAGASCAR

Malaria Operational Plan FY 2017

TABLE OF CONTENTS

ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AMM	*Agence du Médicament de Madagascar*
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
CCDS	*Comité Communal du Développement Sanitaire/* Community Health Development Committee
CDC	Centers for Disease Control and Prevention
CHL	Central Highlands
CHV	Community health volunteer
CSB	*Centre de santé de base*/ Basic heath center
DHIS2	District Health Information System2
DHS	Demographic and Health Survey
DLP	*Direction de la Lutte contre le Paludisme/* National Malaria Control Program
EPI	Expanded Program on Immunization
FBO	Faith-based organization
FY	Fiscal year
GHI	Global Health Initiative
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoM	Government of Madagascar
HF	Health facility
HMIS	Health Management Information System
HSS	Health systems strengthening
HW	Health worker
iCCM	Integrated community case management
IDSR	Integrated disease surveillance and response
IEC	Information, education, communication
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
KAP	Knowledge, attitude, practices
MDG	Millennium Development Goal
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MoH	Ministry of Health
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
NFM	New Funding Model
NGO	Non-governmental organization
NSP	National Strategic Plan for Malaria
OP	Organophosphate
PCV	Peace Corps volunteer
PhaGDis	*Pharmacie de gros de district/* District pharmaceutical depot
PMI	President's Malaria Initiative

RA	Resident advisor
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SALAMA	Madagascar Central Medical Store
SBCC	Social and behavior change communication
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
SPA	Small project assistance
SSD	*Service de santé de district/* District health service
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USG	United States Government
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 RBM Partnership's second generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and 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.

Madagascar was selected as a PMI focus country in December 2006, with full implementation starting in 2008. After a military coup in 2009, PMI was unable to provide direct assistance to the government of Madagascar (GoM), hindering ability to support activities at the health facility level, including support for malaria in pregnancy, case management and monitoring and evaluation activities. Nevertheless, between 2009 and 2014, PMI focused support on the Madagascar National Strategic Plan for malaria; increased efficiencies through greater coordination and programmatic integration with key partners; implemented woman- and girl-centered approaches through its community-level programming; and improved and expanded the monitoring and evaluation of the program. As a result of internationally recognized free and fair presidential elections in December 2013, the U.S. Government lifted the restrictions on working directly with the GoM health system in May 2014, and re-engaged with the GoM from the central level to the primary health facility level.

This FY 2017 Malaria Operational Plan presents a detailed implementation plan for Madagascar, 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. The activities that PMI is proposing to support fit in well with the National Strategic Plan for malaria (NSP) 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 Madagascar, 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 2017 funding.

The proposed FY 2017 PMI budget for Madagascar is $26 million. PMI will support the following intervention areas with FY 2017 funds:

Entomologic monitoring and insecticide resistance management: A key objective of the NMCP — to interrupt and ultimately eliminate the transmission of malaria — depends on accurate epidemiological and entomological surveillance to better inform vector control implementation. Entomologic monitoring is supported in 26 sites across Madagascar: PMI supports 11 sentinel sites, Institute Pasteur of Madagascar supports 5 sites, and the NMCP supports 10 sites. In late 2015, the NMCP hired a new head entomologist, who has experience in both field and laboratory malaria vector surveillance methods. A new entomology monitoring and evaluation plan was developed in 2016, incorporating current PMI guidance. Additionally, in 2016/2017 Madagascar plans to develop an insecticide resistance management plan with WHO funding and PMI technical support. With FY 2017 funds, PMI will continue to build the entomological capacity of the NMCP and support collection of basic and advanced entomological indicators in sentinel sites.

Insecticide-treated nets (ITNs): PMI is supporting the 2013-2017 NSP goal of universal coverage with 1 ITN per 2 persons in 92 of the 112 health districts where seasonal or perennial malaria transmission occurs. PMI supports free mass distribution campaigns to achieve equitable coverage, and is scaling up keep-up strategies, such as continuous distribution methods at the community level to replace damaged nets and cover new sleeping spaces. PMI also supports social marketing of highly subsidized ITNs in limited peri-urban areas, and with the lifting of restrictions is now supporting routine distribution in health facilities to reach pregnant women coming for antenatal care and children coming for vaccination. PMI procured 6.35 million ITNs to support the September to December 2015 mass distribution campaign. FY 2017 funds will be used to support the 2018 mass distribution campaign.

Indoor residual spraying (IRS): The revised 2013–2017 NSP calls for focalized IRS targeting 17 low burden districts in the Central Highlands (CHL) that are stratified at the commune level and covering up to 30% of communes with the highest transmission. PMI has supported IRS in the CHL since 2008, and in the South since 2010, based on the national strategy. Currently, PMI is implementing blanket IRS in three higher burden districts of the East Coast, and two districts from the South East. These new districts in the South East have been added since epidemiologic data showed an increase of malaria in 2015, as compared to previous years, despite high ITN coverage. With FY 2017 funds, PMI plans to continue implementing IRS in the East Coast and South East, and will continue to support entomological monitoring in a sample of sites throughout Madagascar, including monitoring of the residual efficacy of the insecticide class.

Malaria in pregnancy (MIP): Intermittent preventive treatment for pregnant women (IPTp) using sulfadoxine-pyrimethamine (SP) was adopted as a national policy in late 2004 in the 93 districts where stable malaria transmission occurs. When the political constraints related to working with the Government of Madagascar began in March 2009, PMI focused its efforts to prevent and control malaria in pregnancy on social and behavior change communication (SBCC) at the community level to promote early and frequent antenatal care (ANC) clinic attendance and improve understanding of the benefits of IPTp. With the lifting of restrictions in May 2014, PMI re-engaged at the health facility level and is focusing on strengthening MIP activities, including ensuring availability of SP, quinine, ACTs and ITNs for pregnant women. In FY 2016, PMI will continue to support strengthening of health provider practices to implement the NMCP's updated IPTp policy through training and supervision by regional and district malaria teams, ensuring MIP is part of comprehensive ANC service delivery. With FY 2017

funding, PMI will continue to support implementation of MIP activities at the community and health facility levels, and will procure approximately 500,000 treatments of SP for use at ANC.

Case management: Under the revised 2013–2017 NSP, the goal for case management is to correctly diagnose and treat at least 80% of malaria cases seen at public and private health facilities. PMI activities to improve diagnostics, supply chain management, and case management at public health facilities were suspended in 2009. Efforts were then subsequently focused on community-based interventions and supporting non-governmental organizations (NGOs) and faith-based organizations (FBOs). PMI has supported integrated community case management (iCCM) of malaria, pneumonia, and diarrhea in rural communities and has reached about half of those communities nationwide. PMI's 2 bilateral projects support community case management and related malaria activities in 15 regions of Madagascar; Global Fund covers the remaining 7 regions, and all malaria related activities are implemented under the leadership of the NMCP. To date, PMI has supported training of more than 15,500 Community Health Volunteers (CHVs) in malaria case management and has set up approximately 1,178 malaria commodities supply points at the commune level to serve the CHVs. PMI has also supported training in malaria diagnostics and RDT use by providers from NGO/FBO run health facilities. With the lifting of restrictions, PMI supported a health facility survey to assess readiness to provide high quality care, level of support given to CHVs, and health workers' malaria case management practices. Following the assessment, PMI supported training of trainers from 10 out of 22 regions who will serve as trainers and supervisors in malaria diagnostics and treatment. These trainers will facilitate cascade training in their respective regions, conduct supervisory visits at designated health facilities, and establish quality assurance (QA)/ quality control (QC) programs within these facilities. In FY 2016, PMI will support the implementation of outreach diagnostic and case management training and supportive supervision (OTSS) in health facilities from 15 regions. PMI will provide support through bilateral projects to health facilities (HF) and approximately 15,500 CHVs for refresher training, as well as routine supervision of CHVs by health staff. With FY 2017 funds, PMI will support refresher training, supportive supervision, and national laboratory QA/QC capacity, as well as the reintegration of the CHV supply chain into the national system, while strengthening the distribution of malaria commodities at the HF level.

Health systems strengthening and capacity building: The NMCP leads national control efforts through the formulation of policies and strategies, coordination of malaria control partners, and implementation as secondary recipients of most of the Global Fund malaria grants. Health service quality is substantially below standard, and public and non-governmental sector capacity to plan effectively and manage health programs is weak. PMI is working with the Ministry of Health (MoH) to strengthen the supply chain, in-service training and supervision, and leadership/management and governance. PMI funds contributed to multiple assessments in 2014, including assessments of the national pharmaceutical supply chain, health facility services for malaria, and a malaria KAP (Knowledge, Attitude, Practice) survey. PMI also contributed to the assessment of maternal and child health services which included findings on quality of IPTp services in health facilities. PMI will focus on building NMCP technical and managerial capacity at all levels of the health care system, both through implementing partners and direct support to the NMCP and other government partners in FY 2016. With FY 2017 funding, PMI will continue to support strengthening of the commodity supply chain, MIP and malaria case management at health facilities, and leadership/management and governance activities.

Social and behavior change communication (SBCC): The NMCP developed the 2013-2017 SBCC action plan with the overall objective of achieving 85% use of malaria prevention and case management

services among the target population. PMI supports a variety of SBCC strategies to promote healthy behaviors including mass- and mid-media approaches such as radio spots, mobile videos with local actors, and print materials for sensitization. PMI also supports approximately 15,500 CHVs in 15 regions providing interpersonal malaria SBCC messages to promote correct care seeking and prevention behaviors. PMI will continue to support malaria messages reaching rural areas through community-based interpersonal communication by CHVs, skits and dramas, mobile video unit shows, and radio spots in FY 2016, and will reengage health care providers at facility level. With FY 2017 funds, PMI will continue to ensure that CHVs and health facility staff have access to and utilize SBCC materials and tools that are standardized and harmonized across all malaria partner activities.

Surveillance, monitoring and evaluation (SM&E): The National Malaria M&E Strategy calls for the strengthening of the M&E system in order to detect and control most epidemics, and assure that at least 80% of malaria data are reported from health facilities. PMI contributed to the nationwide 2008/2009 Demographic Health Survey (DHS), the 2011, 2013 and 2016 Malaria Indicator Surveys (MIS), the 2013 Millennium Development Goal survey, and continues to provide support for fever surveillance at 54 sentinel sites collecting weekly data. PMI supported the MoH to complete a comprehensive assessment of the national Health Management Information System (HMIS) in 2016, and various disease surveillance systems, and is working with stakeholders to identify priority recommendations to improve the system. PMI will continue to support malaria surveillance activities including, routine data management and epidemic surveillance with FY 2016 funds. With FY 2017 funds, PMI will continue to help strengthen the national HMIS system through targeted support to the MoH for training, supportive supervision, and materials for the routine data system as well as help support the integration of various surveillance systems into the Integrated Disease Surveillance and Response (IDSR) system. This includes the transition of existing sentinel sites, which PMI had been supporting, into the national surveillance system. PMI will also support therapeutic efficacy studies in four sites scheduled for 2018 and a malaria health facility survey.

Operational research (OR): The NMCP OR priority areas include: (1) the use of sterile mosquitoes for malaria control; (2) therapeutic efficacy studies, and; (3) anthropological studies to inform behavior change communication activities to reduce malaria burden and improve access to services. With FY 2015 funds, PMI is supporting an operational research activity to assess the effectiveness and costs of various approaches to active case detection in districts with very low transmission in the Central Highlands. The study will compare reactive case detection to mass drug administration around passively detected malaria cases, in order to help the NMCP determine the most feasible and effective approaches to further reduce and maintain malaria transmission at low levels. Additionally, PMI is supporting an anthropological study to assess ITN use and barriers in different regions of Madagascar, in order to inform the NMCP on optimal ITN SBCC messages and use. With FY 2016 funds, PMI will support a study to inform the NMCP on reasons for delayed or non-care seeking behavior of caretakers of children and adults with fever, at the community and health facility levels. With FY 2017 funds, PMI is proposing an operational research study of key mobile populations in the CHL and fringe areas in an effort to move towards pre-elimination.

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 for 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 2015-2020 takes into account the progress over the past decade and the new challenges that have risen. 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 extreme poverty. It is also in line with the goals articulated in the RBM Partnership's second generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and 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.

Madagascar was selected as a PMI focus country in December 2006, with full implementation starting in 2008. After a military coup in 2009, PMI was unable to provide direct assistance to the government of Madagascar (GoM), hindering PMI's ability to support activities at the health facility level, including support for malaria in pregnancy, case management and monitoring and evaluation activities. Nevertheless, between 2009 and 2014, PMI focused support on the Madagascar National Strategic Plan for malaria; increased efficiencies through greater coordination and programmatic integration with key partners; implemented woman- and girl-centered approaches through its community-level programming; and improved and expanded the monitoring and evaluation of the program. As a result of internationally recognized free and fair presidential elections in December 2013, the U.S. Government lifted the restrictions on working directly with the GoM health system in May 2014, and re-engaged with the GoM from the central level to the primary health facility level.

This FY 2017 Malaria Operational Plan presents a detailed implementation plan for Madagascar, 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. 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 Madagascar, 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 2017 funding.

2. Malaria situation in Madagascar

Malaria is endemic in 90% of Madagascar; however, the entire population is considered to be at risk for the disease. Malaria cases and deaths reported through the national Health Management Information System (HMIS) have fallen between 2003 and 2013. In 2014/2015, however, there was an observed increase in malaria cases that was attributed to cyclones, heavy rains and flooding, and stockout of malaria commodities in many parts of the country. The most recent HMIS data from late 2015 to the first half of 2016, which followed the September to December 2015 ITN campaign, show a significant reduction in malaria cases in the majority of health districts compared to 2014 with only a couple of districts still showing recalcitrant increases in cases. Among all age groups, malaria morbidity decreased from 19% in 2003 to 6.5% in 2013, and from 21.6% in 2003 to 6.8% in 2013 among children under five years of age. However, data from 2014 and 2015 show an increase in malaria cases in the 6-13 age group.

In 2013, malaria was the eighth leading cause of morbidity among children under five, down from second in 2007, and the second leading cause of death among children under five in 2013 as reported by district hospitals.[1] While hospital deaths attributed to malaria fell from 17% in 2003 to 10% in 2012, severe malaria remained among the top five causes of reported overall mortality.[2]

Madagascar witnessed over a decade of child health improvement between 1997 and 2012. According to the 2009 Demographic and Health Survey (DHS) and 2012 Millennium Development Goal (MDG) survey, under-five mortality fell from 159 per 1,000 live births in 1997 to 72[3] and 62[4] per 1,000 live births by 2008 and 2012 respectively. Other determinants of child survival — such as morbidity and coverage of important health interventions — have improved significantly during this period. For instance, between 1997 and 2008, the prevalence of diarrhea in children decreased by about 70% and respiratory infections by approximately 87%, while the proportion of moderately or severely anemic children fell by 59% between 1997 and 2008.

Despite these improvements in child health indicators, Madagascar still faces major health challenges, which threaten social and economic development. Access to and quality of health services was negatively impacted by the political crisis, which started with the March 2009 coup and led to more than 200 primary health center (*centre de santé de base* [CSB]) closures over the last six years. National health infrastructure, information, and commodity management systems are extremely weak, and much remains to be done at central and regional levels to ensure quality services and sustainable health financing.

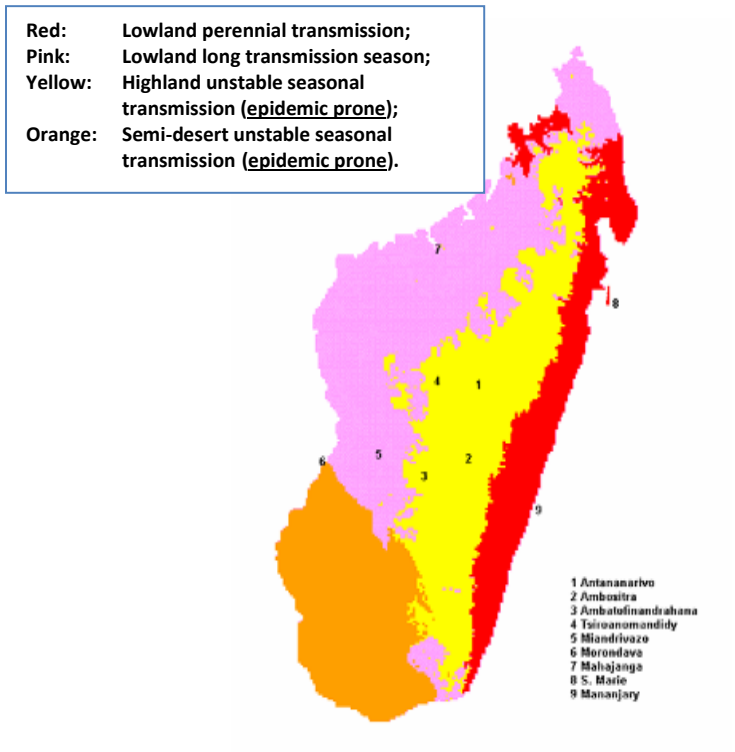
These challenges have a significant impact on overall health and malaria activities at every level of the public health system. There have been delays in planned health policy reform, limited supervisory and monitoring visits due to security issues and lack of funds, delayed data reporting, and interruptions in

[1] Annuaire Statistique 2013
[2] NSP 2013-2017
[3] DHS 2009 Report
[4] MDG Survey Report 2013

supplies of essential medicines to the health facility level. The non-governmental sector has reported difficulties due to insecurity in the field and reduced capacity of the health sector at the decentralized level as a result of changes in personnel and delays in fund disbursements. With the lifting of restrictions in May 2014, the MOH has reopened 100 CSBs, recruited 300 new health providers and renewed focused on ensuring commodities are available throughout the supply chain from central to the CSB levels.

The country has historically been stratified into four malaria epidemiologic zones based on the duration and intensity of malaria transmission: the East Coast, the West Coast including the North, the Central Highlands, and the South, roughly corresponding to the bioclimatic map below. The rainy season varies, starting in late October or early November and lasts until April or May; however, on the East Coast the rainy season and increased malaria transmission may last as long as nine months. The cyclone season extends from December to April.

Figure 1: Madagascar Malariometric Stratification



The East Coast has perennial transmission and the West Coast has seasonal transmission that typically runs from October to May with reduced transmission in July and August. In both regions, immunity among adults is reported to be high and most morbidity and mortality is among children under five years of age and pregnant women. Almost one-third of the Central Highlands lies above 1,500 meters, where malaria transmission does not occur, or the transmission season is short, seasonal, and unstable. In the semi-desert South, transmission is also seasonal but very unstable and in some areas, is almost absent. Immunity is limited in the human population of both the upper Central Highlands (CHL) and the South, and those areas are prone to periodic epidemics, which are often associated with high levels of mortality in all age groups. The most recent large-scale epidemic occurred in the late 1980s in the Central Highlands and killed an estimated 30,000 people. The Fringe districts of the CHL are those areas with

an altitude between 800 and 900 meters that lie between the epidemic-prone areas of the upper CHL and the malaria-endemic areas on the coasts.

Plasmodium falciparum is the predominant species of malaria parasite in all areas. The 2013 Malaria Indicator Survey (MIS) found less than 1% of *P. vivax* and *P. malariae*. However, historically the prevalence of non-*Plasmodium falciparum* infections has been higher in certain epidemiological zones. A 2007 study showed that among 661 randomly selected school-age children seen at eight sites throughout the country, the prevalence of each *Plasmodium* species was 16.2% *P. falciparum*, 13.0% *P. vivax*, 3.6% *P.ovale*, and 1.8% *P. malariae*; overall, 46.8% of infections were falciparum, 37.6% were vivax, 10.4% were ovale, and 5.2% were ovale. The two primary vectors are *Anopheles gambiae* s.l. (East and West Coasts) and *An. funestus* (CHL and South). *An. arabiensis* is present in all four epidemiological zones. *An. funestus* increases in abundance during the rice-growing season and was the primary vector responsible for the outbreaks in the CHL in the late 1980s. Since this vector prefers to feed and rest indoors, it is quite sensitive to indoor residual spraying (IRS). *An. arabiensis*, also present in the Central Highlands, is more ecologically independent of humans and their domestic environment. *An. mascarensis* has been reported as a primary vector in the southeast and as a secondary vector on the island district of Sainte Marie.

The revised 2015-2017 National Strategic Plan (NSP) organized the country into two malaria operational zones based on changes in transmission dynamics, local epidemiology, and level of coverage of malaria interventions: the high transmission zone, including the East Coast and West Coast, and the low transmission zone including the South, and the CHL. In addition, the revised NSP also takes into account vulnerable zones and key populations for the targeting and reinforcement of malaria interventions based on needs. According to the NSP, approximately 20% of the Malagasy population resides in vulnerable zones or districts considered insecure and where access to services is limited. The NSP also identifies vulnerable target populations including migrants and workers working in the mining areas.

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

The Ministry of Health (MoH) at the national level is represented by the cabinet of the Minister of Health and the national directorates reporting directly to the Director General for Health under the Secretary General of the MoH. Madagascar is administratively divided into 22 regions, 119 administrative districts (only 112 health districts), 1,579 communes, and 17,500 *fokontany*,[5] the equivalent of villages in most African countries. Each region has a regional health directorate and a regional hospital. Contrary to other administrators in Madagascar, the *fokontany* chief is chosen through a grass roots selection process by community members and is not affiliated with a political party.

The organization of the health system follows the same general organization as the administrative system down to the district level. At the commune level there is at least one public primary health care facility (CSB), serving each commune. The formal health system is composed of four levels[6]:

- There are 12 university teaching hospitals plus 10 specialized referral centers
- There are 16 regional hospitals for patients requiring a higher level of care that serve as tertiary care health facilities

[5] INSTAT, 2012
[6] Annuaire des Statistiques du Secteur Sante 2013

- There are 87 first referral district public hospitals
- There are 2,563 CSBs. Among these, 1,616 are known as CSB Level II, which are expected to be staffed with at least 1 physician, and 947 CSB Level I, which are staffed by a nurse or paramedic and in some cases a nurse's aide.

In addition, about 680 health facilities are privately run, predominantly by non-governmental organizations (NGO)/faith-based organizations (FBOs). The majority of these facilities are classified as CSBs. Since 2012, PMI supports training and donation of malaria commodities, mostly RDTs, in 161 NGO/FBO run facilities offering malaria diagnostics and treatment services. Some FBO-run hospitals are part of the district level hospitals[6].

The MoH has a critical staff shortage at all levels of the public health system, especially for service provision below the central level. In addition, health workers are not distributed equitably throughout the country, resulting in higher concentrations of qualified health staff in the urban areas. According to the 2013 National Health Statistics (*Annuaire des Statistiques du Secteur Santé*), the national ratio of doctors to the population is 1 per 6,200, with rural regions having less than 1 doctor for every 10,000 inhabitants [7].

Regional and district heads oversee health teams that implement integrated health interventions; currently all regional and district health teams have malaria focal persons. The district hospital is the first referral structure for CSBs; the district health team, currently known as *service de santé de district* is headed by a medical chief called *Médécin Inspecteur*, responsible for technical supervision of all CSBs in his/her jurisdiction.

The malaria control unit was established in 1921 with the aim of preventing malaria epidemics. Until the late 1980s, the focus was on the 26 epidemic-prone districts. In 1998, the first five-year national malaria control strategy was designed, defining control interventions per transmission zones and introducing the use of chloroquine for community-based malaria treatment and chemoprophylaxis among pregnant women. In June 2011, the GoM elevated the malaria control service to a National Malaria Control Program (NMCP) directorate level in the MoH organizational structure. Assisted by a Deputy Director, the NMCP Director supervises a team comprising six technical divisions: Vector Control, Case Management, Laboratory, Epidemiologic Surveillance, M&E, and SBCC, and one support division: Finance and Administration. With the June 2014 government decree restructuring the organization of the MoH, the NMCP was elevated to the cabinet level, under direct supervision of the Minister. A recent government decree (February 2015) repositioned the program back under direct supervision of the Director General for Health. The program was renamed *Direction de la Lutte contre le Paludisme (DLP).*

In 2008, Madagascar approved an integrated community case management (iCCM) package offered by community health volunteers (CHVs) to deliver health services at the fokontany level. Currently, CHVs provide treatment for children under five diagnosed with uncomplicated malaria, acute respiratory infections, and diarrhea. They also offer family planning for eligible families, micronutrient supplementation, and nutrition monitoring and referral. The community-based health services policy calls for a more comprehensive package of services including primary care to newborns for CHVs. Three recent pilots, one testing the administration of pregnancy test kits, a second testing the prevention of postpartum hemorrhage by the distribution of misoprostol by CHVs, and a third testing newborn infection prevention using chlorhexidine by CHVs were successful and are being scaled up. Based on the national implementation directives, each *fokontany* has a team of two CHVs, one specialized in child health and another in maternal and reproductive health. Plans are underway to cross-train all CHVs so that they can at least advise and refer all maternal and child patients in their respective communities.

There are over 34,000 CHVs in the country, trained mostly by a Global Fund National Strategy Application (NSA) grant and by the United States Agency for International Development (USAID)-funded integrated bilateral health projects. The number of CHVs supported by USAID and PMI has increased over the years as the bilateral health projects have expanded their geographic and population coverage. In 2015, approximately 14,000 CHVs were supported by PMI and USAID funds. In 2016, this total number increased to approximately 15,500 with the expansion of the USAID bilateral health projects in the Eastern and Western areas of the country.

The iCCM package through CHVs is supported by USAID-funded projects and targets populations in *fokontanys* located five kilometers or more than one hour's walk from the nearest health facility. However, the selection and establishment of CHVs supported by Global Fund is not based on the same distance criteria. The MOH is updating the National Policy of Community Health in 2016 and will consider how to address these issues. In addition, three directorates in the MoH — Malaria, Maternal Child and Reproductive Health, and the Health Districts Directorate —share responsibility for the oversight of the iCCM activities, which makes coordination and ownership a challenge. Especially challenging are harmonization of supervision tools and content, commodity management, activity reporting, and data management. Both Global Fund and USAID are actively engaged to support the establishment of integrated systems.

4. National malaria control strategy

The 2013–2017 NSP for malaria was updated in December 2014, following a midterm review. It was determined that based on 2014 health facility data and household survey findings, progress towards pre-elimination targets was slow, and many districts' routine data showed an increase in malaria burden. The negative impact of the political crisis, the interruption of many activities for more than two years under Global Fund, and the limits to the NMCP capacity as secondary recipient in implementing activities under Global Fund grants were identified as major causes of slow progress. The revised strategy has reorganized the country into two main malaria control zones based on changes in transmission dynamics, local epidemiology, and level of coverage of malaria interventions: the high transmission zone, including the East Coast and the West Coast, and the low transmission zone including the South, the CHL, and Fringe areas. Intervention strategies are now being implemented according to the new operational stratification taking into account the vulnerability of districts with a focus on key populations. Vulnerable geographic zones include seven localities with limited access due to insecurity and other key target populations such as migrants, mining workers, prisoners, unemployed, and the Les Mikeas ethnic group in the south of Madagascar. The NSP calls for the reinforcement of existing malaria interventions in these zones and populations but not as a separate strategy. Other major changes to the strategy are the adoption of focalized IRS only in low transmission districts in the CHL, and the dissemination and rollout of the new IPTp guidelines in the existing 93 IPTp districts per the new WHO guidelines.

Efforts to establish pre-elimination zones continue; the NMCP in 2015 declared a pre-elimination zone covering six districts in the CHL with <2% parasitemia among children under five, and less than 5% microscopy and RDT positivity. The NMCP strategy for pre-elimination includes active case detection, plus radical treatment by ACT and low dose primaquine, and is focused primarily on the CHL. The surveillance system remains the same for both transmission areas, involving close collaboration between the Division of Surveillance within the NMCP and the RBM subcommittee on surveillance. In addition, to support Madagascar's pre-elimination goals, PMI is supporting an operational research study in low

transmission zones of the CHL, involving reactive case detection. Transmission is based on RDT positivity rates, where any area with RDT positivity rates greater than 5% is considered high transmission. Upsurges are determined based on thresholds, where an alert is triggered if a health facility reaches a threshold. While the details on Madagascar's pre-elimination strategy are still in the nascent stages, it is anticipated that the new NSP (2018-2022) will include further clarity on the approach to pre-elimination, which will be discussed during the Malaria Program Review stakeholders meeting in 2017.

Insecticide-treated nets (ITNs)*:* In 2008, a major strategic change regarding ITN distribution in Madagascar occurred. The strategy moved from targeted distribution of ITNs to vulnerable groups, to universal coverage—defined in the 2008–2012 National Strategy as 2 nets per household in 92 malaria endemic districts, and excluding the 20 CHL districts mostly covered by IRS and epidemic surveillance systems. Under the 2013-2017 National Strategy, the ITN universal coverage goal was redefined to align with WHO and Alliance for Malaria Prevention recommendation of one net per two persons. By the end of 2015, the goal was for at least 80% of households in targeted districts to own at least one ITN per two persons. Madagascar prioritizes free ITN distribution through mass campaigns as the primary approach to scaling up to universal coverage. In addition, three "keep up" strategies are supported: routine distribution through antenatal care (ANC) and expanded program on immunization (EPI) clinics; continuous distribution in endemic districts through CHVs aiming to cover every sleeping space and replace damaged or lost nets; and the sale of highly subsidized ITNs in some peri-urban communities.

Indoor residual spraying (IRS)*:* The 2013–2017 NSP calls for focalized IRS stratified by commune in three geographic zones, which have completed three to four consecutive years of blanket IRS: the CHL; the Fringe areas bordering the CHL; and districts to the west and south of the Fringe. Focalized IRS includes only the highest transmission communes and relies on malaria surveillance and response planning to prevent epidemics. Approximately 30% of all communes undergo spraying, which is prioritized based on clinical and entomological data that show the highest levels of ongoing transmission. Following revisions of the IRS strategy in December 2014, Madagascar has now limited IRS to 17 districts in the CHL not covered by mass ITN distribution. The decision was made after careful review of household survey findings which showed no significant added value of combining IRS with ITNs in low transmission districts. Global Fund supports the focal IRS in the pre-elimination areas (CHL and Fringe districts), while PMI supports blanket spraying in higher burden districts in the East and Southeast. The country has implemented IRS in three Eastern districts and two Southeast districts to measure transmission impact of coupling IRS and ITNs in high burden areas.

Malaria in pregnancy (MIP)*:* Intermittent preventive treatment for pregnant women (IPTp) has been implemented since 2004 and currently covers 93 endemic districts where malaria transmission is stable or seasonal, and excludes 19 CHL districts. The decision to implement IPTp in one additional district (Itasy), as compared to the ITN targeted districts was made in 2011 by the RBM stakeholders. The MIP strategy includes the provision and promotion of ITN use during pregnancy and IPTp, delivered as a package during ANC visits. The 2013–2017 NSP was recently updated to provide sulfadoxine-pyrimethamine (SP) early in the second trimester and at each ANC visit thereafter, in order to align with the WHO's recent recommendation on new SP dosing during pregnancy. The updated NSP includes the IPTp3 indicator as part of its strategy with the aim of achieving 40% IPTp3 by 2017. Administration of IPTp should be directly observed and free-of-charge. CHVs play an essential role in promoting the use of antenatal services. All focused antenatal care, including tetanus vaccination and malaria prevention activities, is integrated at the CSB level. The NMCP works closely with the *Direction de la Santé Familiale –Directorate of Family Health (*former *Direction de la Santé de l'Enfant, de la Mère et de la Reproduction)* to plan and implement MIP activities, including IPTp. The NMCP has also included IPTp as part of an integrated ANC services package during the mother and child health promotion weeks held

twice a year in April and October. In addition to ANC counseling, these biannual health weeks include other health focused activities such as the distribution of vitamin A and deworming medicines to children 6–59 months, and iron, and folic acid to pregnant women, implementation of mass immunization campaigns, and dissemination of health promotion messages.

***Case management**:* ACTs were adopted as the first-line treatment for malaria in 2005. ACTs and RDTs were rolled out in public health facilities from late 2006 through 2008 and at the community level in late 2008. The NMCP policy requires that, where possible, all cases of malaria be diagnosed by microscopy or RDT, including at the community level. Where biological diagnosis is not possible, diagnosis should be based on clinical evaluation and treatment should be provided after other causes of fever have been excluded. Under the revised 2013–2017 NSP, the goal for case management is to correctly diagnose and treat at least 80% of malaria cases seen at public and private health facilities. First-line treatment is artesunate-amodiaquine (AS/AQ) (except for pregnant women in their first trimester, in which case treatment is oral quinine); in the six pre-elimination districts in the CHL within the low transmission zone, the national strategy also calls for administration of a single low dose of primaquine in addition to AS/AQ for cases of simple malaria, except in pregnant women and children less than six months of age. Treatment of severe malaria is parenteral artesunate at the CSB and the hospital level. Rectal artesunate should be administered as a pre-referral treatment at community and health facility levels for symptoms of severe malaria in children less than five years of age. As of early 2015, injectable artesunate and pre-referral rectal artesunate had not yet been rolled out, but this is planned to occur before the end of 2016.

***Health systems strengthening (HSS)**:* The NMCP leads national control efforts through the formulation of policies and strategies, coordination of malaria control partners, and implementation as secondary recipient of the majority of Global Fund malaria grants. Health service quality is substantially below standard, and the NMCP capacity to plan effectively, implement efficiently, and report on time is limited. Additional challenges for the NMCP include ensuring effective coordination from the central level down to the district level with other government directorates who have equal responsibility in disease control, epidemiological surveillance, program oversight and reporting, and training and supervision of staff who lack skills in malaria control. The November 2014 strategy review adopted decentralization principles with the plan to give more responsibility to regional and district teams in management of human and financial resources. The revised strategy also adopted the integration of malaria commodities management into the MoH logistics and commodity management unit.

***Monitoring and evaluation (M&E)**:* The 2013–2017 National Malaria M&E Strategy calls for the strengthening of the M&E system in order to detect and control 100% of epidemics, and assure the quality of at least 80% of data reported from health facilities on malaria. The revised strategy set the objective of ensuring availability of quality epidemiological data to make it possible to monitor the evolution of malaria across the transmission zones. The strategy supports the adoption of the web-based District Health Information System2 (DHIS2) to improve access to data and integrate multiple existing health data management systems. The strategy also supports the expansion of SMS messaging to improve epidemic surveillance and completeness of reporting from remote and inaccessible districts. In collaboration with different Directions of the MoH, NMCP plans to strengthen the integrated HMIS system and the Integrated Disease Surveillance and Response (IDSR) system. Supported by WHO, the NMCP is currently piloting an integrated surveillance for 24 diseases in 17 districts.

***Operational research (OR)**:* The NMCP operational research priorities are linked to major malaria control interventions supported by PMI. The November 2014 midterm review of the 2013–2017 National Strategy listed the following OR priority areas for the remaining time of the strategy: (1) the use of sterile mosquitoes for malaria control; (2) therapeutic efficacy studies; and (3) anthropological

studies to inform behavior change communication activities, in association with malaria burden and access to services.

Social behavior change communication (SBCC)*:* The NMCP developed the 2013–2017 SBCC action plan with the overall objective of achieving 80% use of malaria prevention and case management services among the target population. The November 2014 strategy review put an emphasis on mobilizing mothers and care givers to seek prompt treatment for children with fever within 24 hours, and priority to regionalized SBCC design, using anthropologic study findings. The strategy plans to improve public relations and advocacy, mobilize decision-makers and communities, increase interpersonal communication, and enhance service providers' skills in communicating with care seekers. A revised communication plan was elaborated in 2016 to increase the impact of SBCC, involving the Ministry of Education and the traditional leaders.

The table below describes the key strategies by transmission zone.

Table 1: NMCP Strategy by Intervention and Transmission Zone

Strategies/interventions	High Transmission Control Zones (endemic East and West)	Low Transmission control zones (non-endemic CHL, Fringes and South)
IRS		
Focalized IRS		√ (17 districts in CHL)
Focalized IRS for epidemic response	√	√
ITNs		
ITN universal coverage	√	√ (South and Fringes)
Routine and continuous ITN distribution	√	√ (South and Fringes)
Focalized ITN distribution in response to epidemics	√	√ (South and Fringes)
IPTp		
IPTp among pregnant women	√	√ (South and Fringes)
Case management		
Diagnostic case confirmation	√	√
ACTs for confirmed cases	√	√

Strategies/interventions	High Transmission Control Zones (endemic East and West)	Low Transmission control zones (non-endemic CHL, Fringes and South)
Radical treatment (ACT plus primaquine) for confirmed cases		√ (CHL)
Surveillance		
Weekly surveillance	√	√
(Re)active case detection during an epidemic (ACTs for confirmed cases)	√	
(Re)active case detection, around an index case (ACT + PQ for confirmed		√ (6 districts in CHL)

5. Updates in the strategy section

There are no new updates to the NSP since it was last updated in 2014 following a mid-term review, covering the period of 2015-2017. The next Malaria Program Review scheduled for the end of 2016 will integrate input from the scientific review of malaria activities being convened in August 2016, as well as intervention coverage data provided from the 2016 MIS. This review will be conducted in preparation for the development of the new NSP, which will be developed in 2017.

6. Integration, collaboration, and coordination

Several donors and partners support malaria interventions in Madagascar, including PMI, Global Fund, United Nations Children's Fund (UNICEF), WHO, Principality of Monaco, and Roll Back Malaria (RBM)/Southern Africa Regional Network, with the NMCP coordinating all partners. Under NMCP leadership, a strong local RBM partnership has been established, and committee meetings are held monthly. Over the last five years, RBM partners worked closely to oversee and conduct three Malaria Indicator Surveys (MIS 2011, MIS 2013, and MIS 2016), to plan and design the Malaria Program Review (July 2011), to organize and facilitate a national conference on pre-elimination (November 2011) to inform the design of the 2013–2017 NSP, to conduct the 2012 and 2013 mass distribution of over nine million ITNs in 92 districts, and to coordinate technical assistance as needed at all levels. In November 2014, RBM partners conducted a midterm review of the 2013–2017 NSP, resulting in setting new targets for some of the major malaria control measures.

The NMCP and RBM partners submitted a concept note for the Global Fund New Funding Model (NFM) and the new grant was approved in 2016, with activity implementation starting in July 2016 for one year. The country is waiting for the Global Fund replenishment process in order to submit a second NFM grant.

With FY 2017 funding, PMI will continue to seek opportunities to collaborate with other USG health programs to ensure maximum impact for every health dollar the USG invests in the country. PMI has been supporting the integration of maternal and child health services at the community level since 2009. Since malaria prevention and control activities have been implemented as part of integrated maternal and child health services, PMI will contribute to strengthening the capacity to deliver these services.

PMI will work with other USG-funded programs and other partners to support the comprehensive primary health care package, including the training and implementation of community-based diagnosis and treatment of fever, early correct case management, and IPTp.

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.[7]

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

8. Progress on coverage/impact indicators to date

[7] http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

The most recent Demographic and Health Survey (DHS) was carried out from November 2008 to August 2009 and provides baseline indicators for PMI in Madagascar. Child mortality was estimated at 72 per 1,000 live births by the direct method. A Millennium Development Goal (MDG) survey was conducted in December 2012/January 2013 and estimated child mortality at 62 per 1,000 live births, a small decrease from 2009. However, maternal mortality remained high (479 deaths per 100,000 live births), and stagnated at levels similar to what was measured in the 2008/2009 DHS (498 deaths per 100,000 live births). Additional household surveys carried out include the Malaria Indicator Surveys (MIS) in 2011 and 2013. A 2016 MIS is currently underway with preliminary results anticipated to be available in September 2016. Supplementary data, including routine malaria-specific health management information system (HMIS) data and malaria program data compiled by the NMCP, are reported and centrally stored in a national malaria database. Some national malaria indicators have been estimated based on these data and additional sources such as special studies and limited surveys. Results for some malaria indicators are summarized in Table 2 below.

Table 2: Evolution of Key Malaria Indicators in Madagascar from 2008 to 2013

Indicator	2008/09 DHS (PMI baseline)	2011 MIS	2013 MIS
% Households with at least one ITN[1]	73	94	79
% Households with at least one ITN for every two people[1]	23	40	35
% Children under five who slept under an ITN the previous night[1]	58	89	71
% Pregnant women who slept under an ITN the previous night[1]	58	85	68
% Households in targeted districts protected by IRS	N/A[2]	79[3]	59[4]
% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	41	34	44
% Children under five with fever in the last two weeks who had a finger or heel stick	N/A[5]	6	15
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	5	19	54
% Women who received two or more doses of IPTp during their last pregnancy in the last two years[6]	8	22	21

[1]Among 92 targeted districts that receive ITNs per the national strategy 2008-2012
[2]The DHS 2008/2009 did not collect information on IRS
[3]Among 53 targeted health districts that benefit from IRS per the national strategy 2008-2012
[4] In 2012 Madagascar transitioned from district-wide to focalized IRS targeting communes in the Central Highlands, but the MIS estimate is at the district level.
[5]The DHS 2008/2009 did not collect information on finger/heel stick
[6]Among 93 targeted districts that benefit from IPTp

9. Other relevant evidence on progress

Household survey: A major cross-sectional study conducted in 2012 and 2013 by a local implementer to evaluate the efficacy and impact of malaria interventions collected blood samples and administered household questionnaires to 15,465 participants in 62 sites throughout the country[8]. Results from the study found that 3.7% of participants were RDT-positive, and that ITNs had a protective effect on the population. However, the study also showed that combining ITNs and IRS in low-transmission zones had no significant added value, and that the protective effect of IRS in low-transmission areas was still questionable.

Health facility survey: A nationally representative cross-sectional cluster survey of 65 outpatient public health facilities conducted in Oct-Dec 2014 showed that only 38% of health facility staff were trained to perform either malaria microscopy or RDTs. When assessed individually, 41.6% of health workers (HWs) reported receiving formal training on RDT use, with the same proportion receiving formal training on malaria case management with emphasis on ACT use. A significant proportion of facilities (between 65.0% and 81.3%) had the various AS/AQ treatment courses in stock the day of the survey, but only an average of 10% of the facilities had a minimum of 20 courses on hand. Only approximately two-thirds of surveyed facilities had a copy of the national malaria control policy and just over half had a copy of the national ACT guidelines. The survey also found that HWs tested 97.4% of patients for whom malaria was suspected, and that HWs administered or prescribed ACTs to 86.1% of patients diagnosed with uncomplicated malaria. Weighted analysis showed that the proportion of patients diagnosed with uncomplicated malaria who were properly counseled on use of ITNs was 32.3%, who returned to the health facility (HF) if signs of severity were present or symptoms worsened was 19.4%, who returned to the HF for a follow-up visit after two days was 32.3%, who completed treatment courses to the end was 23.7%, and who continued to eat while sick was relatively low. Only approximately two-thirds of HFs supervised their CHVs and provided or delivered supplies to them.

[8] http://www.malariajournal.com/content/13/1/465

III. OPERATIONAL PLAN

PMI supports all elements of the NMCP's national strategy. Along with USAID Family Planning and Maternal Child Health funding, PMI supports integrated community case management in 15 out of 22 regions through 2 community health bilateral projects, 8 regions in the hard to reach districts in the West and North, and seven regions in the West, Central and East of the country (see Figure 2). Following the re-engagement with the GoM in May 2014, the bilateral projects are working with district health teams to plan and implement refresher training, support providers' supervision including supervision of CHVs by CSB staff, and to improve data collection and reporting. The choice of the 15 regions was a concerted effort among Madagascar health partners; the remaining 7 regions are receiving similar support from Global Fund.

Figure 2: 15 Priority USAID and PMI Regions

1. Vector monitoring and control

NMCP/PMI objectives

Under the 2013–2017 NSP, Madagascar supports both ITNs and IRS as vector control interventions, along with entomological monitoring in 26 sites throughout the country. Madagascar has adopted one ITN for every two persons to achieve universal coverage for all districts in the high transmission zone, including the East Coast and the West Coast, and low transmission districts in the South and Fringe areas. There are presently six districts in the CHL meeting pre-elimination criteria; the NMCP with Global Fund financing, implements focal IRS in these pre-elimination areas of the CHL. Since 2014, PMI has refocused the geographic area for IRS by implementing IRS in a few high burden districts, to assess the impact of combining IRS and ITNs. While the epidemiological data collection and analysis is still in process, the NMCP and stakeholders will share the outcomes at the country's Malaria Program Review, slated for the end of 2016. The PMI targeted area for blanket IRS was selected by in-country stakeholders due to its high malaria burden, despite universal ITN coverage.

a. Entomologic monitoring and insecticide resistance management

Progress since PMI was launched

PMI funds have supported the collection of basic entomological indicators, including monitoring the residual efficacy of IRS, in approximately ten sentinel sites each year. The NMCP's Vector Control Committee selects the entomological monitoring sentinel sites annually, in discussion with PMI, and partners, including IPM, who also supports entomological sentinel sites. Routine insecticide susceptibility monitoring of insecticides has guided the country's IRS program, and justified switching insecticides to a longer-lasting organophosphate.

Progress during the last 12-18 months

PMI-supported entomological monitoring occurred at 11 sentinel sites: 4 in the CHL, 1 in the South, and 6 along the East Coast. Both IRS-targeted and 'similar' comparison sites were included to monitor indicators such as vector-insecticide resistance and IRS residual effectiveness. The majority of the entomological monitoring sites are consistent from year to year with the exception of a few adjustments due to security issues. The sites are monitoring the same indicators, as defined by the PMI Technical Guidance and include basic indicators such as: identification of vectors, density, behavior, and susceptibility. In addition more advanced indicators are collected including: parity, age, sporozoite rate, and PCR is used for molecular identification of species and to determine the resistance mechanism. The residual efficacy is monitored only in IRS zones. According to the 2015 entomological report for PMI supported sites, 4,665 mosquitoes (2,611 female anopheline and 2,054 culicine mosquitoes) were collected over a six months period using human landing catches, pyrethrum spray catches and aspiration methods. Of the 56% of anopheline species, 34% were malaria vectors, with the three principal malaria vectors noted as: *An. gambiae* s.l. (52.4%), *An. funestus (5.2%),* and *An. mascarensis* (3.6%).

Insecticide susceptibility tests were performed in all 11 PMI supported sentinel sites, using 2- to 4-day old adult, non-blood fed female mosquitoes reared from field collections and identified to the species level, using both WHO tube test and CDC bottle bio-assays. The 2015 vector insecticide resistance profile indicates resistance to pyrethroid class insecticides (deltamethrin, lambda-cyhalothrin and permethrin), emerging cross-resistance between DDT and pyrethroids, and universal susceptibility to carbamates and organophosphates. Intensity assays were also conducted, and there was no evidence of

high intensity resistance to pyrethroids, following exposure to 5X and 10X concentrations of the diagnostic dose of insecticide.

TABLE 3: 2015 RESULTS OF INSECTICIDES SUSCEPTIBILITY TESTS (*AN. GAMBIAE S.L.*)

District	Deltamethrin 0.05%		Lambdacyhalothrin 0.05%		Permethrin 0.75%		Alphacypermethrin 12.5mg/bottle	
	2014/2015	2015/2016	2014/2015	2015/2016	2014/2015	2015/2016	2014/2015	2015/2016
AMBOHIMAHASOA	100 (100)	100 (100)	99 (100)	99 (100)	100 (100)	97 (100)	100 (100)*	100 (100)*
AMBOSITRA	100 (100)	100 (100)	98 (100)	96 (100)	99 (100)	99 (100)	94 (100)*	95 (100)*
BEKILY	100 (100)	100 (100)	100 (100)	85 (100)	100 (100)	80 (100)	91 (100)*	100 (100)*
BRICKAVILLE	100 (100)	100 (100)	98 (100)	99 (100)	98 (100)	100 (100)	100 (100)*	100 (100)*
FANDRIANA	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)*	100 (100)*
FARAFANGANA		100 (100)		100 (100)		100 (100)		99 (100)*
FENERIVE EST	99 (100)	99 (100)	100 (100)	99 (100)	95 (100)	99 (100)	91 (100)*	91 (100)*
FIANARANTSOA II	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)*	100 (100)*
TOAMASINA II	93 (100)	92 (100)			96 (100)	100 (100)	98 (100)*	97 (100)*
VANGAINDRANO		100 (100)		100 (100)		100 (100)		100 (100)*
VAVATENINA	92 (100)	98 (100)	100 (100)	100 (100)	100 (100)	82 (100)	100 (100)*	100 (100)*

District	DDT 4%		Bendiocarb 0.1%		Pirimiphos-methyl	
	2014/2015	2015/2016	2014/2015	2015/2016	2014/2015	2015/2016
AMBOHIMAHASOA	98 (100)	30 (100)	100 (100)	100 (100)	100 (100)	100 (100)
AMBOSITRA	27 (100)	56 (100)	99 (100)	100 (100)	100 (100)	100 (100)
BEKILY	100 (100)	100 (100)	98 (100)	100 (100)	100 (100)	100 (100)
BRICKAVILLE	96 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
FANDRIANA	93 (100)	96 (100)	100 (100)	100 (100)	100 (100)	100 (100)
FARAFANGANA		100 (100)		100 (100)		100 (100)
FENERIVE EST	100 (100)	99 (100)	100 (100)	100 (100)	100 (100)	100 (100)
FIANARANTSOA II	29 (100)	45 (100)	100 (100)	100 (100)	99 (100)	100 (100)
TOAMASINA II	99 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
VANGAINDRANO		100 (100)		100 (100)		100 (100)
VAVATENINA	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)

In 2015/2016, the monitoring of the residual efficacy of the insecticide sprayed in four PMI supported IRS districts occurred monthly. Results indicate that after six and seven months, organophosphate insecticide was still effective in the South East and East Coast, respectively.

Plans and justification

With FY 2016 funds, PMI will focus on building the NMCP's capacity to implement routine, robust entomological monitoring. These funds will also provide technical assistance to the NMCP in the development of an insecticide resistance monitoring plan, which will be funded by WHO. PMI will also assist in the expansion of the current NMCP entomology laboratory by converting a shipping container into an innovative insectary in a box. With FY 2017 funds, PMI will continue supporting monitoring at

select sentinel sites, including basic and advanced entomological indicators, insecticide susceptibility and intensity assays, and IRS residual efficacy.

Proposed activities with FY 2017 funding: ($230,000)

1. *Support entomological monitoring:* Includes support for comprehensive entomological monitoring at 11 sentinel surveillance sites. Basic indicators will be collected monthly, while PCR and susceptibility test will be carried out annually. Residual efficacy of IRS will be collected until two consecutive months of data show less than 80% mortality. Collection methods to be used are human landing catches and pyrethrum spray catches. Activity will also focus on building NMCP capacity for the monitoring, and includes procurement of entomological supplies. *($230,000)*

b. Insecticide-treated nets

Progress since PMI was launched

Madagascar completed nationwide, mass campaigns to deliver free ITNs to reach all persons living in malaria endemic areas in 2009–2010, in 2012–2013, and more recently in 2015. The 2009–2010 campaign achieved an average of 1.8 ITNs per household compared to the then national target of 2 ITNs per household according to MIS 2011. This resulted in high ownership with 94% of households reporting ownership of at least one ITN six months after the campaign compared to 73% ownership in 2008–2009. The 2012-2013 mass campaign was conducted following the earlier strategy of 2 ITNs per household (equating to about 1 ITN: 2.4 persons) and delivered ITNs to 31 districts on the East Coast in 2012 and the remaining 61 endemic districts at the end of 2013. Since the 2013 MIS was conducted at the beginning of the year and before completion of the 2013 mass campaign in the rest of the country, ITN ownership was lower than with MIS 2011. The survey found that 79% of households owned at least one ITN, with 71% of children under five years of age sleeping under an ITN the previous night.[9]

The 2015 campaign was conducted between September and December and covered all 92 ITN target districts, applying the national policy of 1 ITN per 1.8 persons. Field data collection for Madagascar MIS 2016 is planned for completion by the beginning of July 2016; it will provide the results on coverage and ITN use following the mass distribution campaign.

Several reports, including a 2012 PMI assessment of the physical durability of nets distributed in late 2009 on the East Coast, indicated a rapid decline in net survivorship in Madagascar. Among 500 polyester and polyethylene ITNs tagged and examined 3 years later, only 152 (30%) remained in the households. Of those nets no longer present it is not known what proportion were lost due to attrition unrelated to physical durability (e.g. given away) and what proportion were no longer present due to loss of physical integrity. Among the 152 remaining nets found in households after 3 years, 80% were considered still useable by household members. Surviving polyethylene nets were found to have larger-sized holes overall and a larger estimated mean surface area of holes than polyester nets. Following the 2013 mass distribution campaign, PMI supported durability monitoring of ITNs. Assessments of loss due to removal, physical durability, and bio-efficacy, were carried out at 6-, 12- and 24-month intervals among 3 ITN brands at 6 sites. Preliminary data of the 3,000 ITNs monitored indicated that at the 12-month data point, there was practically no insecticidal content. However, the ITN integrity or physical durability data indicates that at the 24-month data point, a good portion of nets are still considered "serviceable".

[9] MIS 2013

Currently, the rest of the data is being analyzed and manuscripts are being drafted to present complete results on survival, integrity and bio-efficacy. Final results will allow the NMCP of Madagascar and its partners to better define the serviceable life of an ITN in the Madagascar setting, thereby better informing program decision-making around maintaining high ITN coverage.

The 2012 ITN durability assessment highlighted the need to support delivery of ITNs between campaigns to maintain high coverage. In 2014 /2015, PMI/Madagascar tested a continuous distribution model by CHVs at the community level in three districts, to improve availability of ITNs free-of-charge for households in need. The continuous distribution was implemented simultaneously with routine EPI and ANC clinic ITN distribution, channels traditionally used in Madagascar. Covering any uncovered sleeping space became the only eligibility criteria for receiving an ITN. The approach relied on teams of CHVs, one team collected ITNs from supply points, generally located at the nearest public health facility (CSB), and managed the distribution of ITNs to the populations to cover all sleeping spaces. The other team visited the households in their jurisdiction to assess the needs and distributed vouchers indicating the number of nets needed per household. In 2014, CHVs visited families in their *fokontanys* and recorded needs of ITNs for pregnant women, vaccinated children, and for new and existing uncovered sleeping spaces on an as-needed basis. In 2015, CHVs visited households in their *fokontanys* and recorded the existence of uncovered sleeping spaces. In both years, continuous distribution was successful in increasing availability and use of ITNs in pilot districts of Toamasina II, Vohipeno, and Vangaindrano. The continuous distribution model is being scaled up in up to 19 high burden districts on the East Coast, starting in July 2016. PMI has also distributed ITNs to communities in response to epidemics or disasters, such as cyclones. Out of a stock of 27,000 ITNs set aside for cyclone and disaster response, PMI provided 8,000 nets in early 2015 to the South-Eastern region hardest hit by cyclones and resulting flooding. The current channels supported by PMI in Madagascar are listed in Table 4.

Table 4: Madagascar national ITN distribution strategies

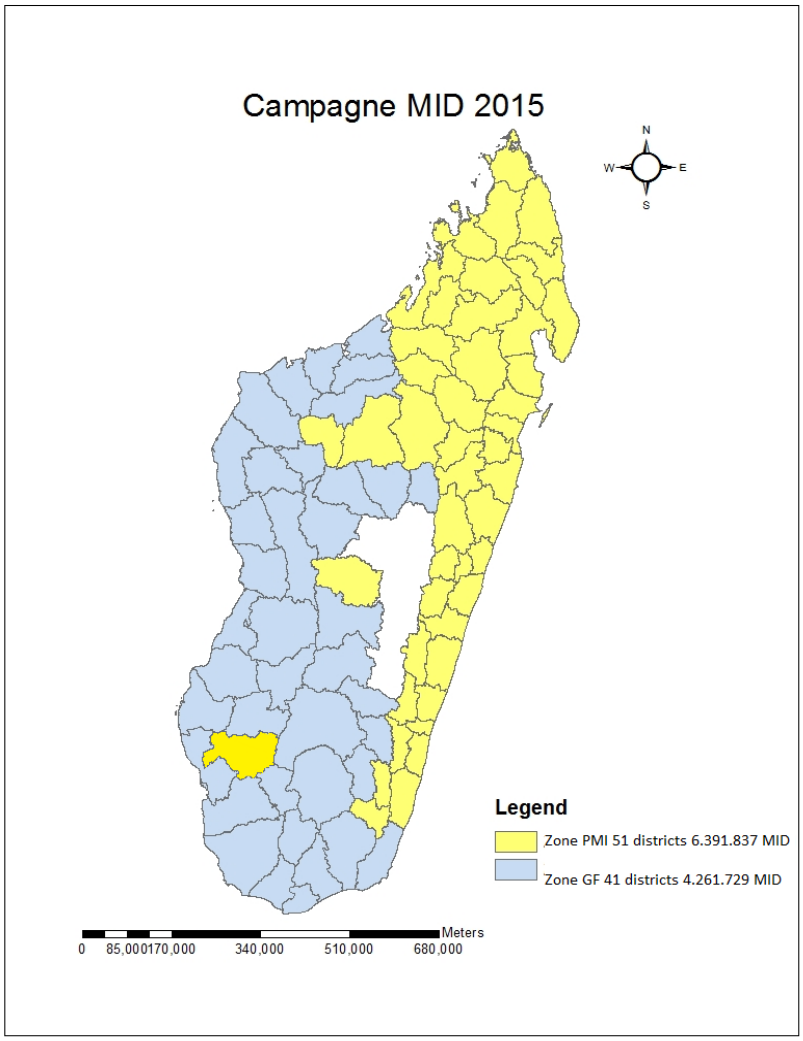
Type of ITN Distribution	***Strategy***	***Approach***	***Target Population***
Free Distribution	Catch-Up	Mass Campaign	One ITN per two persons in 92 lowland and coastal districts
	Keep-Up	Facility-based delivery to pregnant women at ANC visits to and vaccinated children at EPI visits	Pregnant women and vaccinated children in 93 lowland and coastal districts
	Keep-Up	Community-based continuous distribution through CHVs	All residents in 92 lowland and coastal districts to cover every uncovered sleeping spaces; currently implemented in 19 east coast districts
	Emergency Response	Distribution in response to natural disasters and emergencies	One ITN per two persons in communities most affected by natural disasters, such as cyclones
Social marketing	Keep-Up	Social marketing; commercial sales of subsidized nets	Residents of peri-urban areas who can afford subsidized nets

Note: One additional district was added to the 92 endemic districts for MIP.

Progress during the last 12-18 months

With a combination of FY 2013 and FY 2014 funds, PMI supported the September to December 2015 mass distribution campaign with 6.39 million ITNs covering 51 districts primarily on the East Coast, the North, and North-West of the country. In addition, Global Fund procured 4.2 million ITNs to cover 41 districts in the Fringes, the South, and South-West. This was the first time Madagascar conducted a mass distribution covering all 92 targeted ITN districts over a period of 3 months. The 2015 campaign followed the current national policy of one net per 2 persons (estimated as one ITN per 1.8 persons). PMI and Global Fund coordinated the preparation of the campaign through improved enumeration in order to minimize risk of stockouts or low inventory at distribution sites during the campaign. The 2015 mass distribution campaign was rolled out as shown by the map in Figure 3.

Figure 3: Distribution of districts covered during the 2015 ITN mass distribution campaign



In addition to ITNs for the mass campaign, PMI supported continuous distribution of ITNs at the community level. In 2015, PMI's support for continuous distribution expanded to a total of 5 districts in the South East with high malaria burden, with an estimated 300,000 ITNs procured for continuous distribution. Although there is no plan for CHVs to conduct an evaluation of ITN use after distribution as such, the CHVs routinely visit households on a continuous basis to identify uncovered sleeping spaces, and conduct ITN use promotion activities. During the two weeks after distribution campaign,

CHVs also visit households to verify the net is hung and if not, will help families to hang the net. Lastly, the ongoing anthropological study is looking at pockets of low ITN use, which will also provide insight to the NMCP and partners as to how CHVs and bolster ITN use. Performance of community continuous distribution proved to be high; between March and August 2015, out of 29,100 vouchers distributed, only 10 vouchers were never redeemed. In 2016, PMI support for continuous distribution will expand to 19 high burden East Coast districts.

With Global Fund procured nets, the national program continues to support routine distribution of ITNs to pregnant women and vaccinated children through ANC and EPI clinics at CSB. Performance of this routine distribution continues to be low; according to NMCP data, of the 700,000 nets planned for routine distribution annually, approximately 300,000 are distributed. Coordination between the NMCP and the Family Health Program has not been optimal for the planning of quantities of ITNs needed and ensuring facilities are stocked with nets for ANC and EPI. Additionally the health facilities also have not received clear guidance on these routine distribution channels. Following the lifting of USG restrictions, PMI is working to improve this model by incorporating promotion of clinic-based routine distribution into current efforts and reinforce and expand these through focal ANC, which is defined as the promotion of IPTp and sensitization of ITN use by pregnant women.

Commodity gap analysis

Table 5. ITN Gap Analysis

Calendar Year	**2016**	**2017**	**2018**
Total Targeted Population (92 ITN districts)	19,713,360[1]	20,265,334	20,832,763
			Continuous Distribution Needs
Channel #1: ANC[2]	709,681	775,149	796,853
Channel #2: EPI [3]	615,057	632,278	649,982
Channel #4: CHV continuous distribution[4]	532,500	767,500[5]	-
Channel #5: Social marketing[6]	450,000	450,000	450,000
Channel #6: Cyclone response & Disaster	50,000	50,000	50,000
Estimated Total Need for Continuous	***2,357,238***	***2,674,927***	***1,946,835***
			Mass Distribution Needs
2018 mass distribution campaign[7]		0	11,573,757
Estimated Total Need for Campaigns[8]		***0***	**11,573,757**
Total Calculated Need: (Routine and Campaign)	***2,357,238***	***2,674,927***	**13,520,593**
			Partner Contributions
ITNs carried over from previous year	257,092	0	681,949
ITNs from MoH	0	0	0
ITNs from Global Fund Round	977,846	1,356,876	1,335,126
ITNs planned with PMI funding	1,000,000	2,000,000	2,300,000
Total ITNs Available	**2,136,538**	**3,356,876**	**4,317,075**
Total ITN Surplus (Gap)	**(220,700)**	**681,949**	**(9,203,518)**[9]

[1]Estimated population in ITN districts is derived from a 2.8 % annual increase applied to the INSTAT 1993 census population

[2] Needs based on expected 80% ANC-1 coverage in 2016 and projected 5% annual increase in 2017; no increase applied in 2018
[3] Needs based on expected 80% EPI coverage in 2015
[4] Will resume in July 2016, therefore a small quantity of nets will be distributed to replace about 5% of ITNs distributed during the mass campaign
[5] The need for continuous distribution in 2017 should aim at replacing 30% of ITNs in the 19 East Coast districts, which were distributed during the mass campaign to sustain universal coverage. A mass campaign is planned for 2018,so no continuous distribution
[6] Needs for social marketing ITNs based on sales history numbers
[7] ITN needs for 2015 mass campaign are obtained by dividing the total population in ITN districts by 1.8
[8] No mass distribution is planned in 2016 and 2017
[9] Global Fund cannot commit to mass campaign ITN contribution before the next global funds replenishment.

Plans and justification

FY 2017 funds will be used to procure 2.3 million ITNs to support the planned 2018 ITN mass campaign distribution, and cover associated warehousing and distribution costs. Currently the Global Fund NFM grant does not include the procurement of ITNs to support the 2018 campaign, due to the timing of the grant cycle. The Global Fund portfolio management team plans to support the 2018 mass distribution campaign after the funding replenishment is completed. PMI will contribute a portion of the ITNs needed and will advocate with NMCP, Global Fund and other donors for support of additional nets to address the quantities of nets needed for the 2018 campaign. PMI will continue to support the design and implementation of targeted SBCC for increased use of malaria prevention measures including ITNs as a priority, especially during pregnancy (see SBCC section for more information), and strengthen the routine distribution channels. PMI will continue and complete the monitoring of ITN durability including physical integrity, survivorship and efficacy of nets distributed in the 2015 mass campaign.

Proposed activities with FY 2017 funding: ($9,889,500)

1. *Procure ITNs for 2018 mass distribution campaign:* To procure 2.3 million ITNs for mass distribution, coordinated and jointly funded with Global Fund *($7,675,000)*
2. *Support warehousing and distribution costs in country:* Assumes a cost of $0.87/ITN for logistics from central level to districts, district level warehousing, and transportation to CSBs & CHV sites *($2,100,000)*
3. *Support for continued monitoring of net durability*: Includes monitoring the physical durability of different brands of ITNs that were distributed as part of mass campaigns in 2015. *($100,000)*
4. *Technical assistance of ITN activities:* Support for technical assistance to monitor and evaluate ITN activities *($14,500)*

c. Indoor residual spraying

Progress since PMI was launched

The current national strategy, which was recently revised for 2015–2017, recommends IRS in the epidemic-prone CHL, where there is no ITN coverage. The national strategy calls for focalized IRS, based on health facility malaria cases and RDT positivity rates, and epidemic alert reporting. PMI has supported IRS in Madagascar since 2008, initially supporting blanket IRS in the CHL and Fringe areas, in collaboration with the Global Fund. Carbamate insecticides were introduced in order to mitigate emerging pyrethroid resistance. However due to the short residual efficacy, this insecticide class was phased out in 2014. In 2014, the NMCP agreed that PMI implement a pilot IRS program on the East Coast for two to three years, to see if IRS can impact these areas of higher malaria prevalence. The East Coast was selected by in-country stakeholders due to its high malaria burden, despite universal ITN coverage. The combination of IRS and ITNs is expected to better control malaria in this area of high

population density. In the most recent IRS round, PMI supported blanket spraying in the three high burden districts of the East Coast, plus blanket spraying in an additional high burden district in the South East, from August to September 2015. Global Fund, due to grant disbursement issues and delays in insecticide procurement, was unable to support IRS from 2013-2014. However, in 2015, Global Fund did support focalized IRS in the CHL, with technical assistance provided by PMI's implementing partner.

Table 6: PMI-supported IRS activities 2014 - 2018

Calendar Year	Number of Districts Sprayed	Insecticide Used	Number of Structures Sprayed	Coverage Rate	Population Protected
2014	40 communes (*focal IRS*) (CHL+Fringe)	Pyrethroid & Carbamate	125,125	97%	749,965
	3 districts (East)	Organophosphate	149,408	95%	557,419
2015	3 districts (East)	Organophosphate	172,120	91.9%	654,861
	1 district (South East)	Organophosphate	75,782	92.5%	361,980
2016*	3 districts (East)	Organophosphate	188,814		662,655
	2 districts (South East)	Organophosphate	119,751		551,032
2017*	5 districts (East & South East)	Organophosphate	~300,000		~1,200,000
2018*	6 districts (East & South East)**	TBD***	~350,000		~1,450,000

*Represents targets based on the 2016 IRS work plan, and/or projected targets based on national strategic plan and/or discussions with the NMCP.
** IRS expansion is contingent on NgenIRS Project approval.
*** Insecticide selection is dependent on susceptibility testing, novel insecticides, and the soon to be developed insecticide resistance management plan.

Progress during the last 12-18 months

PMI supported blanket IRS in three districts in the East Coast from August to September 2015 and one district in the Southeast in August 2015, using organophosphates, due to longer residual efficacy. Additional highlights of the 2015 IRS campaign include:

- A total of 247,902 structures were sprayed (172,120 in the East and 75,782 structures in the South East) out of 247,902 targeted for spraying, resulting in a 92.2% spray coverage overall.
- A total of 253,410 of the structures were mobilized with IEC materials prior to the IRS round.
- There were 3,302 people trained (2,229 in the East and 1,073 in the South East), including 1,337 (40.5%) women. Women employed in supervisory positions increased from 6.9% in 2014 to 25.8% in 2015.

- Madagascar utilized innovative technologies in an effort to maximize efficiencies and improve implementation of IRS: mobile soak pits for environmental compliance in remote areas, a mobile phone-based performance management tracking tool, and a tablet-based M&E system.
- Post-spray cone bioassay testing results confirmed 100% mortality (at baseline), indicating high quality spray with the correct dosing of insecticide. Residual efficicay monitoring at six and seven months post-spray, in the South East and East respectively, indicates sustained mortality that is greater than 80%.

Plans and justification

With FY 2016 funds, PMI plans to shift to new areas in the East Coast, based on epidemiological data, in order to continue to reduce malaria in the highest burden areas. Plans include the two South East districts being sprayed with FY 2015 funds, plus up to three additional East Coast districts, using organophosphates. Former PMI-supported IRS areas will receive PMI support via reinforced surveillance and additional SBCC messages around consistent ITN use. The September to December 2015 universal coverage campaign, in addition to the continuous distribution of ITNs along the East Coast, should ensure sufficient ITN coverage. In addition, the surveillance subcommittee will closely monitor HMIS data for any upsurges, and couple the information with addtitional to data from existing fever sentinel sites. Lastly, there will also be renewed emphasis on coordination with and capacity building at the NMCP as it implements Global Fund-supported IRS activities in other areas of the country, such as the CHL.

With FY 2017 funds, PMI plans to continue IRS in up to six disricts in the East and South East, if approved to participate in the NgenIRS Project. Madagscar is a candidate country for the UNITAID funded NgenIRS Project in 2018. This market intervention project includes a short term co-payment to accelerate the reduction of price for long-lasting IRS insecticides. The price reduction will enable Madagascar to expand coverage of long-lasting IRS from baseline levels, using effective, potentially novel insecticides. The insecticide selection will be made based on susceptibility data, WHOPES approved new insecticides on the markert, and in conjunction with Madagascar's insecticide resistance management plan.

Proposed activities with FY 2017 funding: ($7,085,500)

1. *Conduct IRS*: PMI will support the implementation of IRS in up to six high burden districts on the East Coast. The NMCP's Vector Control Committee and relevant stakeholders will select the districts based on data from the HMIS, in addition to other considerations such as entomological data, accessibility (both security wise, infrastructure and presence of rivers), ecological sensitive areas and density of the population. *($7,055,500)*
2. *Conduct environmental compliance monitoring*: This activity will support one independent monitoring visit to assess adherence to PMI's Best Management Practices for environmental compliance. *($30,000)*

2. Malaria in pregnancy

NMCP/PMI objectives

The NMCP supports a three-pronged approach to MIP including uptake of IPTp with SP, provision and use of ITNs, and prompt diagnosis and treatment of malaria during pregnancy. As part of the national strategy to prevent and limit morbidity associated with malaria during pregnancy since 2004, IPTp is currently implemented in 93 lowland and coastal districts where malaria transmission is stable or seasonal. The decision to implement IPTp in one additional district (Itasy), as compared to the ITN

targeted districts was made in 2011 by the RBM stakeholders. The policy excludes the remaining 19 districts in the Central Highlands, which have low prevalence and are epidemic prone.

The NMCP supports SP administration to pregnant women at each scheduled ANC visit, with the first dose being administered as early as possible in the second trimester and subsequent doses of SP provided at least one month apart. The IPTp3 indicator is included in the updated version of the NSP (2015-2017) with a target of 40% coverage among pregnant women receiving a third dose of IPTp during their pregnancy by 2017. PMI is also supporting the NMCP with the development of the new NSP (beyond 2017) and will ensure that IPTp3 is included. With the updating of the IPTp policy, PMI and the NMCP are supporting efforts, such as revisions to the ANC registers, to update routine reporting on frequency of IPTp treatments, including IPTp3 and IPTp4. The NMCP recommends that IPTp be administered as directly observed treatment free-of-charge. Iron and folic acid is recommended in the National Protocol for the Fight against Micronutrient Deficiency: 60mg of iron and 400µg of folic acid (low dose) for 180 days (six months) without interruption during pregnancy, to continue after delivery if need be.

According to national guidelines, pregnant women who are diagnosed with uncomplicated malaria should receive treatment with quinine in the first trimester and an ACT is recommended for treatment during the second and third trimesters.

The NMCP and *Direction de la Santé de l'Enfant, de la Mère et de la Reproduction* (Directorate of Child and Maternal Health and Reproductive Health) participate on the national ANC working group and coordinate on the implementation of MIP activities, including IPTp and ITN promotion, and the provision of iron and low dose folate, an essential component of comprehensive ANC services.

Progress since PMI was launched

Overall uptake of IPTp2 has remained constant between two MIS surveys (22% in 2011 and 21% in 2013). Results of the 2016 MIS will be available in the fall of 2016. The 2013–2017 NSP objective targets 85% coverage of IPTp2 by 2017 among pregnant women attending ANC. The NMCP revised the monthly HMIS reporting form to capture the number of women who receive two doses of SP for IPTp to monitor progress towards this goal. In November 2014, the NMCP issued a policy directive to reflect the 2012 WHO IPTp recommendations for improved IPTp uptake. PMI and implementing partners worked closely with the MOH on this national policy change including updating MIP guidelines and ensuring health facility providers are trained in the new policy.

The use of ITNs remains high among pregnant women at 68% in 2013, although this figure represents a decrease from 85% ITN use among pregnant women reported in 2011. The NMCP prioritizes provision of ITNs to pregnant women at their first ANC visit.

To further support MIP interventions, the NMCP has included IPTp as part of integrated ANC services that are promoted during mother and child health promotion weeks in April and October of each year. During these biannual health weeks, vitamin A and deworming medicines are distributed, mass immunization campaigns for children are conducted, ANC sensitization messages are provided to pregnant women, and health promotion messages are disseminated. Program surveillance data show that IPTp uptake peaks during and right after these mother and child health weeks.

Progress during the last 12-18 months

With FY 2015 funds, PMI and partners helped with rolling out the updated IPTp implementation guidance developed by the national ANC working group and disseminated to regional and district malaria teams. PMI supported MIP activities in 55 of the 93 IPTp districts to strengthen and improve

IPTp uptake at the health facility level and ensure promotion of MIP at the community level by CHVs. In the other 38 IPTp districts, PMI coordinated efforts with the NMCP on strengthening health provider practices in focused antenatal care, including the distribution of updated IPTp guidelines and IPTp job aids.

With FY 2015 funds, PMI supported MIP activities through more than 14,000 trained CHVs delivering SBCC MIP messages to a third of the country population living in hard to reach places, on the importance of seeking antenatal care (early and frequent visits), taking monthly doses of IPTp, and consistent use of ITNs. CHVs play an essential role in promoting the use of antenatal services, including encouraging pregnant women to seek IPTp at each ANC visit (after first trimester) and to sleep under an ITN. PMI-supported CHVs promoted healthy motherhood through education and community sensitization by promoting ITN use and encouraging pregnant women to seek ANC services. PMI procured 600,000 SP treatments with FY 2015 funding for distribution in 2016 to public health facilities as well as approximately 300 NGO and FBO clinics that are currently part of a USAID Maternal Child Health program network.

Despite the high reported rate of ANC attendance (90% of pregnant women attend ANC at least once) and relatively early attendance during the course of the pregnancy (DHS 2008-2009), IPTp uptake remains low. The HMIS data available from 2015 reports that 64% of pregnant women attended at least one ANC visit and 34% of pregnant women received at least two doses of IPTp. There is presently limited information available to better understand the specific issues related to SP administration at the facility level. The 2016 MIS will help inform about current coverage of MIP interventions following the post-sanction period. Additionally, PMI also intends to conduct a health facility survey in 2017 to better understand the specific facility level issues and bottlenecks related to IPTp and ANC. With the 2016 MIS and 2017 health facility survey, PMI will be able to assist the NMCP and Reproductive Health programs to better target MIP interventions. SP stockouts combined with restrictions on supporting facility level services delivery have impeded progress on IPTp. The health system experienced SP stockouts for almost two years due to delays in the Global Fund procurement; this issue was resolved in 2016 with PMI and Global Fund procuring sufficient quantities of SP treatments for use at the health facility level. Some issues related to provider practices, bottlenecks, missed opportunities, etc. are currently being addressed by PMI through re-training of health providers and improving supportive supervision visits. PMI and its implementing partners are also coordinating with NMCP and Reproductive Health programs on MIP activities by developing a joint MIP workplan this year which outlines plans for training of facility staff, joint supervisory visits, improving SBCC messages, and ensuring availability of SP stocks. Thus, it appears that the NMCP, PMI and Global Fund have improved coordination to ensure availability of SP in the country and at the health facility level. Furthermore, some women attend ANC services at private clinics, which do not regularly promote IPTp. In response to the reported low uptake of SP for IPTp, the NMCP, with partners, is employing alternative strategies such as reaching out to private ANC health providers with training on ANC and IPTp, and using CHVs to deliver targeted messages on MIP and ANC, including early diagnosis and prompt treatment of malaria. CHVs also played an important role in planning, organizing, and conducting health promotion outreach activities, including IPTp for pregnant women, during the biannual mother and child health campaign weeks. With FY2015 funding, PMI is supporting an integrated malaria case management and malaria in pregnancy training (including the new IPTp policy) in 2016 for the regional and district malaria teams as well as reaching approximately 2,363 health providers at the CSB facilities with this integrated training.

Table 7. Status of IPTp policy in Madagascar

WHO policy updated to reflect 2012 guidance	November 2014
Status of training on updated IPTp policy	In process.
Number of health care workers trained on new policy in the last year	Approximately 2,363 health providers by September 2016
Are the revised guidelines available at the facility level?	In process
ANC registers updated to capture three doses of IPTp-SP?	Not yet; registers are currently being revised to capture numbers of treatments and will be rolled out in 2017 to all ANC health facilities.
HMIS/ DHIS updated to capture three doses of IPTp-SP?	Not yet; PMI will support HMIS strengthening at the national level in 2016, including adding IPTp3 to the list of malaria reported indicators.

Commodity gap analysis

The *Service de Santé de District* (SSD or District Health Office) is responsible for assigning the estimated amount of SP needed by each CSB. The CSB staff or community members are responsible for transporting the SP from the district health office to their local CSB. In FY 2017, an estimated 1,940,233 SP treatments are needed to protect pregnant women expected to attend at least 3 ANC visits in the 93 malaria-endemic health districts where MIP interventions are a part of the malaria prevention and control strategy. The estimated SP need is based on approximately 90% of pregnant women attending ANC at least once, and 55% of pregnant women making a second ANC visit and 35% of pregnant women attending a third ANC visit. Global Fund is procuring SP treatments annually and will procure approximately 2.1 million treatments of SP for IPTp arriving in 2017, which will address most of the country's annual SP needs. With FY 2017 funding, PMI will procure approximately 500,000 treatments to contribute to overall SP needs. This is based on the assumption that attendance for ANC services would most likely increase following PMI-supported MIP activities at health facility and community levels to strengthen and improve IPTp uptake. PMI and Global Fund are ensuring delivery of SP to the district level.

Table 8: SP Gap Analysis

Calendar Year	2016	2017	2018
Total Population in 93 IPTp districts (estimated 2.8% population growth rate)	19,916,984	20,474,659	21,032,335
SP Needs			
Total number of pregnant women attending ANC (assumes 4.5% of population is pregnant women, with 90% ANC 1, 55% ANC2, 35% ANC3)**	1,613,276	1,888,787	1,940,233
Total SP Need (in treatments)	1,613,276	1,888,787	1,940,233
Partner Contributions			
SP carried over from previous year	0	0	0
SP from MOH	0	0	0
SP from Global Fund	468,403	1,735,290	2,103,800
SP from Other Donors	0	0	0
SP planned with PMI funding	600,000	0	500,000
Total SP Available	1,068,403	1,735,290	2,603,800
Total SP Surplus (Gap)	(544,873)	(153,497)	663,567*

*PMI will closely monitor SP treatment quantities available in 2016 and 2017 and procure additional treatments if needed to address any gaps. The projected 2018 surplus will likely be less as PMI supports efforts to improve ANC attendance and IPTp uptake.

** An estimated 4.5% of the total population in the 93 IPTp districts is estimated to be pregnant; and an estimated percentage of these women attend their first, second and third ANC visit (90%, 55% and 35%) based on DHS 2008/9 data on ANC1 at 90%.

Plans and justification

PMI will support strengthening of MIP activities both at the community and public facility levels, including the completion of refresher training for health facility staff in all 93 IPTp focus districts as well as an integrated case management and MIP training for regional and district malaria teams. With FY 2017 funding, PMI will continue to support MIP implementation at the community and facility levels for promoting early ANC attendance and IPTp uptake. PMI will support the strengthening of routine reporting of IPTp, including updating ANC registers, and supporting integrated supervisory visits conducted by regional and district malaria and MCH teams. PMI will also support the NMCP's strategy to strengthen MIP and IPTp at the more than 200 private sector ANC providers where some pregnant women seek ANC services. Most of the SP treatment needs will be met in 2018 by the Global Fund NFM malaria grant. With FY 2017 funding, PMI will also procure approximately 500,000 treatments of SP for use in 2018, based on the expectation that ANC services uptake would gradually increase following PMI-supported MIP activities at the health facility and the community levels to strengthen and improve IPTp uptake. Quinine will be procured through the Global Fund for treatment of malaria during the first trimester of pregnancy. PMI will explore different strategies for getting Peace

Corps Volunteers engaged in MIP activities in the communities they serve, especially looking into different approaches to increase IPTp uptake and making sure these volunteers are linked with CHVs. PMI will also continue to support community SBCC activities led by the CHVs who encourage pregnant women to attend ANC services and request SP for IPTp, as well as encourage early diagnosis and treatment of malaria in pregnancy with quinine and ACTs.

Proposed activities with FY 2017 funding: ($875,000)

1. Support CHVs with MIP training and implementation: Provide training and implementation support for CHVs in MIP and improve SBCC messages and interpersonal communications for MIP. Support includes promoting ITN use, as well as referrals to health facilities for early and frequent ANC visits, malaria case management, and administration of SP for IPTp at monthly intervals. *($400,000)*

2. Strengthen MIP at facility level: PMI will support MIP strengthening activities with the NMCP at the facility level in all 93 IPTp implementing districts, including strengthening and improving IPTp uptake, ITN use, and ANC attendance for diagnosis and treatment of malaria during pregnancy. Support includes necessary revisions to update malaria and maternal health program training curriculum and strengthen routine reporting at health facilities on IPTp, including continuing any necessary on-the-job-training related to updating the ANC registers and HMIS routine reporting forms, training of midwife and ANC health facility staff, and supporting integrated supervision visits by district and regional malaria and MCH teams. PMI will also support the NMCP's efforts to strengthening private sector ANC providers in MIP and IPTp through training and the dissemination of the updated IPTp guidance. *($400,000)*

3. Procure SP: PMI will procure approximately 500,000 treatments of SP for IPTp in line with WHO IPTp guidelines for pregnant women attending ANC at health facilities. *($75,000)*

3. Case management

a. Diagnosis and treatment

NMCP/PMI objectives

Under the revised 2013–2017 NSP, the goal for case management is to correctly diagnose and treat at least 80% of malaria cases seen at public and private health facilities. Currently RDTs are used at all government primary health care facilities, and at hospital level before severe cases receive microscopy for parasitemia calculation and species identification. CHVs are also required to use RDTs for diagnosis, and before treatment of malaria at the community level. Madagascar uses combination RDTs (HRP2/pLDH) to detect *falciparum* infections, other infections, and mixed *falciparum*/other infections. The 2013 MIS found that 1.3% of 5,303 children 6–59 months tested by RDT were positive for non-falciparum malaria; however, real-time PCR found much lower rates of non-falciparum malaria. PCR analysis on a sample of these children (469 RDT-negative and microscopy-positive and 468 RDT-negative and microscopy-negative samples) found that of 387 PCR-positive samples, only one was positive for P. vivax, and only one for P. malariae malaria infection. However, an earlier study in 2007 of 661 asymptomatic schoolchildren in eight sentinel sites across the country found that 28.7% were positive by PCR for malaria, including 13.0% positive for *P. vivax.*[10].

[10] Menard et al. Plasmodium vivax clinical malaria is commonly observed in Duffy-negative Malagasy people. PNAS March 2010. (http://www.pnas.org/content/107/13/5967.full.pdf)

According to the national case management guidelines last updated in June 2015, AS/AQ combination therapy is the first-line antimalarial treatment for uncomplicated malaria in Madagascar, with artemether/lumefantrine (AL) as second-line therapy. The 2014 therapeutic efficacy study (TES) that PMI funded indicated that AS/AQ was 100% effective for treating uncomplicated malaria. For severe malaria, intravenous artesunate is first-line treatment according to national policy, with quinine as second-line treatment. The national guidelines recommend injectable artesunate or quinine for severe malaria treatment, or rectal artesunate for pre-referral treatment of severe malaria for children under five years old. In reality, however, health facility staff have not been trained on use of injectable artesunate and continue to use quinine for treatment of severe malaria, although some injectable artesunate donations from the Chinese government are available at selected health facilities. In the six pre-elimination districts in the CHL, the national strategy also calls for administration of a single low dose of primaquine in addition to AS/AQ for cases of uncomplicated malaria, except in pregnant women and children less than six months of age. The new treatment guidelines also call for AS/AQ plus a 14-day course of primaquine for uncomplicated *P. vivax* malaria, although this is not currently being implemented due to concerns about primaquine safety in G6PD-deficient individuals and limited access to G6PD deficiency testing. PMI will continue to work with the NMCP to ensure that health facility workers and CHVs are well trained to accurately diagnose and manage cases of malaria in health facilities (HF) and at the community level, starting most immediately with overdue updates on training in severe malaria case management.

Progress since PMI was launched

Diagnostic confirmation using RDTs was introduced by the MoH starting mid-2006 and reached all primary health care facilities by the end of 2008, along with the introduction of ACTs. In 2010, the national iCCM curriculum was revised to include RDT testing of all fever cases among children under five years of age managed by CHVs at the community level. Currently RDTs are used at all government primary health care facilities.

Due to USG restrictions on working with the public health sector, PMI focused exclusively on supporting diagnostics among CHVs and FBO/NGO facilities starting in 2009. PMI procured RDTs for CHVs and FBO/NGO facilities and supported ongoing training, supervision, and use of RDTs by CHVs and private clinics. Most of PMI's case management support was directed at the community level until mid-2014 when restrictions on working with public health facilities were lifted. PMI provided support to two bilateral projects that focus on community delivery of health services that include iCCM of malaria, diarrhea, and pneumonia by CHVs, in line with the MoH policy for community case management by CHVs. Global Fund and UNICEF also provide significant support to the NMCP and the MoH for this approach. These 2 USAID health bilateral projects cover 15 of the 22 regions in Madagascar, with Global Fund supporting similar activities in the remaining 8 regions. One bilateral covers 100% of the communes in its 7 regions, which encompass 3,023 fokontany (villages) and approximately 3.4 million people. The other bilateral reaches about 64% of communes (506 total) in its 8 regions due to difficult accessibility.

With the lifting of restrictions, PMI began a robust plan for re-engaging with the public sector particularly in the areas of training, supervision, and supply chain/malaria commodity stock management. The December 2014, PMI-supported health facility survey assessed readiness of health facilities to provide high quality care, including the availability of antimalarial drugs recommended by the NMCP, supplies and equipment, trained and supervised health workers, and level of support given to CHVs. In addition, the survey evaluated the appropriateness of health worker practices related to clinical assessment of ill patients, conformity to malaria diagnosis and case management guidelines and data quality.

The 2013 MIS survey showed that the proportion of children under five years old with fever who seek advice and treatment has risen from 34% to 44%, and the proportion of children in the same age group who received antimalarial drugs had almost tripled (from 19% to 54%) compared to the 2011 MIS survey. Diagnostic confirmation with RDT and treatment with ACTs is now standard of care, and according to the December 2014 health facility survey, health workers tested 97.4% of patients seen for curative care consultations for whom malaria was suspected; however, health workers did not suspect malaria in 52% of patients who presented with fever or history of fever, indicating non-systematic history taking by health workers. Of those patients who tested positive for malaria, all were administered or prescribed an antimalarial (86.1% ACTs) for treatment of uncomplicated malaria; however, 3 of 13 patients diagnosed with malaria by health workers were given a non-ACT for treatment. Adherence to negative RDT results was extremely high, with 99% of RDT-negative patients not prescribed antimalarials. However, clinical case scenarios with clinicians showed poor knowledge of severe malaria and relatively poor ability to differentially diagnose illnesses.

PMI and the Global Fund have been supporting first-line antimalarial drug (AS/AQ) efficacy monitoring every two years. The 2009 study conducted in Maevatanana showed 100% efficacy of AS/AQ, and subsequent studies at two sites in 2010, Vatomandry and Miandriavazo, showed 98.8-100% efficacy. In 2012/13 therapeutic efficacy (TES) studies funded by Global Fund in four sites representing different transmission areas showed 98-100% efficacy. The latest PMI funded TES studies in three fever surveillance sites in 2014 showed 95-100% efficacy of AS/AQ. The next TES study is scheduled to start in late 2016.

Progress during the last 12-18 months

Following the December 2014 health facility survey, in February 2015, PMI supported a training of six NMCP staff who will serve as expert trainers and supervisors in malaria laboratory diagnostics and treatment. In addition, 12 supervisors at the national level were trained in OTSS. These trainers have facilitated the first round of OTSS training in 24 health facilities around Antananarivo. Plans are underway to train additional supervisors in OTSS at the regional level to train district-level staff to conduct supervisory visits at designated health facilities, and to establish quality assurance (QA)/quality control (QC) programs within these facilities. The Global Fund has recently assumed financial responsibility for laboratory and case management QA/QC so PMI will scale back its support for laboratory QA/QC to avoid duplication of efforts.

With FY 2015 funds, PMI supported the training of 9,194 CHVs in malaria diagnostics and treatment. PMI also procured and distributed 802,154 ACTs and 2,780,000 RDTs for CHVs, public health facilities, and FBO/NGO facilities. FY 2015 funds have been slow to arrive in country and reach partners. In the first quarter of 2016, one of the USAID bilateral projects covering 7 of 22 regions of Madagascar reported that CHVs tested 39,433 children under five with fever with RDTs, of whom 14,781 (37.4%) were positive; a total of 8,799 children under five with fever were treated with an ACT by the CHV within 24 hours of the appearance of fever. In this area, the bilateral last supported malaria case management refresher training for its CHVs in 2014, and in 2015 was focused on introducing new maternal and neonatal health tools. The other bilateral, covering 8 regions of Madagascar, conducted malaria case management refresher training from October 2015 to April 2016 for all 3,722 CHVs providing malaria care in the community; during the first quarter of 2016, CHVs in these areas reported testing 27,148 children under five with fever with RDTs, of whom 48% tested positive for malaria, and 62% of them were treated with ACTs (with the lower rate of treatment due to ACT stockouts).

Shifting case management support from the community level exclusively to both community and facility levels after the lifting of US government sanctions has been slow to happen. Pre-service training of new health workers was prioritized first, delaying the implementation of refresher training for existing health

workers. Health facility staff have yet to be trained on injectable artesunate for severe malaria and the updated WHO IPTp policy. PMI reprogrammed FY 2016 funds to increase the allocated budget for integrated malaria case management refresher training at health facilities to ensure this happens as soon as possible.

In the last two years, the capacity of the national laboratory has improved significantly, and they routinely do expert microscopy, as well as molecular analysis, for two TES sites they maintain. With recent PMI support for reagents and consumables, the functionality of the national laboratory has continued to grow and the laboratory aims to begin doing malaria serology in 2016.

Commodity gap analysis

A gap analysis was recently completed by partners, using historical consumption data, although additional clarification is still needed about the estimated needs. With FY 2016 funds, PMI plans to support a supply chain assessment to better help the country understand bottle necks in commodities distribution, followed by a strengthening activity. The Global Fund has committed to purchasing all RDTs and most ACTs through 2018 under the NFM grant. The tables below present the upcoming RDT and ACT needs and partner contributions through 2018.

Table 9: RDT Gap Analysis

Calendar Year	2016	2017	2018
Total country population	24,307,669	24,988,284	25,687,956
Population at risk for malaria	24,307,669	24,988,284	25,687,956
PMI-targeted at-risk population*	24,307,669	24,988,284	25,687,956
Total number of projected fever cases**	4,969,131	5,108,266	4,988,734
Percent of fever cases tested with an RDT	95%	95%	100%
RDT Community needs	1,611,792	1,656,922	1,703,316
RDT Health facility needs	3,108,883	3,195,931	3,285,418
Total RDT needs	**4,720,675**	**4,852,853**	**4,988,734**
Partner contributions			
RDTs from previous years	2,751,485	0	0
RDTs from Global Fund*	0	4,852,853	4,988,734
RDTs from PMI	1,900,000	0	0
Total RDTs available	**4,651,485**	**4,852,853**	**4,988,734**
Surplus (shortage) of RDTs	**(69,190)**	**0**	**0**

Gap analysis calculated by partners based on consumption data.

* The Global Fund, under the New Funding Model, has committed to purchasing all RDTs and most ACTs needed in Madagascar in 2017 and 2018.
** Calculated based on positivity rate and monthly consumption; source is the Supply Chain Committee.

Table 10: ACT Gap Analysis

Calendar Year	2016	2017	2018
Total country population	24,307,669	24,988,284	25,687,956
Population at risk for malaria	24,307,669	24,988,284	25,687,956
PMI-targeted at-risk population*	24,307,669	0	0
ACT Community needs	413,213	424,783	436,677
ACT Health facility needs	1,703,067	1,575,677	1,457,817
Total ACT Needs	**2,116,280**	**2,000,460**	**1,894,494**
Partner contributions			
ACTs from previous years	821,523	0	27,852
ACTs from Global Fund**	0	1,528,312	1,894,494
ACTs from PMI	1,200,000	500,000	500,000
Total ACTs available	**2,021,523**	**2,028,312**	**2,422,346**
Surplus (shortage) of ACTs	**(94,757)**	**27,852**	**527,852**

* The Global Fund, under the New Funding Model, has committed to purchasing all RDTs and most ACTs needed in Madagascar in 2017 and 2018.
** Calculated based on positivity rate and monthly consumption; source is the Supply Chain Committee.

Plans and justification

With FY 2016 funds, PMI will continue to prioritize support for the implementation of integrated refresher training at the health facility level that covers severe malaria treatment and the updated guidelines on IPTp. These trainings were funded with FY 2015 funds but have been slow to start, and the first round is planned for June 2016. With FY 2017 funds, PMI will continue to support development of revised refresher training curriculums and supervision tools at the national level. PMI will also work closely through its two bilateral partners to coordinate refresher training to facility-based health workers on malaria case management to ensure that all health workers in the bilateral areas are trained on use of injectable artesunate and the new IPTp guidelines.

At the community level, the iCCM program is being fully integrated into the MoH system, and PMI will continue to provide support through the bilateral projects to health facilities and approximately 15,500 CHVs for refresher training, M&E integration and correct use of data monitoring and reporting tools, and routine supervision of CHVs by health staff. Immediately after the lifting of the USG restrictions in May 2014, USAID/Madagascar issued instructions to all USG-funded projects working with the MoH to start planning for re-engagement and direct collaboration with the public health system; specifically

supporting CSBs' interaction with CHVs by 1) direct supervision; 2) commodity re-supply; 3) monthly group meetings; and 4) refresher trainings planned and conducted by CSB staff, as needed. Supplies of malaria commodities for CHVs are progressively being transferred to the national supply chain through the districts and primary health facilities. The PMI-supported integrated bilateral projects will work closely with the NMCP to transition responsibilities for supervision and supply provision to health facilities.

With FY 2017 funds, PMI will continue to support both bilateral projects to strengthen malaria case management at the community and health facility levels in project areas. Funds will be used to support malaria case management refresher training for staff from all facilities and CHVs in the community, in addition to district health officers. Funds will also be used to build capacity of health facility staff to carry out CHV supervision and to continue to enhance M&E integration and correct use of data monitoring and reporting tools.

The Global Fund will be assuming responsibility for supporting laboratory diagnostics and QA/QC at the national and regional levels, but PMI will continue to provide some limited support for training and supervision of laboratory technicians, using a recently finalized QA/QC manual developed in collaboration with the NMCP. PMI will also procure laboratory consumables and reagents for the national reference laboratory, which conducts expert-level microscopy as well as molecular diagnosis, using PCR machines purchased with the assistance of PMI. Finally, PMI plans to procure approximately 500,000 ACT courses to complement the Global Fund's planned procurement of all malaria commodities in 2017 and 2018; PMI stocks can be used in case of upsurges in malaria or delays in Global Fund procurement. In addition FY17 funds will support a therapeutic efficacy study planned for 2018.

Proposed activities with FY 2017 funding: ($3,260,000)

1. *Procure ACTs*: PMI will purchase approximately 500,000 treatments of ACTs to complement the Global Fund commodities procurement. Funding includes distribution to districts. *($300,000)*
2. *Procure laboratory consumables and reagents:* PMI will support procurement of laboratory supplies and reagents to support the revitalization of the national reference laboratory. Supplies include reagents for microscopy and molecular analysis. This activity is a continuation of supportive supervision activities initiated in FY 2015 and continued in FY 2016 to help build capacity at the national reference laboratory, and will be coordinated at the level of the NMCP. *($50,000)*
3. *Refresher training and strengthening of routine supervision and M&E of CHVs and health facility staff*: PMI funding will provide support for refresher training in case management and M&E, as well as supportive supervision of CHVs and public and private health facility workers. PMI funding will support refresher training for approximately 2,000 CHVs and 3,000 facility-based health workers in the PMI bilateral projects areas (from a total of approximately 2,360 public and private facilities). *($1,900,000)*
4. *Refresher training and supervision of malaria case management at health facility levels.* PMI will provide support to the national level to update and expand malaria case management refresher training and supportive supervision at health facilities. Funds will support national-level curriculum and supervision tools, and will also support training and supervision activities of health workers throughout the 112 health districts. *($600,000)*
5. *Training and supervision for laboratory technicians.* PMI will continue to support laboratory diagnostics throughout Madagascar, building upon a recently finalized QA/QC manual developed in collaboration with the NMCP. *($200,000)*

6. *Therapeutic efficacy studies:* Collaborate with the NCMP to conduct TES in all 4 sites. Assumes $50k per site. *($200,000)*
7. *Technical assistance to support community case management*. Support for one CDC technical assistance visit to support the case management of malaria. (*$10,000)*

b. Pharmaceutical management

NMCP/PMI objectives
The revised 2013–2017 NSP objective is to achieve zero stockouts in public health facilities for ACTs and SP by 2017.

SALAMA, the national central purchasing agency, is responsible for procuring essential medicines and medical consumables for use in the public sector and a portion of the private sector and ensuring their distribution to the district level. All medicines dispensed at public health facilities are sold with a mark-up of approximately 35% of the SALAMA price. Distribution of malaria commodities, like other donated commodities for vertical programs, will not be charged the full 35% rate. Program donated commodities are charged service fees, which vary depending on the service or combination of services provided by SALAMA, which might include procurement (0.8% service fee), warehousing (1.6% service fee), and/or distribution (2.1% service fee). PMI-procured commodities will be charged fees for distribution in general, and fees for warehousing and distribution if the arrival of commodities at SALAMA does not coincide with immediate distribution plans. With the lifting of the USG restrictions in May 2014, PMI began to support the revitalization of SALAMA with other USG funding streams, and move to an integrated supply chain system to manage malaria and other USG-funded commodities.

Progress since PMI was launched
In Madagascar, the free distribution of malaria commodities through the public sector has resulted in parallel procurement and distribution channels to the district level. There are also different channels for distributing antimalarial medicines and products within districts, which is based on a push system down to the districts. At the district level, the district pharmaceutical depots are the intermediary points in the public sector supply chain. They are managed primarily by NGOs under a contract with the MoH through the Department of Pharmacies, Laboratories, and Traditional Medicine and they sell to the health facility pharmacies. Free and donated malaria commodities are received and managed by the District Health Office, while the products from SALAMA are managed by the district pharmaceutical depots. In both cases, CSBs are responsible for the collection and transportation of their supplies from the district level to their respective facilities. This limits the quantities that most of them can transport at any one time, as they primarily rely on public transportation. Furthermore, some CSBs are inaccessible for four to six months of the year during the rainy season, thus requiring advanced planning to ensure a reliable supply of health commodities. The absence of a clear distribution schedule leads to frequent stockouts, as indicated in the 2014 PMI-funded health facility assessment. A significant proportion of facilities (between 65.0% and 81.3%) had the various ASAQ treatment courses in stock the day of the survey, but many fewer had a minimum of 20 courses on hand (between 7.7% and 12.1%, depending on weight band). About 42% of facilities had injectable quinine in stock on the day of the survey and about 10% had quinine tablets in stock.

In addition to ACTs, CHVs also dispense other medicines subsidized under a social marketing model financed by USAID. This includes oral rehydration salts plus zinc tablets (approximately $0.22) for the treatment of diarrhea among children under five years of age; cotrimoxazole tablets (approximately $0.09), and cotrimoxazole oral suspension (approximately $0.32) for the treatment of uncomplicated pneumonia. Previously, USG-supported CHVs were re-supplied through a parallel system, receiving

their supplies from private re-supply points run by individuals, often small shops in larger towns and cities. USAID-funded bilateral projects used to supply these private supply points with commodities. However, as of October 2015, the MoH issued a formal communication allowing CHVs to re-supply at the CBS level. USAID-funded partners began the transition from these private re-supply points to have CHVs re-supply their commodities at the CSB; this has been progressing slowly.

Quality Assurance: The *Agence du Médicament de Madagascar*, which includes the National Medicines Quality Control Laboratory, is responsible for testing most pharmaceutical products destined for use in the country and products already on the market. The medicines quality monitoring program is designed to help the national drug authority to detect substandard and counterfeit medicines and take immediate action to remove such medicines from the market. Prior to the *coup d'état* in 2009, with USG support, the agency established seven peripheral testing sites where samples of antimalarials are regularly collected and tested using portable quality testing kits. An additional 15 kits were procured in 2012 with the Affordable Medicines Facility – malaria funding, thus fulfiIling the goal of expanding drug quality testing sites to the 22 regional reference hospitals in Madagascar. Unfortunately, the testing sites are no longer functioning, due to intermittent support for supervision and field activities with the *coup*.

PMI has been contributing to the CHV parallel supply chain system by procuring and distributing malaria commodities and by providing technical assistance to support the CHV programs. The CHVs are also trained to provide maternal, newborn, and child health services, including reproductive health counseling, family planning services, nutrition assessments, and treatment for pneumonia and diarrhea. PMI and other USAID health funds supported the July 2014 assessment of the national pharmaceutical supply chain which reported the following findings: (1) lack of funding for supply chain logistics at the periphery; (2) multiple vertical program-funded distribution channels lacking integration and coordination; (3) closure of a number of commune and district level drug depots following de-capitalization; (4) recurrent commodity stockouts at health facility level; (5) inexistence of a clear system for moving health commodities from districts to CSB and; (6) low capacity of and inexistence of support mechanisms for human resources in charge of pharmaceutical management. The supply chain was designed to move commodities from central to district level, leaving out the logistics for distribution between districts and the peripheral level.

Progress during the last 12-18 months

PMI has supported the MoH to set up the Procurement and Logistics Committee, which is in charge of strategic planning, and the Logistic Management Unit, which is in charge of operations. This committee is presided by the Secretary General of MoH but is led technically by the Direction of Pharmacy, Laboratory and Traditional Medicines; representatives from SALAMA and other technical partners are members. Its role is to coordinate commodity management for different programs. For this aim, a specific software, called Pipeline, is implemented for quantification and planning of essential drugs.

PMI continues to support the distribution of ACTs and RDTs via CHVs to the communities located in *fokontany* that are at least five kilometers from the nearest public health facility. As of October 2015, more than 15,000 CHVs were receiving malaria commodities and support from PMI via this parallel supply system. PMI funding procured approximately 1,900,000 RDTs, 1,100,000 ACTs and 175,000 injectable artesunate in 2015, which have been delivered to sub-regional warehouses that supply CHVs in PMI-supported districts. PMI funds also supported training on malaria consumption forecasting and commodity ordering, and period end-user verification of stocks.

Plans and justification

PMI and other USG funding streams will continue to support the supply chain and distribution of malaria commodities at both the community level and now at the CSB level. With both USAID and PMI

funds, a supply chain pilot will continue in 2016 to assess the best way to support supply chain beyond the district level in two regions of Madagascar. This activity, planned with FY 2015 funds, was delayed due to the transition between implementing partners. Once a clear plan for the re-integration/consolidation of the CHV supply chain is agreed upon by the stakeholders, FY 2016 and FY 2017 funds will prioritize support the integration of commodities distribution, based on the lessons learned and recommendations from the supply chain pilot. PMI will then work with other stakeholders to phase out the parallel CHV supply chain with FY 2016 funds, and support the national integrated supply chain, where CHVs would resupply at CSBs, using FY 2017 funds. PMI also plans to support the rebuilding of a QA/QC system, through the National Medicines Quality Control Laboratory via implementing partners.

Proposed activities with FY 2017 funding: ($500,000)

1. *Strengthen the supply chain for malaria commodities:* PMI will ensure the continuous supply of RDTs and ACTs via an integrated national supply chain system. This activity includes training of MoH staff at the district and lower levels on the implementation of the revitalized supply chain system. This system will integrate the parallel CHV supply chain system, and activities will include integrated quantification and forecasting, sub-regional warehouse optimization, and supervision support. This activity will be co-funded with other USAID Health Office programs. Funding will also include support to strengthen the national QA/QC system. *($500,000)*

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 and health information systems strengthening, drug quality monitoring, and NCMP capacity building. PMI also collaborates with U.S. Peace Corps Volunteers to promote malaria prevention messages and innovative activities about malaria in their communities.

NMCP/PMI objectives

The NMCP leads national control efforts through the formulation of policies and strategies, as well as the coordination of all partners involved in malaria control. The NMCP is also the secondary recipient of most of the Global Fund malaria grants, and it coordinates the RBM partnership comprising several partners including PMI, UNICEF, WHO, Global Fund, private sector companies, local and international NGOs, research institutions, and other government services, in an effort to optimize efforts and investments in the fight against malaria in Madagascar. Sustaining current gains in malaria control towards pre-elimination requires an efficient health system. However, challenges for the NMCP include ensuring effective coordination from the central level down to the district level with other government directorates, especially the directorates in charge of health districts (DDS), maternal and child health (DSFa), and epidemiological surveillance (DVSSE), which have equal responsibility in disease control, epidemiological surveillance, program oversight, reporting, refresher training and supervision of service providers.

Progress since PMI was launched

Following five years of political crisis and a staff hiring freeze since 2009, the MoH is currently facing a critical staff shortage at all levels of the public health system, especially for service provision below the regional level. In addition, health workers are not evenly distributed throughout the country. More than 65% of the population lives beyond five kilometers of a health facility, frequently in inaccessible places. To improve access to service, PMI, along with Global Fund and UNICEF, helped train a cadre of community health workers, in the ratio of two per *fokontany*. The CHVs provide preventive services and

treat uncomplicated cases of the three most common childhood illnesses: pneumonia, diarrhea, and malaria. CHVs refer severe cases to the nearest primary health facility. The shortage of staff, both in terms of numbers and skills, affects the quality of services at each level of the service delivery pyramid.

PMI and Global Fund have supported formative supervision, supply chain strengthening, therapeutic efficacy studies and more recently QA/QC of lab diagnostics services. The MoH is currently working on improving the quality of the health management information system, as well as strengthening the epidemiological surveillance extended at the community level. Public and non-governmental sector capacity to plan effectively and manage health programs is weak, particularly in the areas of administrative management, and the collection and use of data for program management and decision-making. National health infrastructure, information and commodity management and logistics systems are extremely weak, and much remains to be done at central, regional, and district levels to ensure sustainable health financing.

PMI supported a health facility assessment, and a malaria SBCC determinants study to inform malaria programming in Madagascar in 2014. Along with other USAID health funding, PMI contributed to the assessment of maternal and child health services which included findings on quality of IPTp services in health facilities. Lastly, PMI closely collaborates with U.S. Peace Corps, and has provided funding and technical support for malaria Peace Corps Volunteers for several years.

Table 11: Health Systems Strengthening Activities

HSS Building Block	Technical Area	Description of Activity
Health Services	Case Management	Improve, through training and supportive supervision, QA/QC systems to monitor laboratory diagnostic services quality
Leadership, Management &Governance	Health Systems Strengthening	Build NMCP technical and managerial capacity at all levels, both through implementing partners and direct support to the NMCP to increase effectiveness
Health Workforce	Health Systems Strengthening	Support short term and long-term training of individuals to build capacity at the NMCP in epidemiology, M&E or other malaria program management functions including pharmaceuticals and commodity management.
Health Information	Monitoring and Evaluation	Strengthen routine health data & disease surveillance system, planning, forecasting and program management, through health staff M&E training and the support of a web-based system for data.
Essential Medical Products, Vaccines, and Technologies	Case Management	Support improved forecasting, procurement, quality control, storage and distribution of malaria commodities (ITNs, SP, ACTs, and RDTs)

Progress during the last 12-18 months

PMI is working with USAID Madagascar to strengthen specific health systems areas, starting with supply chain, HMIS, epidemiological surveillance, in-service training and supervision, and leadership/management and governance strengthening. PMI funds contributed to a USG assessment of the pharmaceutical supply chain in July/August 2014. As a result, support to SALAMA, the national parastatal in charge of supply chain, is underway. This support includes training, facilitating needed

restructuring, and piloting a new distribution scheme that runs from the central to the commune level. In addition, the European Union has also pledged to contribute to building a new SALAMA warehouse and procurement of new trucks to delivery commodities.

An in-depth assessment of the HMIS, including surveillance systems, was completed in December 2015, and included a thorough review of the data collection process, and organizational structure. As a result, a plan for consolidating different data management systems currently used into one web-based system was designed, with the aim of installing DHIS2 functionality at the central level in 2017, an effort led by the IT Division of the MoH. The process includes the setting up of a DHIS2 committee, the harmonization of indicators, training of trainers, and the purchase of a server.

Additional plans include the review of data collection tools for an integrated disease surveillance system, and training of health facility staff on HMIS.

PMI is also working closely with the MoH to strengthen linkages between CHVs and health facility staff for better coordination and integration into the national health system. CHVs are now supervised, submit monthly iCCM reports and collect most health commodities at the health facility level.

In March 2016, the PMI entomologist from Atlanta facilitated a discussion among malaria partners with the aim of designing a plan to build the NMCP capacity in entomological monitoring.

With support from the Global Fund New Funding Model slated to start in July 2016, the NMCP will implement health systems strengthening activities in three areas: improving community health services, improving supply chain, and strengthening epidemiological surveillance.

PMI has also supported malaria Peace Corps Volunteers with FY 2015 funds, and plans to support four volunteers with FY 2016 funds: three volunteers seconded to PMI implementing partners, and one coordinator at the central level. Other donor contributions to improve health systems strengthening include the Principality of Monaco, which is funding the construction of a National Training Center at the NMCP site.

Plans and justification

PMI will continue to build NMCP technical and managerial capacity at all levels of the health care system, both through implementing partners and direct support to the NMCP and other government partners. PMI will support improvement of quality services through on-the job training coupled with increased frequency of supervisory visits. PMI will work with the NMCP, Global Fund, and RBM partners to support the implementation of the national malaria control strategy and associated plans: the national malaria monitoring and evaluation plan, and the national communication plan. PMI will actively participate in the strategy review and the design of the 2018-2023 national strategy documents.

Regarding monitoring and evaluation, PMI will continue to support refresher training, reinforcement of the analytical capacity at the central and district levels, and support for the development of a system to promote the centralization and storage of data (including surveys and program reports) gathered by various NGOs, implementing partners, and other donors (costs referenced in Monitoring and Evaluation section).

With regards to malaria SBCC activities, PMI will continue to work with stakeholders to implement the new communication strategic plan, to periodically review, update, and harmonize malaria behavior change communication messages (costs referenced in SBCC section).

To help the NMCP reach preventive and curative coverage targets for key malaria interventions, PMI will continue collaboration with other partners to support the NMCP, specifically to increase capacity at all levels to plan, implement, supervise, and forecast commodity needs; improve distribution systems; coordinate with partners; strengthen the HMIS; and monitor and evaluate malaria activities. PMI staff and implementing partners will continue to provide on-the-job training and support to improve NMCP management and coordination capacity. PMI will work closely with the NMCP to implement laboratory and molecular surveillance in preparation for malaria pre-elimination (costs referenced in other MOP sections).

In addition, PMI will work to strengthen NMCP training and supportive supervision capacity of malaria case management and diagnostics at the central, regional, and districts level (costs referenced in Case Management section). Of particular attention, PMI will support the strengthening of the MoH pharmaceutical and commodity management system, including support to SALAMA's capacity to store, distribute, and forecast commodity needs (costs referenced in Pharmaceutical and Commodity Management section). PMI will build the capacity of the NMCP in epidemiology through FETP, or an equivalent training program. PMI also plans to continue collaborating with Peace Corps Volunteers and supporting malaria projects though the small projects assistance (SPA) funding.

Proposed activities with FY 2017 funding: ($125,000)

1. *Support three third year Peace Corps Volunteers embedded into USAID implementing partners, and one third year volunteer in charge of coordinating malaria activities supported by PCVs in Madagascar. ($50,000)*
2. *Support one FETP trainee*: PMI will support one person from the NMCP/MoH to participate at a regional Field Epidemiology Training Program to strengthen the national capacity in malaria epidemiology and surveillance. *($75,000)*

5. Social and behavior change communication

NMCP/PMI objectives

The NMCP strategic plan supports SBCC as an essential component of its malaria prevention and control interventions and established a SBCC working group, which supports major communication events such as World Malaria Day and mass ITN distribution campaigns. The NMCP developed a five-year SBCC action plan (2013-2017), which aligned with the NSP, with the overall objective of achieving 80% use of malaria prevention and case management services among the target population. Specific objectives include: strengthening adoption of favorable behaviors in malaria control among individuals and communities; and encouraging involvement of stakeholders and actors from different sectors in malaria control efforts. To achieve these objectives, the SBCC plan calls for strengthening advocacy, SBCC and social mobilization activities, reinforcing capacities of all stakeholders involved in malaria control through periodic training, and active participation of the community through CHVs, health providers, community leaders, and religious groups. In 2015, the NSP was revised, following a mid-term review; the communication action plan was subsequently revised in support of the updated NSP. Key parts of the revised plan which covers the years 2016 and 2017 include: 1) Targeting migrant populations; 2) Emphasizing the implementation of IPC through the CHVs; 3) Engaging the traditional leaders in the communication; 4) Developing an approach through the schools (in collaboration with the Ministry of Education) and; 5) Consideration of new social media communication tools. In the CHL, Fringe districts and southern part of the country, the SBCC activities are intensified during the peak transmission season. A new communications plan will be developed in conjunction with the new NSP

covering the period 2018 to 2022. The Global Fund and PMI are the main donors supporting the NMCP's SBCC activities.

Progress since PMI was launched

At the community level, each village or fokontany has identified two CHVs, one focusing on child health and one responsible for maternal and reproductive health. A total of approximately 34,000 CHVs exist nationwide to provide SBCC messages and assist in community mobilization; however, not all CHVs are currently active or supported by partners. PMI supports over 15,000 CHVs in 15 regions, implementing integrated community management of childhood illness activities, including diagnosis and treatment of malaria, as well as providing interpersonal malaria SBCC messages to promote correct care seeking and prevention behaviors. With FY 2013 funding, PMI supported implementing partners to update SBCC training materials for use by CHVs, including ensuring IPTp and ITN messages were included. Between October 2013 and March 2014, more than 5,000 PMI-supported CHVs participated in behavioral change empowerment training, which focused on promoting and educating pregnant women as well as men on ANC, ITNs, iron and folate, and IPTp with SP. During this same period, PMI-supported CHVs reached over 1.8 million people (59% were women) through home visits, group education sessions and mass media events in the targeted project areas.

PMI supports an integrated "healthy family" social behavior change communication (SBCC) campaign focused on increasing knowledge and adoption of preventive behaviors and utilization of malaria commodities for prevention and appropriate treatment. The "healthy family" campaign is broadcast twice weekly by two radio stations with national reach, including the national radio. Before being aired, the malaria prevention messages, along with other maternal and child health desired behaviors, are designed and tested to accommodate accepted local language and culture.

PMI also supports a third-year malaria Peace Corps Volunteer to serve as a focal point and coordinate with other PCVs in Madagascar on malaria SBCC efforts and overall health system strengthening. PCVs have promoted malaria SBCC messages through their community development activities, participated in World Malaria Day, and highlighted SBCC messages at soccer events to raise awareness about malaria control.

The most recent KAP survey conducted in September of 2014 measured exposure to malaria messages, as well as behavior uptake, include ITN usage, IPTp uptake and care seeking behavior. It showed that over half (56.6%) of the respondents said they had heard or seen at least one message about malaria prevention or treatment during the last year. The messages most commonly heard or seen were about ITNs (40.0%), MIP (39.4%), the severity of malaria (11.2%) and the risk of contracting malaria (10.6%). The majority (82.7%) of the respondents also knew that mosquito bites cause malaria, and more than two thirds (71.7%) of the respondents mentioned two or more symptoms. About four-fifths (86.8%) of the respondents named one or more correct ways to prevent malaria, while about one-fifth (19.5%) mentioned one or more incorrect preventive methods. About 64.2% of the respondents agreed that people only get malaria when there are lots of mosquitoes around and 58.0% agreed that their children were so healthy that they could recover quickly if they had malaria. In addition, 94.4% of the survey respondents said that each case of malaria could potentially lead to death and 88.4% said they almost always worried that their child might have malaria when they had a fever. Almost two-thirds (62.1%) of respondents were aware of a place in their community where they could purchase bed nets. The majority (95.8%) of the respondents believed that sleeping under a bed net every night was the best way to avoid malaria. Nonetheless, about half (49.3%) said that many people sleeping under a mosquito net still got malaria. Few (9.2%) caretakers knew that SP was the prophylaxis given to pregnant women

to prevent malaria, and women (11.1%) were considerably more likely than men (3.8%) to mention SP for the prevention of malaria in pregnant women. Awareness about ACT was not very common: about one-quarter (23.8%) of the respondents mentioned ACT as a medication for treating malaria and almost half of respondents (46.7%) did not know what drug was used to treat malaria.

These findings clearly show the need to invest in more targeted SBCC to increase knowledge and awareness about malaria interventions, improve IPTp uptake, and promote prompt and appropriate care-seeking for treatment of malaria.

Progress during the last 12-18 months

PMI has been instrumental in reinvigorating the in-country SBCC Technical Working Group which includes SBCC Activity Managers of PMI implementing partners and NMCP and MoH counterparts. This now well-functioning group reviews key malaria messages and harmonizes them among members. There is significant representation in the group in terms of geographical coverage as well. Because of causal linkages between natural disaster and malaria outbreaks, this working group is also collaborating with SBCC colleagues from the National Office of Disaster Management within Ministry of the Interior.

With FY 2015 funding, PMI supported the revision of the national communication plan that will cover 2016-2017 to align with the revised national strategy and with the findings from the last KAP survey PMI also supported the implementation of sensitization toolkits for the mass ITN campaign in 2015. The revised national communication plan reinforces the contribution of the community in engaging the traditional leaders and through sensitization at the primary schools.

PMI undertakes outreach and awareness activities at all levels, from the national level down to the community. At the national level, PMI and stakeholders advocate at different levels of the MoH in order to gain their participation and extend collaboration with the following government entities: Ministry of Defense, Ministry of population, Ministry of Education, and Ministry of Environment in terms of communication messages for malaria prevention. At the regional level, partners advocate for communication in six priority regions to have them involved in the dissemination of malaria messages. At the community level, partners communicate through community dialogue by involving the traditional leaders and key community members. Messages are harmonized, with ongoing SBCC training of CHVs, and SBCC tool production; an example are the primary school tools to foster a “community-children’’ approach on ITN use.

As part of World Malaria Day events, the SBCC working group organized weekly interviews with the national radio, during the months of April and May 2016, spreading one malaria message per week. The celebration of the World Malaria Day in June was an opportunity to sensitize the local population on malaria prevention and to engage the community through primary schools, local authority and traditional leaders.

To strengthen the SBCC capacity of the NMCP, PMI plans to support the participation of the NMCP SBCC focal point at the Communication Community of Practice (CCoP) workshop in September 2016.

Plans and justification

Based on progress and output from the in-country SBCC working group, recent studies, and field visits findings, the NMCP is committed to implementing more efficient SBCC tools and approaches.

Because of regional differences in culture and normative behaviors, PMI is currently supporting an anthropological study to further refine SBCC campaigns and activities beyond the findings of these

studies. The objective of the study is to better understand the socio-cultural barriers related to the utilization of bed nets in different areas of the country. Presently, on the Eastern and Western coasts, SBCC messages for malaria control are disseminated all year round, because transmission is perennial. In the Central Highlands, Fringe and the South, SBCC activities are intensified during the peak transmission season. The 2016 study will examine regional differences in community behaviors and cultural practices that may be influencing the uptake of malaria preventions. This findings will help guide the NMCP and malaria partners in developing a more refined approach to malaria control and response. It will also guide the development and adaptation of targeted malaria SBCC messages for different malaria transmission zones.

Targeted SBCC activities will include promoting the use of ITNs by the general population and by pregnant women and children under five years of age in particular, promoting community acceptance of IRS, early and regular antenatal clinic attendance to ensure uptake of IPTp, and prompt diagnosis and treatment of malaria. Specifically, PMI will support:

- *ITNs*: Using interpersonal communication with CHVs, activities will focus on increasing ITN use among those who have access to a net by addressing relevant ideational elements and improving understanding of how durable nets are and how to best maintain them to maximize their durability and effectiveness. Net promotion programs will provide forums for discussions about nets in addition to mid-media channels such as radio. Household decision-makers, particularly men, will be encouraged to be involved in the allocation of nets within the household to ensure equitable distribution of nets for all sleeping spaces. Misuse of ITNs will also be discouraged.
- *IRS*: Strategic health communication programs will aim to reinforce community acceptance for IRS while addressing negative attitudes that could complicate the implementation of IRS campaigns. Peace Corps volunteers will be engaged in IRS areas.
- Malaria in pregnancy: SBCC programs will aim to champion the effectiveness of IPTp to prevent malaria through strategically designed messages that capitalize on the high prevalence of ANC care to develop a norm that establishes taking SP as a critical part of antenatal care. In addition to advocacy to ensure continuous availability of SP in health facilities, efforts to improve interpersonal communication and technical skills of health providers with respect to IPTp will be undertaken. These activities will be particularly important in the Sub-desert transmission zone, where IPTp-related ideation was particularly poor. Special outreach will be made to women who are not married as they are less likely to adhere to the recommended IPTp treatment than married women.
- *Case management*: A focus of case management SBCC activities at the health facility level will aim to reinforce confidence in malaria diagnostics and discourage the use of ACTs with a negative RDT result. These strategies will be integrated into interventions aimed at improving health care providers' competence to manage fever and malaria. Programs will seek to increase knowledge of ACTs in areas of unstable transmission at the community level and increase caregiver confidence in their ability to seek diagnosis and treatment of malaria in areas of stable transmission through interpersonal communication with CHVs. Forums that are inclusive of women are particularly salient to this context as they are marginalized in decisions regarding child health.

To complement mass media efforts, PMI will continue to support interpersonal communication and community-based behavior change interventions implemented through re-engagement with the public sector, as well as through NGOs and CHVs. The CHVs will provide outreach to families to convey malaria prevention awareness messages and to teach personal preventive behaviors through participatory

radio listening groups, small group education sessions, and home puppets, which are popular in Madagascar. Skits and dramas will also be used to convey messages and promote behaviors. Use of interpersonal communication approaches will be prioritized over the use of mass media, with the aim of using approximately 70% of the SBCC budget for this type of communication strategy.

Proposed activities with FY 2017 funding: ($1,000,000)

1. *Implementation of malaria SBCC activities nationwide:* Continue support for the reproduction of the malaria toolkit and support materials, and the implementation of mass media activities. Communication through mass media and social media will use integrated malaria messaging including the four key messages related to correct use of ITNs, acceptance of IRS where applicable, preventing malaria among pregnant women, including promoting uptake of IPTp and early and prompt care seeking for malaria case management. Special efforts will be deployed for the uptake of IPTp and appropriate care seeking. PMI will continue to support coordination of SBCC messages at the national level that will include updating the standard and harmonized package of essential SBCC malaria messages based on feedback from FY 2016 implementation of this activity and to evaluate the new communication plan. *($350,000)*
2. *Support for malaria SBCC activities at the community and health facility level*: Support the implementation of harmonized malaria messages at the community and health facility level using the two bilateral projects in Madagascar. PMI will support malaria messages reaching rural areas through community-based interpersonal communication by CHVs, skits and dramas, mobile video unit shows, and radio spots. Targeted and general SBCC activities will be implemented to mobilize traditional and religious community leaders and civic organizations to promote malaria prevention and control. Madagascar has strong traditional structures in place at the community level and more than 18 ethnic groups in country. PMI will continue to work closely with stakeholders and public and private partners to engage these groups in malaria control. Primary schools, traditional leader and journalists will be particularly targeted. PMI will reengage health care providers at the facility level to ensure they have access to and utilize SBCC materials and tools available through malaria partners and help develop key malaria messages that are standardized and harmonized across all malaria partner activities. Investments will be made across all intervention areas including ITNs, IRS, malaria in pregnancy and case management.*($650,000)*

6. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

The objectives of the revised 2013–2017 National Strategy for Epidemic Surveillance and Response are primarily to strengthen the M&E system in order to detect and control most epidemics, and to assure that at least 80% of malaria data are reported from health facilities. Following a midterm review of the Strategic Plan and using recent malaria data, the country was stratified into two operational zones based on malaria epidemiology: 1) an endemic zone or high transmission area that includes the East Coast and the West Coast; and 2) a non-endemic or low transmission area covering the Central Highlands and the Sub-arid South. This reclassification is a move away from the previously identified three operational zones: control, consolidation, and pre-elimination zones. The NMCP currently monitors the same data in the two transmission zones. Efforts are underway to establish one well-functioning integrated surveillance system, moving away from the vertical systems currently in place. There are several surveillance system pilot programs being tested. Once these programs are completed and evaluated, an integrated system will be designed and rolled out taking into consideration the diverse data needs of the two operational zones.

Progress since PMI was launched

The current M&E system for malaria is comprised of: 1) the national HMIS, which reports malaria cases and deaths monthly from health facilities; 2) the Integrated Disease Surveillance and Response system, which is based on a weekly reporting of notifiable diseases; 3) an integrated fever sentinel surveillance system, which provides highly accurate and rapid reporting of data from 54 individual sentinel health facilities and 118 CHVs; and 4) population-based surveys such as DHS and MIS. Additional M&E data are available, including insecticide resistance monitoring, therapeutic efficacy studies conducted approximately every two years, and pharmacovigilance monitoring.

The national HMIS system is the MoH's integrated monthly routine reporting system that relies on paper-based reporting from health facilities (and to a limited extent from communities) to the district level, and from the district level to the national level via electronic database transfer. The HMIS actually consists of multiple databases for various reporting sectors: primary health facility data (GeSIS), community health, human resources in health facilities, and commodities. The MoH developed an HMIS strengthening strategy in 2013 and recently made some progress in harmonizing indicators across programs, revising health facility registers, and updating GeSIS in December 2014. Compilation of malaria data reported through GeSIS is completed with the assistance of a data manager supported by Global Fund grants. Starting in 2008, reports have been entered into the central database and are available for use by the NMCP. The NMCP has also created a website for sharing program information: http://www.pnlp-madagascar.mg.

The Integrated Disease Surveillance and Response system (IDSR), implemented jointly by the MoH division responsible for epidemic surveillance (DVSSE) and WHO, is based on a weekly paper-based and SMS aggregate reporting of suspect and confirmed cases on the list of notifiable conditions that includes malaria. The IDSR, in theory, is a surveillance system covering all health facilities in the country and allowing early detection and investigation of outbreaks. Since the beginning of its implementation in Madagascar in 2000, however, its funding has been limited and unstable, leading to uneven implementation. For this reason, the IDSR is functional only in 18 districts out of 112 in the country, and completeness and timeliness of data reporting have been very poor. Other major limitations of this system are its inability to efficiently share data across health programs, and very limited data quality control and supportive supervision.

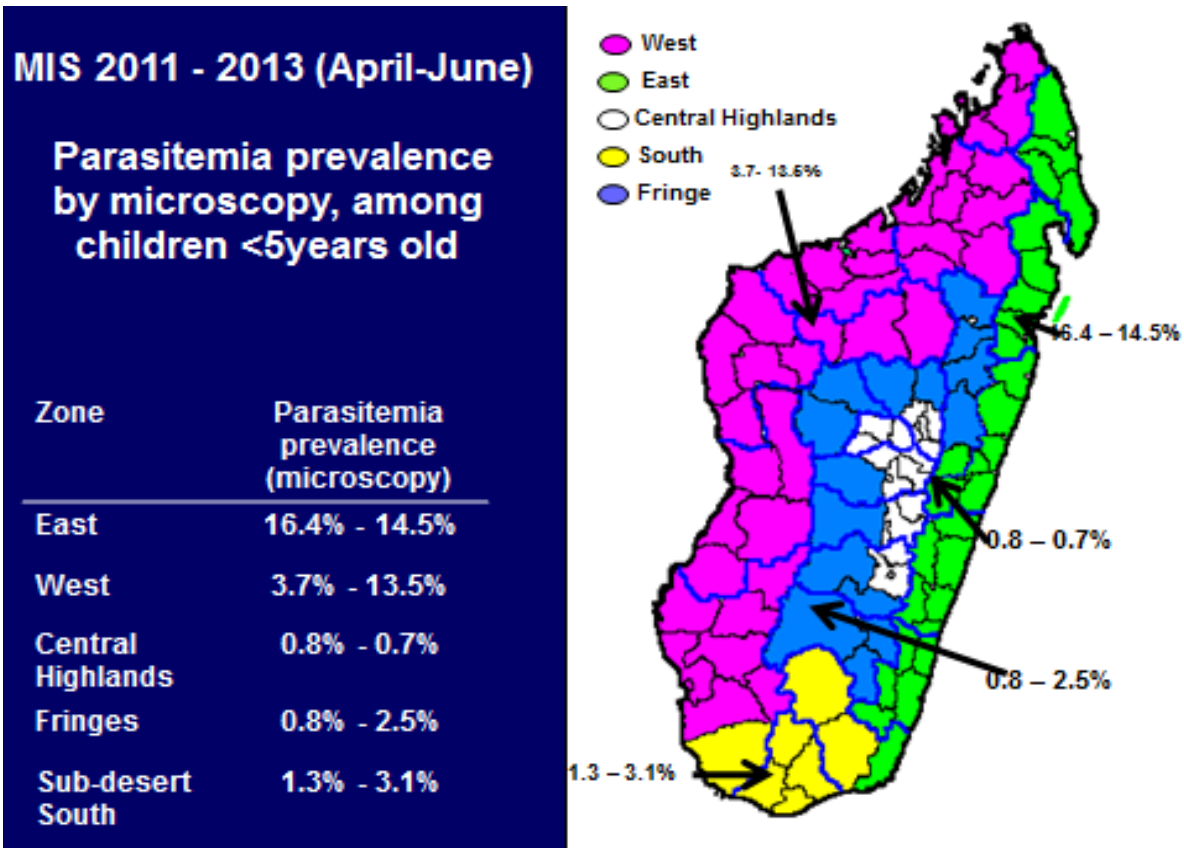
PMI has been supporting a fever surveillance system managed by a bilateral project collecting data at 54 sentinel sites and from 118 CHVs and providing weekly information on fever causes. This system uses syndromic surveillance coupled with confirmation by diagnostic testing to systematically classify all fever cases as a laboratory-confirmed malaria case, a suspected case of an outbreak-prone disease (i.e., arbovirus, influenza, malaria, plague), or other fevers. Aggregate data on the number of fever cases is transmitted daily to the central level from each site using short message service phone technology, including demographic information, clinical symptoms, RDT results, and history of antimalarial treatment before clinical consultation. Weekly feedback on reported data is provided to the fever sentinel sites and CHVs, and a quarterly newsletter summarizing the reported cases and trends is distributed to the RBM partners and other stakeholders. The fever sentinel sites system is currently the only readily available source of timely malaria morbidity trend data available to PMI and the USG, and it was responsible for the detection and response to potential epidemics in several regions of Madagascar from 2012 until 2015. This system is complemented by the Malaria Early Warning System (MEWS) framework that includes analysis of climate data, and program interventions for predicting epidemics.

The baseline national household survey used for tracking malaria indicators is the 2008-2009 DHS. Follow-up national surveys include the 2011, 2013, and most recently the 2016 MIS. Additionally, a large household survey to measure progress toward the MDGs in Madagascar was funded by United

Nations partners and health donor partners, including PMI. The MDG survey was completed in January 2013 and replaces the 2008–09 DHS survey. This household survey used a combination of two large standard household survey questionnaires: the DHS questionnaire and Living Standards Measurement Survey questionnaire. The survey estimated child mortality at 62 per 1,000 live births, which represents a small decrease from 2009. The maternal mortality rate stagnated and remained high at 479 deaths per 100,000 live births, down from 498 deaths per 100,000 live births according to the 2009 DHS.

The 2013 MIS co-funded by PMI, provided the second nationwide report of parasitemia results in Madagascar. Data shows that only two of the five malaria operational zones, the East coast and Central Highlands had a decrease in parasitemia prevalence in children under five compared to MIS 2011. The other transmission areas showed increases in parasitemia prevalence. This can be partially explained by the timing of the implementation of both surveys in relation to ITN mass campaigns. MIS 2011 was conducted in April-May 2011 and after completion of the rolling ITN mass campaign in all 92 districts in 2009/10. In 2013, however, the MIS survey was conducted when only East Coast districts had been covered by the 2012 ITN mass campaign, while other malaria transmission zones had not benefitted yet from the rolling campaign completed in late 2013. These results help confirm data from previous surveys and studies, showing that access to ITNs is closely linked with parasitemia prevalence; with increased ITN access, parasitemia prevalence decreases, but with reduced access the opposite occurs. A summary of the parasitemia data is shown in Figure 4.

Figure 4: Parasitemia prevalence



Progress during the last 12-18 months

In 2015, PMI supported a preliminary assessment of the national HMIS system and the country's various disease surveillance systems, including the fever sentinel sites, and the IDSR. The main findings included a fragmented HMIS system with duplication of data collection, and a poorly functioning

disease surveillance system with low coverage. In light of these findings, technical support to the MoH started in 2015 with a comprehensive assessment of the HMIS and disease surveillance systems with the Performance of Routine Information System Management (PRISM) tool. The objective was to conduct a detailed data quality review, including: 1) a thorough review of the data collection process, organizational structure, and challenges; 2) a review of the different databases to assess quality of data reporting; and 3) an assessment of the performance in providing quality malaria surveillance data.

The results of the 2015 PRISM assessment of the routine data system show that a third of the health districts did not receive monthly routine data reports from their respective health facilities, and only 80% of health districts received reports after the deadline. Data accuracy was 68% between reports and data sources. Some of the factors contributing to low data quality include low motivation of users to collect and report data, lack of capacity of service providers and lack of a quality assurance system for data. Regarding the disease surveillance systems, only 70% of evaluated health facilities of all types reported accurate data. The evaluation also showed a low overall data completeness, with only 62% of all health facilities reporting to the IDSR. In addition, timeliness of reporting was less than 50% for all health facilities. Completeness and timeliness of reporting to the district and region were equally low, with 70% completeness to both levels, and timeliness of 69% at district level and less than 50% at the regional level. Only one third of assessed private health facilities used standard malaria case definition for diagnosis. About three-quarters of the sentinel sites (74%), half of CSB level II (56%) and 40% of CSB level I reported using surveillance data to conduct prevention / control activities in the last 12 months.

The MoH started two integrated disease surveillance pilot projects in 2016 in 19 health districts throughout Madagascar. One of the pilot programs is the tablet-based collection of data from health facilities from 17 health districts on 32 notifiable diseases including malaria, based on disease case definitions. This project is currently funded by the WHO, the Global Fund, and the UN Central Emergency Response Fund (CERF), with an evaluation planned for November 2016. The other project, funded by the International Association of National Public Health Institutes (IANPHI) is also collecting data on diseases of epidemic potential from both CHVs (on paper) and health facilities (tablets) in 2 districts in the North; an evaluation is also planned for the end 2016. Based on the results of both pilot evaluations, the country will develop a unique system to serve as the new national integrated disease surveillance system. PMI contributed to the country dialogue and decision to conduct those pilot projects and is planning to support the independent evaluations that will be the basis for the scale up of the national integrated disease surveillance system.

The 2014 health facility survey (cross-sectional cluster survey of 65 outpatient public health facilities) conducted between October and December 2014, assessed the readiness of HFs to provide high quality care (including availability of antimalarials and RDTs), health worker practices related to malaria diagnosis and treatment and accuracy of provider-conducted malaria diagnostic testing through blood smear cross-checking of survey-enrolled patient samples at the central level. Results of the survey showed that only 38% of health facility staff were trained to perform either malaria microscopy or RDTs. A significant proportion of facilities (between 65.0% and 81.3%) had the various AS/AQ treatment courses in stock the day of the survey, but only an average of 10% of the facilities had a minimum of 20 courses on hand. Approximately 60% of the facilities had injectable quinine available the day of the survey. Ninety-six percent of health workers interviewed have used an RDT at some point, but struggled to recall/cite the appropriate quantity of blood and buffer solution to add to the wells. Two-thirds of surveyed facilities had a copy of the national malaria control policy and just over half had a copy of the national ACT guidelines. CHW affiliation was also assessed and 78.5% of health facilities reported some level of engagement with CHWs. However, only about a quarter of HFs (24.1%)

organized some form of in-service training for their CHWs in the 12 months preceding the survey and 67.2% of HFs supervised their CHWs and 62.4% of HFs provided or delivered supplies to their CHWs.

The most recent MIS survey was completed in July 2016, with preliminary data to be made available in September 2016. The country has been observing, however, based on HMIS data, a significant decrease in malaria cases throughout the country following the September-December 2015 ITN mass campaign. Please see below a graph on the most recent HMIS data.

Figure 5: Trends in Malaria Cases from HMIS (2013-2016)

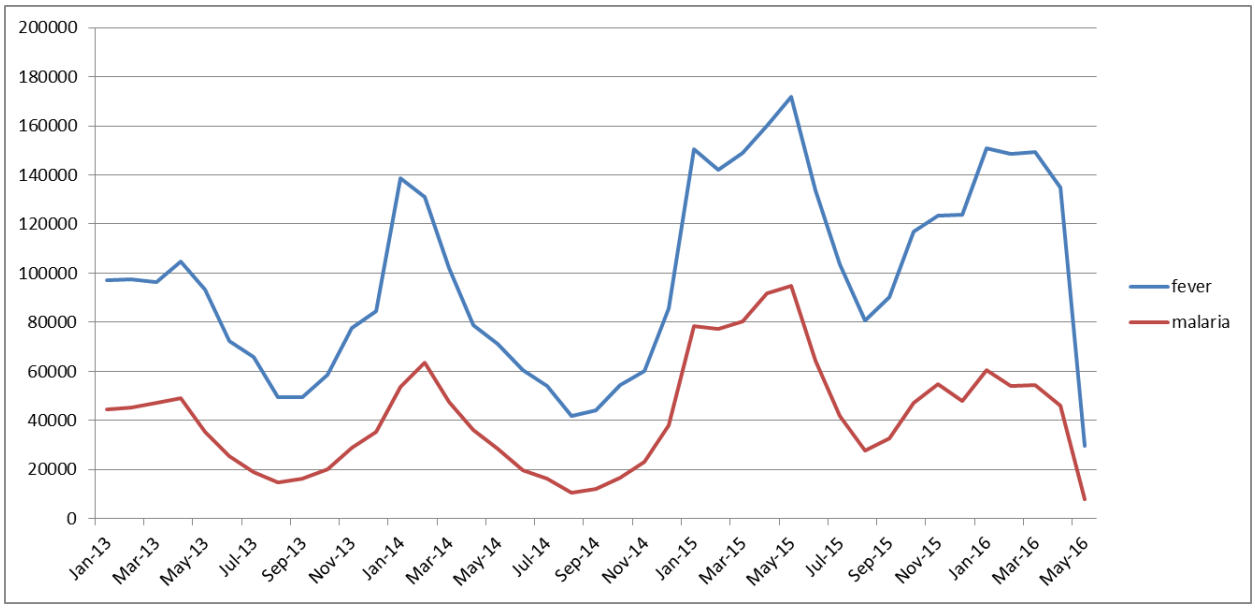


Table 12. Surveillance, Monitoring and Evaluation Data Sources

Data Source	Survey Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018
National-level Household surveys	Demographic Health Survey (DHS)									
	MDG Survey				x					
	Malaria Indicator Survey (MIS)		x		x			x		
	National Population Census								x	x
Health Facility and Other Surveys	School-based malaria survey					x				
	Health facility survey					x			x	x
	EUV Survey									
Malaria Surveillance and Routine System Support	Support to malaria surveillance system	x	x	x	x	x	x	x	x	x
	Support to parallel routine malaria info system (Global Fund) *	x	x	x	x	x	x	x		
	Support to HMIS					x	x	x	x	x
Therapeutic Efficacy	In vivo efficacy testing			x		x		x		x
Entomology	Entomological surveillance and resistance monitoring	x	x	x	x	x	x	x	x	x
Other malaria-related evaluations	KAP survey					x				
	Anthropological survey							x		

* Non PMI-funded

Table 13. 2015 Routine Surveillance Indicators

Indicators	Value	Comments
1. Total number of reported malaria cases Data source: HMIS		
Total diagnostically confirmed cases	739,006	
Total clinical/presumed/unconfirmed cases		
If available, report separately for outpatients and inpatients		
Outpatient number of reported malaria cases	739,006	
Diagnostically confirmed	739,006	
Clinical/presumed/unconfirmed	1,545,081	Based on number of fevers with positive RDT results, and signs suggestive of malaria but with negative RDT results.
Inpatient number of reported malaria cases	4,748	
Diagnostically confirmed	4,748	Confirmed by microscopy
Clinical/presumed/unconfirmed	13,608	Based on microscopy confirmation and signs of severe malaria with negative microscopy confirmation.
2. Total number of reported malaria deaths Data source: HMIS		
Diagnostically confirmed	N/A	
Clinical/presumed/unconfirmed	855	Includes microscopically confirmed cases
3. Malaria test positivity rate (outpatients) Data source: HMIS		
Numerator: Number of outpatient confirmed malaria cases	739,006	
Denominator: Number of outpatients receiving a diagnostic test for malaria (RDT or microscopy)	1,487,789	
Test positivity rate	49.7%	
4. Completeness of monthly health facility reporting Data source:		
Numerator: Number of monthly reports received from health facilities	31,511	
Denominator: Number of health facility reports expected (i.e., number of facilities expected to report multiplied by the number of months considered)	38,147	
Reporting completeness	82.6%	

Plans and justification

PMI will continue to support the routine data system and will transition support of fever sentinel sites in FY 2017 to strengthen the national integrated disease surveillance system through the MoH. PMI will also support preliminary activities for the 2019 MIS, a malaria health facilities survey, and laboratory and molecular surveillance of malaria.

With FY 2017 funding, PMI will continue to support HMIS strengthening based on recommendations from the PRISM assessment, including training, supervision, materials for health facility staff, and the establishment of a data warehouse on a DHIS2 platform. DHIS2 is primarily supported by the Global Fund's NFM, however additional funds are needed to support training of users at the national and district/regional levels, supervision and the purchase of an additional server to strengthen the existing system. PMI funding will be used to support a consultant/technical advisor who will be located at the NMCP to train and assist malaria program staff on how to effectively use DHIS2 for malaria data. In addition, funding will support training of other national staff in DHIS2 and development of supervision and support materials.

The long-term goal, as articulated in the National Surveillance Strategic Plan, is for there to be one functional surveillance system. However, there are several surveillance system pilot programs underway. The integrated surveillance system will be designed and rolled into the overall National Surveillance System once the pilots are completed and evaluated. PMI will provide support for the design and integration of the new surveillance system which also includes the transition of sentinel sites to the national integrated disease surveillance system managed by the DVSSE/MoH and integration of the community and health facility-based surveillance and routine epidemic surveillance activities..

Additionally, a health facility survey will be conducted post-sanctions using the same methodology and tools as in 2014, to assess the impact of USG direct support for case management. The results will be compared to the 2014 survey that was conducted pre-sanctions. PMI also plans to support laboratory and molecular surveillance at established health facilities in preparation for pre-elimination.

Proposed activities with FY 2017 funding: ($1,385,000)

1. *Support for HMIS system strengthening:* through targeted support to the MoH for training, supportive supervision and materials for CHVs and health workers, and the DHIS2 web-based platform. This HMIS strengthening activity will build on activities initiated in 2016. This multi-year activity is supported by other donors, including the Global Fund. PMI will focus more on technical assistance with the bilateral project to build the capacity through training and technology transfer. *($600,000)*
2. *Transition of sentinel sites to national surveillance system:* to continue implementation of community and health facility based surveillance activities, provide targeted support to MoH for surveillance, and epidemic detection, and establish an integrated disease surveillance system. The project will provide technical assistance to the MoH by conducting training and assisting the MoH in strengthening and expanding the disease surveillance data collection and management system, including utilization of data for decision-making. The plan is to integrate the fever sentinel sites into the national surveillance system. *($250,000)*
3. *Malaria health facilities survey:* Assess health facility capacity after several years of working with the GoM. The previous health facility survey was conducted in 2014 before re-engagement with the government had begun. *($250,000)*
4. *Malaria Indicator Survey 2019*: support initial preparatory activities for the next MIS study. *($200,000)*

5. *M&E training for regional and district staff*: Facilitate an in-country malaria M&E training for regional and district staff. *($75,000)*
6. *Technical assistance:* One CDC TDY for the support of PMI Madagascar M&E activities. The USAID TDY will be centrally funded. *($10,000)*

7. Operational research

NMCP/PMI objectives

The NMCP Operational Research objectives were revised during the November 2014 midterm review of the 2013–2017 NSP. Priority areas are: (1) the use of sterile mosquitoes for malaria control; (2) therapeutic efficacy studies, and; (3) anthropological studies to inform social and behavior change communication activities, in association with malaria burden and access to services.

Progress since PMI was launched

The Central Highlands of Madagascar have very low malaria transmission and the area has a long history of receiving IRS in the 1990s and 2000s. With funding from PMI and Global Fund, the CHL received four years of blanket spraying (all communes in the supported districts) from 2008 to 2012 and transitioned to focalized spraying, targeting the communes in selected districts with the highest malaria incidence, in 2013, according to the national strategic plan. Communes have been targeted for spraying by calculating estimated malaria incidence from health facility data. However, concerns about the completeness and accuracy of health facility data are compounded by low rates of care-seeking in the formal sector in Madagascar, and have raised questions about the validity of the current approach to estimating transmission intensity and prioritizing communes for IRS. As a method to validate facility-based data, as well as other approaches (e.g., school absenteeism data) for prioritizing malaria interventions, a school-based malaria serology survey was conducted as a gold standard for prioritizing communes for focalized IRS. Preliminary data analysis showed that health facility data identified 21 of 30 communes with the highest transmission determined by serology, for a sensitivity of 70%. This study showed that routine data performed relatively well but did not identify all malaria hotspots. A draft manuscript describing the findings from this study is being prepared.

Table 14: PMI-funded Operational Research Studies

Completed OR Studies			
Title	**Start Date (est.)**	**End Date (est.)**	**Budget**
Use of serology to validate health facility-based data for prioritizing IRS in the Central Highlands of Madagascar.	December 2013	January 2015	$280,000 (FY 2013)
Ongoing OR Studies FY 2015			
Title	**Start Date (est.)**	**End Date (est.)**	**Budget**
Evaluation of reactive case detection versus mass drug administration strategies in the Central Highlands	May 2016	June 2018	$150,000 (FY 2014) + $313,000 (FY 2015)
ITN use and barriers in different regions of Madagascar	April 2016	July 2016	$75,000

Proposed OR Studies FY 2016			
Title	**Start Date (est.)**	**End Date (est.)**	**Budget**
Care-seeking behavior	December 2016	December 2017	$225,000
Planned OR Studies FY 2017			
Title	**Start Date (est.)**	**End Date (est.)**	**Budget**
Epidemiological investigation of key populations in the CHL and fringe areas	October 2017	September 2018	$200,000

Progress during the last 12-18 months

To help the NMCP determine the most effective approaches to further reduce and maintain malaria transmission at low levels, PMI is supporting operational research on the effectiveness of malaria reactive case detection versus mass drug administration strategies with FY 2014 and FY 2015 funds. The study is comparing reactive case detection to mass drug administration around passively detected malaria cases, in order to help the NMCP determine the most feasible and effective approaches to further reduce and maintain malaria transmission at low levels. Funds include support to one Peace Corps Volunteer who is providing dedicated support to the reactive case detection pilot in the CHL. The study objectives were modified following country dialogue and agreement to include a mass drug administration arm; a change from the original objective of comparing two reactive case detection arms. Local partners have now begun field activities following necessary committees' approvals.

PMI is also supporting, with FY 2015 funds, an anthropological study to assess ITN use and barriers in different regions of Madagascar, in order to inform the NMCP on optimal ITN SBCC messages and use. Activities began in the field in April 2016 with data collection completed already in two of the four study sites. Field activities were completed in July 2016 and preliminary data made available later in 2016.

With FY 2016 funds, PMI is supporting a study to inform the NMCP on reasons for delayed or non-care seeking behavior by caretakers of children and adults with fever, at the community and health facility levels. The study was delayed because the NMCP was originally working with the University of Antananarivo on a similar project. However, upon review of study objectives for both studies, the NMCP has requested PMI to proceed with the originally planned care seeking behavior study which will now begin at the end of 2016.

Plans and justification

PMI plans to support a study to inform the NMCP on key populations' movement and access to health care in low transmission CHL and fringe districts, with FY 2017 funds. In line with the NSP, the NMCP requested support for a study focused on key target populations (i.e., those identified as migrants, workers working at mining companies, etc.) as a key target group for the reinforcement of specific interventions and understanding their impact on malaria control strategies and progress towards pre-elimination in CHL and fringe districts. There is very little data available in the country regarding movement and access to health care for these key populations. The purpose of the research is to understand the risk factors for malaria among migrant groups in the. The study will include qualitative research (focus groups with migrant and non-migrant populations) as well as quantitative research, including malaria testing, to understand malaria risk behaviors, access to health care and health care

seeking patterns, and malaria prevalence. PMI will be working with the NMCP and the Institut Pasteur to flesh out the details of the study methodology. Results from the study would help inform targeted interventions to these key populations for malaria control and pre-elimination efforts.

Proposed activities with FY 2017 funding: ($200,000)

1. *Epidemiological Investigation of key populations in the CHL and Fringes:* PMI is proposing to support a study on key populations (migrants, mining workers, etc) to inform the NMCP on targeted interventions for malaria control efforts in low transmission areas. *($200,000)*

8. Staffing and administration

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

The PMI interagency professional staff work together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, 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 Health Office Director and thus the two PMI RAs, one from USAID and one from CDC, report to the USAID Health Office Director for day-to-day leadership, and work together as a part of a single interagency team. Technical expertise housed in Atlanta and Washington complements PMI programmatic efforts.

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

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

Proposed activities with FY 2017 funding: ($1,450,000)

1. *In-country PMI staff salaries, benefits, travel, and other PMI administrative costs:* Continued support for two PMI (CDC and USAID) Resident Advisors and two Foreign Service National staff members to oversee activities supported by PMI in Madagascar. Additionally, these funds will support pooled USAID Madagascar Mission staff and mission-wide assistance from which PMI benefits. *($1,450,000)*

Table 1: Budget Breakdown by Mechanism

President's Malaria Initiative – *Madagascar*

Planned Obligations for FY 2017

Mechanism	Geographic Area	Activity	Budget ($)	%
TBD - IRS Project	Nationwide	Entomological monitoring	$230,000	28%
	6 districts	IRS implementation in 6 districts	$7,055,500	
GHSC/PSM	92 Districts	Procurement of ITNs for the 2018 mass distribution campaign	$7,675,000	33%
	93 Districts	Procure SP	$75,000	
	Nationwide	Procurement of ACTs	$300,000	
		Procurement of laboratory consumables and reagents	$50,000	
		Strengthen national capacity for supply chain management including implementing supply chain assessment recommendations	$500,000	
TBD	92 Districts	Warehousing and distribution of ITNs	$2,100,000	10%
	Sample of 92 Districts	ITN durability monitoring	$75,000	
	Nationwide	Support malaria BCC activities, including social marketing and malaria toolkit reproduction	$350,000	
IPM	Sample of 92 Districts	ITN durability monitoring	$25,000	2%
	Nationwide	Support for Malaria Peace Corps Volunteers	$10,000	
		Therapeutic efficacy studies	$200,000	
		Malaria control study in key populations	$200,000	
CDC/IAA	Nationwide	Technical assistance to vector control activities	$14,500	1%
		Technical assistance to case management activities	$10,000	
		Technical assistance to support M&E activities	$10,000	
		Staffing and administration	$350,000	
GEMS II	6 districts	IRS environmental monitoring	$30,000	0%

CCH	7 Regions	Support CHWs with MIP training and implementation	$250,000	7%
		Refresher training and supervision of community and facility-based case management	$1,100,000	
		Support for Malaria Peace Corps Volunteers	$10,000	
		Implementation of malaria BCC activities at community and health facility levels	$400,000	
MIKOLO Bilateral Project	8 Regions	Support CHWs with MIP training and implementation	$150,000	5%
		Refresher training and supervision of community and facility-based case management	$800,000	
		Support for Malaria Peace Corps Volunteers	$10,000	
		Implementation of malaria BCC activities at community and health facility levels	$250,000	
MCSP	93 Districts	Strengthen MIP at the facility level	$400,000	4%
	Nationwide	Refresher training and supervision of malaria case management at health facility level	$600,000	
TBD - Case Management	Nationwide	Training and supervision for laboratory technicians	$200,000	1%
Peace Corps	Nationwide	Support for Malaria Peace Corps Volunteers	$20,000	0%
TBD	Nationwide	FELTP	$75,000	1%
		Malaria Health Facilities Survey	$250,000	
MEASURE/EVAL	Nationwide	Transition of sentinel sites & consultant	$250,000	4%
		Support for HMIS system strengthening including building NMCP's capacity to manage HMIS	$600,000	
		M&E Training for Regional and District staff	$75,000	
MEASURE/DHS	Nationwide	MIS 2019	$200,000	1%
USAID	Nationwide	Staffing and administration	$1,100,000	4%
Total			**$26,000,000**	**100%**

Table 2: Budget Breakdown by Activity

President's Malaria Initiative – *Madagascar*
Planned Obligations for FY 2017

Proposed Activity	Mechanism	Budget		Geographic Area	Description
		Total $	Commodity $		
PREVENTIVE ACTIVITIES					
VECTOR MONITORING AND CONTROL					
Entomologic monitoring and insecticide resistance management					
Entomological monitoring	TBD - IRS Project	$230,000	$0	Nationwide	Build capacity of the NMCP to conduct comprehensive vector surveillance, assess resistance and other entomological monitoring (i.e. vector taxonomy and density, and insecticide decay rates). Activity includes procurement of entomological supplies for the NMCP and support to 11 surveillance sites. Assumes $20k per sentinel site, plus supplies.
Subtotal Ento monitoring		$230,000	$0		
Insecticide-treated Nets					
Procurement of ITNs for the 2018 mass distribution campaign	GHSC/PSM	$7,675,000	$7,675,000	92 Districts	Procure 2.3 million LLINS for the 2018 LLIN campaign.
Warehousing and distribution of ITNs	TBD	$2,100,000	$0	92 Districts	Provide warehousing and distribution of ITNs.

ITN durability monitoring	TBD	$75,000	$0	Sample of 92 Districts	Facilitate ITN durability monitoring of ITNs with the NMCP. This activity builds on the previous ITN durability studies, where IPM will focus on the entomological activities related to the durability studies.
	IPM	$25,000	$0	Sample of 92 Districts	
Technical assistance to vector control activities	CDC/IAA	$14,500	$0	Nationwide	One CDC TDY to provide technical support for LLIN durability monitoring, and IRS related entomological monitoring.
Subtotal Insecticide-treated Nets		$9,889,500	$7,675,000		
Indoor Residual Spraying					
IRS implementation in 6 districts	TBD - IRS Project	$7,055,500	$3,600,000	6 districts	Conduct blanket IRS in 6 high burden districts in the East Coast.
IRS environmental monitoring	GEMS II	$30,000	$0	6 districts	Conduct an independent environmental monitoring visit of PMI supported IRS areas.
Subtotal IRS		$7,085,500	$3,600,000		
SUBTOTAL VECTOR MONITORING AND CONTROL		$17,205,000	$11,275,000		
Malaria in Pregnancy					
Support CHWs with MIP training and implementation	CCH	$250,000	$0	7 Regions	Provide training and implementation support for CHVs for MIP. Activities include ITN use, and referrals to health facilities for ANC and SP.
	MIKOLO Bilateral Project	$150,000	$0	8 Regions	

Strengthen MIP at the facility level	MCSP	$400,000	$0	93 Districts	Support strengthening MIP activities at facility level in 93 IPTp districts; activities include strengthening and improving IPTp uptake and reporting, ITN use, and ANC attendance in collaboration with USAID bilateral projects and non USAID project areas.
Procure SP	GHSC/PSM	$75,000	$75,000	93 Districts	Procurement of 500,000 treatments of SP to complement Global Fund procurement. Assumes $.15 per tx.
Subtotal Malaria in Pregnancy		$875,000	$75,000		
SUBTOTAL PREVENTIVE		$18,080,000	$11,350,000		
CASE MANAGEMENT					
Diagnosis and Treatment					
Procurement of ACTs	GHSC/PSM	$300,000	$300,000	Nationwide	Procurement of 500,000 treatments of ACTS, to compliment the Global Fund commodities procurement. Funding includes distribution to districts.
Procurement of laboratory consumables and reagents	GHSC/PSM	$50,000	$50,000	Nationwide	Procurement of laboratory supplies and reagents to support the revitalization of the national reference laboratory.
Refresher training and supervision of community and facility-based case management	MIKOLO Bilateral Project	$800,000	$0	8 Regions	Provide support to health facilities for management of CHVs. Activities will include refresher training, M&E

	CCH	$1,100,000	$0	7 Regions	integration, and routine supervision of CHVs. Activity will be co-funded by other USAID funding streams.
Refresher training and supervision of malaria case management at health facility level	MCSP	$600,000	$0	Nationwide	Conduct refresher malaria case management training integrated supportive supervision at the facility level. Activity complements Global Funded activity.
Training and supervision for laboratory technicians	TBD - Case Management	$200,000	$0	Nationwide	Conduct training and supportive supervision for laboratory technicians at the National, Regional and District levels.
Therapeutic efficacy studies	IPM	$200,000	$0	Nationwide	Collaborate with the NCMP to conduct TES in all 4 sites. Assumes $50k per site.
Technical assistance to case management activities	CDC/IAA	$10,000	$0	Nationwide	One CDC TDY to provide technical support for case management.
Subtotal Diagnosis and Treatment		$3,260,000	$350,000		
Pharmaceutical Management					
Strengthen national capacity for supply chain management including implementing supply chain assessment recommendations	GHSC/PSM	$500,000	$0	Nationwide	Support national supply chain management by implementing supply chain assessment recommendations and quarterly end-use verification at health facilities. This activity is co-funded by other USG funding streams.
Subtotal Pharmaceutical Management		$500,000	$0		

SUBTOTAL CASE MANAGEMENT		$3,760,000	$350,000		
HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING					
Support for Malaria Peace Corps Volunteers	Peace Corps	$20,000	$0	Nationwide	Support a third year malaria volunteer to coordinate malaria work with other PCVs in Madagascar. Funding breakdown is $10k to support the MV, plus $10k for SPA projects.
	IPM	$10,000	$0	Nationwide	Support a third year PCV to work on implementation of malaria interventions. Funding will support PCVs nested with partners, and includes housing, transportation and equipment.
	MIKOLO Bilateral Project	$10,000	$0	8 Regions	
	CCH	$10,000	$0	7 Regions	
FELTP	TBD	$75,000	$0	Nationwide	Support 1 FETP trainee to focus on malaria surveillance and M&E capacity.
SUBTOTAL HSS & CAPACITY BUILDING		$125,000	$0		
SOCIAL AND BEHAVIOR CHANGE COMMUNICATION					
Support malaria BCC activities, including social marketing and malaria toolkit reproduction	TBD	$350,000	$0	Nationwide	Support the implementation of harmonized malaria messages at the community and health facility level. Funding includes revision of the malaria toolkit and reproduction of support materials.
Implementation of malaria BCC activities at community and	MIKOLO Bilateral Project	$250,000	$0	8 Regions	Support the implementation of harmonized malaria messages at the

health facility levels	CCH	$400,000	$0	7 Regions	community level.
SUBTOTAL SBCC		$1,000,000	$0		
SURVEILLANCE, MONITORING, AND EVALUATION					
Support for HMIS system strengthening including building NMCP's capacity to manage HMIS	MEASURE/EVAL	$600,000	$0	Nationwide	Provide targeted support to the NMCP to strengthen the HMIS. Activities will include training, supportive supervision and materials.
Transition of sentinel sites & consultant	MEASURE/EVAL	$250,000	$0	Nationwide	Targeted support to the MoH (NMCP and Surveillance & Epidemic Detection Dept.) for surveillance and epidemic detection.
Malaria Health Facilities Survey	TBD	$250,000	$0	Nationwide	Assess health facility capacity after a couple of years of working with the GoM. Previous health facility survey was conducted in 2014.
MIS 2019	MEASURE/DHS	$200,000	$0	Nationwide	Support initial preparation activities for the 2019 MIS.
M&E Training for Regional and District staff	MEASURE/EVAL	$75,000	$0	Nationwide	Facilitate an in country malaria M&E training for Regional and District staff.
Technical assistance to support M&E activities	CDC/IAA	$10,000	$0	Nationwide	One CDC TDY to provide technical support for M&E activities.
SUBTOTAL SM&E		$1,385,000	$0		

OPERATIONAL RESEARCH					
Malaria control study in key populations	IPM	$200,000	$0	CHL and fringe areas	Investigate burden of malaria and transmission dynamics (including access & utilization to malaria services) in the key populations (i.e. migrant mine workers) near pre-elimination zones.
SUBTOTAL OR		$200,000	$0		
IN-COUNTRY STAFFING AND ADMINISTRATION					
Staffing and administration	CDC/IAA	$350,000	$0	Nationwide	Support for CDC annual staffing costs.
Staffing and administration	USAID	$1,100,000	$0	Nationwide	Support for USAID annual staffing and administration, including CDC portion of ICASS.
SUBTOTAL IN-COUNTRY STAFFING		$1,450,000	$0		
GRAND TOTAL		**$26,000,000**	**$11,700,000**		