

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 2018 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.



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## U.S. PRESIDENT'S MALARIA INITIATIVE



**PRESIDENT'S MALARIA INITIATIVE**

**MADAGASCAR**

**Malaria Operational Plan FY 2018**

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## ABBREVIATIONS and ACRONYMS

|                 |   |
|-----------------|---|
| ACT             | Artemisinin-based combination therapy   |
| AMM             | <i>Agence du Médicament de Madagascar</i>   |
| AL              | Artemether-lumefantrine   |
| ANC             | Antenatal care  |
| AS/AQ           | Artesunate-amodiaquine  |
| CCDS            | <i>Comité Communal du Développement Sanitaire/</i> Community Health Development Committee |
| CDC             | Centers for Disease Control and Prevention  |
| CHL             | Central Highlands   |
| CHV             | Community health volunteer  |
| CSB             | <i>Centre de santé de base/</i> Basic health center                                       |
| DHIS2           | District Health Information System <sup>2</sup>   |
| DHS             | Demographic and Health Survey   |
| DLP             | <i>Direction de la Lutte contre le Paludisme/</i> National Malaria Control Program        |
| EPI             | Expanded Program on Immunization  |
| EUV             | End-use verification  |
| FBO             | Faith-based organization  |
| FY              | Fiscal year   |
| GHI             | Global Health Initiative  |
| GeSIS           | <i>Gestion de Système d'Information Sanitaire/</i> Health Information System Management   |
| Global Fund     | Global Fund to Fight AIDS, Tuberculosis and Malaria                                       |
| GoM             | Government of Madagascar  |
| HMIS            | Health Management Information System  |
| HSS             | Health systems strengthening  |
| iCCM            | Integrated community case management  |
| IDSR            | Integrated disease surveillance and response  |
| IEC             | Information, education, communication   |
| IPM             | <i>Institut Pasteur</i> of Madagascar   |
| 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   |
| <i>PhaGeCom</i> | <i>Pharmacie de Gestion Communautaire/</i> Community pharmaceutical depot                 |

|         |   |
|---------|---|
| PhaGDis | <i>Pharmacie de gros de district/</i> 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  |
| SDSP    | <i>Service de District de la Santé Publique/</i> Public Health District Service |
| SM&E    | Surveillance, monitoring, and evaluation  |
| SP      | Sulfadoxine-pyrimethamine   |
| SPA     | Small project assistance  |
| SSD     | <i>Service de santé de district/</i> District health service                    |
| UNICEF  | United Nations Children's Fund  |
| USAID   | United States Agency for International Development                              |
| USG     | United States Government  |
| WHO     | World Health Organization   |

## I. EXECUTIVE SUMMARY

When it was launched in 2005, the goal of the President's Malaria Initiative (PMI) was to reduce malaria-related mortality by 50% 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 began implementation as a PMI focus country in FY 2008.

This FY 2018 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 2018 funding.

The proposed FY 2018 PMI budget for Madagascar is \$23 million. PMI will support the following intervention areas with these 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 being supported in 26 sites across Madagascar: PMI supports 11 sentinel sites, *Institut Pasteur* of Madagascar supports 5 sites, and the NMCP supports 10 sites with GF resources. In 2017, under the NMCP leadership, an entomologic technical working group was established to coordinate vector surveillance and entomological monitoring activities among partners. NMCP also developed an insecticide resistance management plan with WHO funding and PMI technical support. With FY 2018 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. Social marketing of highly subsidized ITNs in limited peri-urban areas as well as routine distribution in health facilities done during immunization and antenatal care are supported by Global Fund. PMI procured 6.35 million ITNs to support the September to December 2015 mass distribution campaign, and 1.3 million nets to support continuous distribution in select high transmission districts in 2016-2017. With FY 2017 funds along with other pipeline resources, PMI will support procurement and distribution of 6 million nets for the 2018 mass campaign, and continue the net durability monitoring study. FY 2018 resources will procure and support the distribution of up to 1 million ITNs through continuous distribution, as well as nets durability.

### **Indoor residual spraying (IRS):**

IRS is a key vector control intervention used in Madagascar, along with ITNs, to prevent malaria. PMI has supported IRS starting with FY 2008 funds, and since October 2016, PMI has implementing blanket IRS in three higher burden districts of the East Coast, and two districts from the South East. In 2017, three new districts in the South East were added, based on a marked increase with epidemiological data compared to previous years, and despite high ITN coverage; this brought the total number of districts to eight receiving PMI supported IRS. With FY 2018 funds, PMI plans to continue implementing IRS in up to five high burden districts in the South East and Southwest, and supporting entomological monitoring, including residual efficacy of IRS, in a sample of sites throughout Madagascar.

### **Malaria in pregnancy (MIP):**

Intermittent preventive treatment (IPTp) for pregnant women using sulfadoxine-pyrimethamine was adopted as a national policy in 2004 in the 93 districts where stable malaria transmission occurs. Since 2016, PMI strengthened health provider practices to implement the NMCP's updated IPTp policy. This includes procurement of SP, elaboration of job aids for health workers and training in MIP, capacity building of CHV in MIP related SBCC. These efforts continued in 2017. With FY 2018 funds, PMI will continue to strengthen MIP activities implementation at health facilities (both public and private) and community levels and will procure 360,000 treatments of SP for IPTp.

### **Case management:**

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 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. PMI has 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 2017, 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 2018 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 2017. With FY 2018 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 communication 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, interpersonal communication 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 with FY 2017 funds, and will engage health care providers at the facility level. With FY 2018 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 objective of the national malaria M&E strategy is to strengthen systems in order to detect and control 100% of epidemics, and to monitor disease across the country by assuring the quality of at least 80% of data reported from health facilities. To achieve these objectives, the NMCP plans to establish one integrated system that incorporates elements of the various systems currently in place. PMI supported assessments of these systems, which revealed a fragmented HMIS, duplication of data collection, and a poorly functioning integrated disease surveillance and response (IDSR) system. Findings from these assessments will be used to update the M&E strategy. With FY 2018 funds, PMI will support activities to strengthen these surveillance systems, including training personnel and conducting health facility, demographic and end user verification surveys. In addition, funds will support training activities to transition data warehousing to a DHIS2 platform, as well as the 2019 DHS survey, which will include a malaria module.

**Operational research (OR):**

The NMCP is currently revising the National Strategic Plan, which includes its operational research priorities. PMI has supported OR in Madagascar, and with FY 2015 funds began funding an 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. With FY 2018 funds, PMI will continue support the final year for this study. With FY 2017 funds, PMI is supporting an epidemiological investigation of key populations in the CHL and fringe areas, in an effort to reduce malaria transmission. In addition, with FY 2018 funds, PMI will support a cost-effectiveness of community-level (CHV) malaria treatment for children up to age 15 years.

**Pre-elimination:**

The NMCP supports efforts to establish pre-elimination zones in Madagascar. However, the criteria for determining pre-elimination status has changed frequently; therefore, the districts targeted for pre-elimination have changed. The pre-elimination strategy will include active case detection, plus radical treatment of confirmed malaria cases in targeted districts, but these plans have not yet been implemented. The NMCP has been using data presented at the scientific conference in November 2016 to inform the National Strategic Plan (2018–2022), which will include a geographically progressive elimination strategy. PMI will assist the development of this strategy, which is expected by the end of 2017. PMI will coordinate with other donors, including the Global Fund, to support the NMCP's elimination activities.

## II. STRATEGY

### 1. Introduction

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

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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.

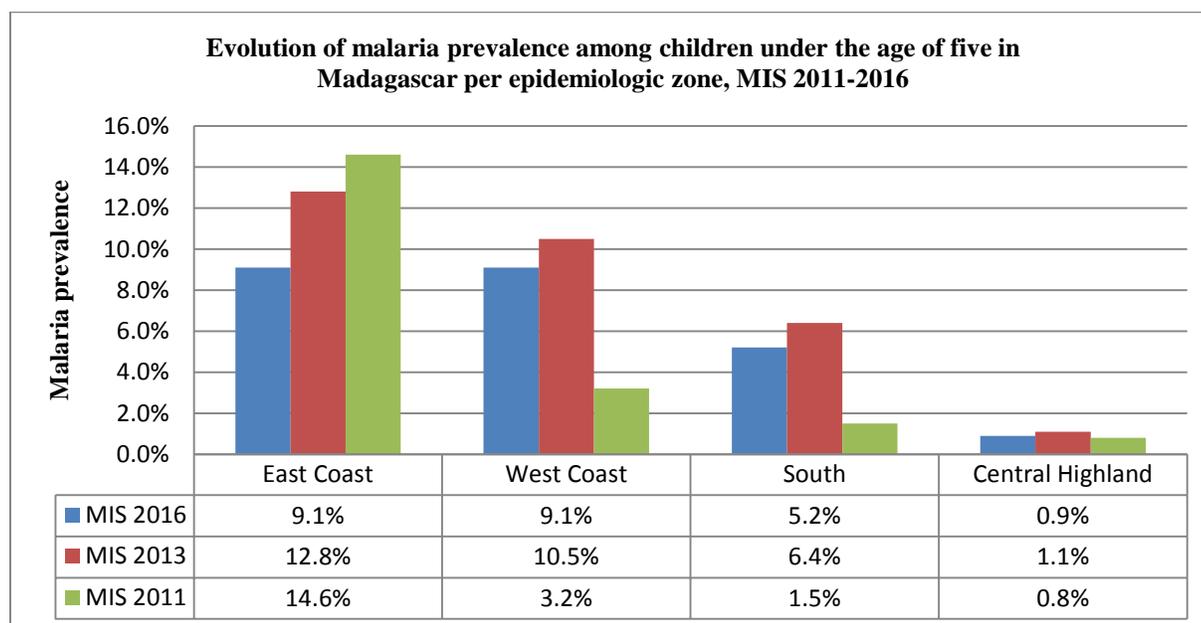
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well with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria 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 2018 funding.

## **2. Malaria situation in Madagascar**

While malaria is endemic in 90% of Madagascar, the entire population of the country is considered to be at risk for the infection and associated morbidity and mortality. From 2003-2013, there were clear impacts observed from malaria control program investments including decreases in malaria cases and deaths reported through the national Health Management Information System (HMIS). Moreover, the 2016 MIS data showed a decrease in RDT-diagnosed malaria from 10% in 2013 to 5.2% in 2016 among children under five years of age. However, these decreases were not uniform throughout the country. The East Coast (one of the PMI focused regions) had declines in cases, whereas the West and Southern regions have had sustained numbers of cases and progress remains stagnant (graph 1). The epidemiology of malaria in Madagascar between 2013 and 2016 has been complex and HMIS data from this period suggest minimal changes in malaria epidemiology in the country. RDT-confirmed malaria cases increased from 380,651 in 2013 to 449,253 in 2016, due in part to increased RDT use (1,026,110 RDTs used in 2013 to 1,487,794 in 2016). There were also isolated epidemics resulting in a peak of malaria cases in mid-2015. These epidemics may have resulted in part from delays in donor funding supporting comprehensive prevention and case management activities. This trend has started to reverse; after a mass ITN distribution campaign from September-December 2015, HMIS data from late 2015 through 2016 showed a substantial reduction in malaria incidence in most health districts. This trend continued with a reduction of 39.1% in malaria incidence and of 60.4% in malaria-related mortality during 2015 and 2016.

**Figure 1: Evolution of malaria prevalence from 2011-2016 per epidemiologic zone in Madagascar**



In 2013, malaria was the eighth leading cause of morbidity among children under five, down from second in 2007, and was the second leading cause of death among children under five in 2013 as reported by district hospitals.<sup>1</sup> 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.<sup>2</sup> Despite continued tremendous reduction in malaria-related deaths from 855 in 2015 to 443 in 2016, malaria remained among the top five reported causes of mortality in 2016 which is similar to previous years.

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<sup>3</sup> and 62<sup>4</sup> 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.

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 a coup in March 2009, and led to closures of more than 200 primary health center (*centres de santé de base* [CSB]) through 2013. 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. In addition, the country has serious health personnel shortages. Nearly half of Madagascar's health personnel will have to retire in the next few years with an annual health worker shortfall of 7,500.

<sup>1</sup> *Annuaire Statistique* 2013

<sup>2</sup> NSP 2013-2017

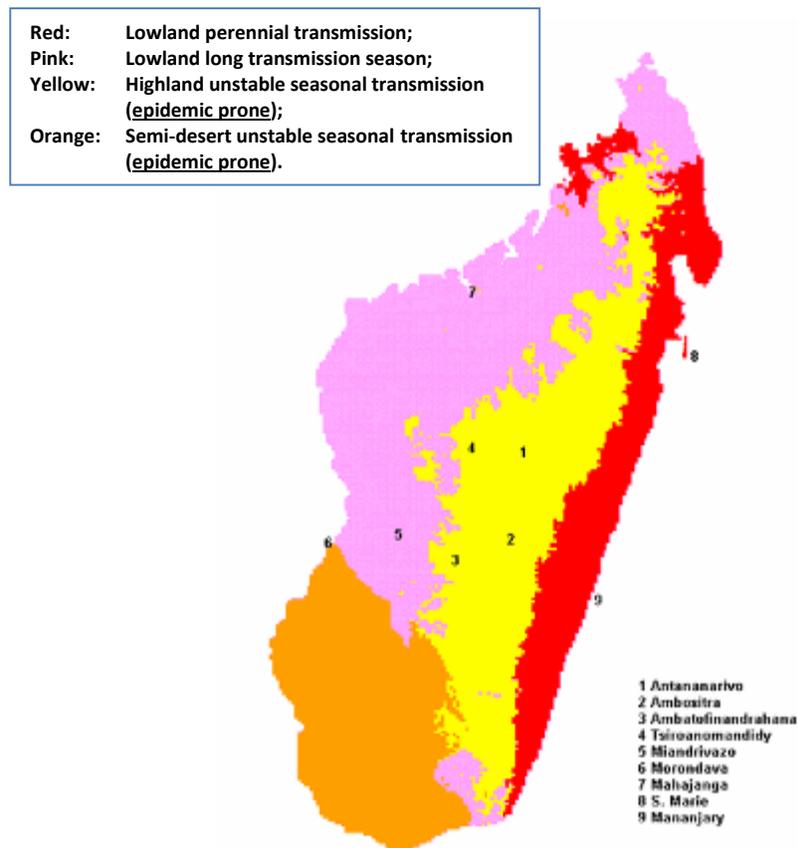
<sup>3</sup> DHS 2009 Report

<sup>4</sup> MDG Survey Report 2013

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 reforms, limited supervisory and monitoring visits due to security issues and lack of funds, delayed data reporting, and interruptions in supplies of essential medicines to health facilities. The non-governmental sector has reported difficulties due to unsafe conditions in the field, and reduced capacity of the health sector 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 focus 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 (Figure 2). 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 2: Madagascar Malariometric Stratification NSP 2013-2017**



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, malaria morbidity and mortality is primarily among children under 15 years of age. Almost one-third of the

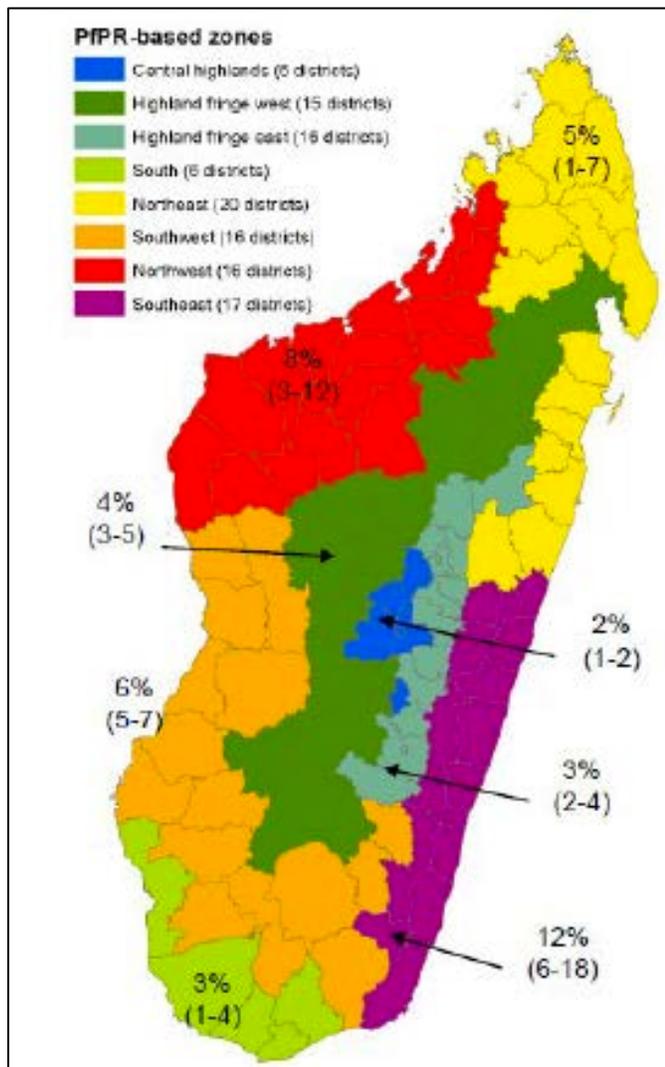
Central Highlands (CHL) lies above 1,500 meters, where malaria transmission does not occur, or if it does, the transmission season is short, and unstable. In the semi-arid South, transmission is also seasonal and unstable; in some areas, is almost absent. In areas of the upper CHL and the South where transmission is low, these areas are prone to periodic epidemics which are often associated with high levels of mortality in all age groups. A large-scale epidemic occurred in the late 1980s in the CHL and killed an estimated 30,000 people and a recent epidemic that occurred in 2015 in Tulear killed 150 persons (Source: the MoH division responsible for epidemic surveillance (DVSSE)). 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*, and the recent 2016 MIS found four *P. malariae* and zero *P. vivax* cases among 445 samples tested by PCR. 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 8 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*. The two primary malaria vectors countrywide are *Anopheles gambiae* s.l. (primarily *An. arabiensis*) and *An. funestus*. *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 CHL, 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 targeting and reinforcement of malaria interventions. According to the NSP, approximately 20% of the Malagasy population resides in vulnerable zones or districts considered unsafe and where access to services is limited. The NSP also identifies key populations at increased risk for malaria, including migrants and mine workers.

The strategic orientation of the 2018-2022 NSP was defined in November 2016 during the NMCP scientific conference, including increasing domestic resources, addressing the malaria epidemic among older children, effective use of low dose primaquine in low transmission areas, an ITN mass campaign in 2018, and select research. The goal is to achieve progressive malaria elimination by epidemiologic zone, and the strategy has defined eight epidemiologic zones (Figure 3). The 2018-22 NSP will be validated through an inclusive process of a Malaria Program Review and an external evaluation, which are planned for June – July 2017, and a final version will be completed in August 2017.

**Figure 3: Madagascar Malariometric Stratification NSP 2018-2022<sup>5</sup>**



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

The Ministry of Health (MoH) is represented by the Minister of Health and is comprised of nine technical directorates under the Directorate General. The Directorate General reports to the Secretary General authority along with 4 supporting directorates and 22 regional directorates. Madagascar is administratively divided into 22 regions, 119 administrative districts (only 112 health districts), 1,579 communes, and 17,500 *fokontany*,<sup>6</sup> which corresponds to a group of villages in rural areas and to a neighborhood in urban areas. Each region has a regional health directorate and a regional hospital. Contrary to other administrators in Madagascar, the *fokontany* chief is chosen by the mayor of a commune through a grass roots selection process by community members and is not affiliated with a political party.

<sup>5</sup> Rosalind E et al, Contemporary epidemiological overview of malaria in Madagascar: operational utility of reported routine case data for malaria control planning, Howes et al. *Malar J* (2016) 15:502

<sup>6</sup> INSTAT, 2012

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<sup>7</sup>:

- 12 university teaching hospitals plus 10 specialized referral centers for specific diseases
- 16 regional hospitals that serve as tertiary care health facilities
- 87 first-referral district public hospitals
- 2,563 CSBs. Among these, 1,616 are 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.

The MoH has critical staff shortages at all levels of the public health system, but particularly for service provision at the regional, district and commune levels. 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.<sup>8</sup>

Regional and district health directors oversee 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 physician, the *Médecin Inspecteur*, responsible for technical supervision of all CSBs in his/her jurisdiction and the management team of the district.

Historically, the national malaria control unit was established in 1921 with the aim of preventing malaria epidemics. Until the late 1980s, the focus of the unit was on 26 epidemic-prone districts. In 1998, the first five-year national malaria control strategy was designed, defining control interventions by 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 unit to a National Malaria Control Program (NMCP) directorate level in the MoH organizational structure. The NMCP Director oversees a team comprising six technical divisions and one support division: Vector Control, Case Management, Laboratory, Epidemiologic Surveillance, M&E, SBCC, and Finance and Administration. In June 2014 the MoH was restructured and the NMCP was elevated to the cabinet level, under direct supervision of the Minister of Health. In February 2015, the NMCP was put back under the direct supervision of the Director General for Health and was renamed *Direction de la Lutte contre le Paludisme* (DLP).

In 2008, Madagascar approved an integrated community case management (iCCM) package to be 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 tests by CHVs, 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. Currently, each *fokontany* has a team of two CHVs, one specializing in child health and another in

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<sup>7</sup> Annuaire des Statistiques du Secteur Santé 2013

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. With Global Fund resources, 10,000 CHVs will receive support to provide iCCM in non-USAID supported regions of Analamanga, Itasy, Boeny, Bongolava, Anosy, leaving a gap of 9,000 CHVs mostly located in very insecure and hard to reach areas.

The MoH's Community Health Policy, developed in 2009, guides CHVs' activities and requires two CHVs per *fokontany* selected by their communities.

The iCCM program is supported by USAID-funded projects targets populations in *fokontanys* located at least five kilometers from the nearest health facility. However, the selection and establishment of CHVs to conduct iCCM activities in Global Fund-supported *fokontanys* is not based on the same criteria. The MoH has been updating the National Community Health Policy and will address these discrepancies. 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. Harmonization of supervision tools and content, commodity management, activity reporting, and data management are particularly challenging. Both Global Fund and USAID are actively engaged in supporting 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's 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 strengthening existing malaria interventions in these zones and populations but not as a separate strategy. Other major changes to the 2013-2017 strategy include 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.

Based on the Madagascar scientific conference held in November 2016, the NMCP is currently re-writing the National Strategic Plan, which will cover 2018-2022. PMI will assist the development of this strategy, which is expected by the end of 2017, and will coordinate with other donors, including the Global Fund, to assist the NMCP to fully implement the new strategy.

***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 the 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 called for focalized IRS stratified by commune in three geographic zones, which had 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 underwent spraying, which was prioritized based on clinical and entomological data that showed 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 low transmission areas (CHL and Fringe districts), while PMI supports blanket spraying in higher burden districts in the East and Southeast. However, pending Global Fund approval, the NMCP plans to conduct blanket IRS in the CHL in 2017 to catch-up the missed focal IRS campaign that was not done in 2016 and early 2017 due to delays with insecticide procurement. In addition to the CHL, the NMCP has implemented PMI-supported IRS in three Eastern districts and two Southeast districts in order to shift resources to higher burden areas. In the future, the NMCP will continue to implement vector control activities based on continued epidemiological analysis.

***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 in

CHL (Itasy district), 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 recommendations. The updated NSP includes the IPTp3 indicator as part of its strategy with the aim of achieving 40% IPTp3 by 2017. To date, the MOH is updating the existing ANC norms and procedures to align with the new WHO recommendations requiring a minimum of eight contacts. 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 uncomplicated 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, but rectal artesunate is not yet available in country. A combined training curriculum for severe malaria case management and MIP was developed in July 2016 followed by nationwide cascade trainings targeting health care providers at facilities (CSB and hospitals) and program managers at all levels. Since then, parenteral artesunate has been used at the CSB and the hospital levels. Pre-referral rectal artesunate rollout will be effective as soon as commodities are available in the country and all CHVs are trained.

**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. However, health service quality is sub-optimal, and the NMCP's capacity to plan effectively, implement efficiently, and achieve timely reporting is limited. Additional challenges for the NMCP include ensuring effective coordination with other government directorates that also have responsibility for disease control, epidemiological surveillance, program oversight and reporting, and training and supervision of staff. The November 2014 malaria 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. The NMCP strategy is supported by other MoH policy agenda items, including universal health coverage and the Community Health Policy.

**Monitoring and evaluation (M&E):** The objective of the revised 2013–2017 National Malaria M&E Strategy is to strengthen systems in order to detect and control 100% of epidemics, and to monitor disease across the country by assuring the quality of at least 80% of data reported from health facilities. To meet this objective, the strategy includes support for integrating the multiple existing health data management systems. Establishing one system that links and incorporates current systems will improve epidemic detection and disease monitoring for appropriate and timely decision-making. Plans to integrate systems include adopting the web-based District Health Information System 2 (DHIS2), and expanding the use of SMS messaging to improve reporting completeness from remote districts. To pilot test an integrated system, the WHO and the MoH supplied 355 electronic tablets to 17 health districts to conduct surveillance for several diseases of epidemic potential including malaria. A plan to scale-up this system to an additional 16 districts (500 tablets) using Global Fund resources (NFM2) is planned. Additionally, USAID and the MoH are piloting mobile applications to be used by CHVs to improve data quality and access from remote communities. Currently 35 CHVs, 7 CSB directors and 8 SDSP staff members are part of this pilot; an evaluation is planned for August 2017.

**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. Since existing data show a high burden of malaria among older children (6-14 years), NMCP plans to expand the malaria case management among older children by CHVs to be piloted in hard to reach and highly affected districts through Global Fund support, and plans to conduct a cost effectiveness assessment of this approach before its rollout. This was decided during the scientific conference organized in November 2016 in preparation of the new NSP 2018-2022.

**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. A revised communication plan was developed in 2016 to increase the impact of SBCC, involving various government Directorates and Ministries, such as the Ministry of Education, Ministry of Environment, and Directorate of Communication within the Ministry of Public Health, and the traditional and local leaders. The revised plan takes into account regional specificities and is based on the WHO Communication for Behavior Impact approach. In addition to strengthening the competency of health workers and CHVs in regards to information, education and communication, to improve the quality and effectiveness of communication (i.e., privilege interpersonal communication between caregivers) the strategy aims to: intensify SBCC activities to achieve behavioral objectives in low and high transmission areas; adapt SBCC in areas with low levels of malaria transmission; and intensify the SBCC activities in the zones affected by natural disasters.

**Table 1: Current NMCP Strategy by Intervention and Transmission Zone**

| <b>Strategies/interventions</b>  | <b>High Transmission Control Zones (endemic East and West)</b>   | <b>Low Transmission control zones (non-endemic CHL, Fringes and South)</b> |
|--|--|--|
| <b>IRS</b>   |  |  |
| Focalized IRS  |  | √ (17 districts in CHL)  |
| Focalized IRS for epidemic response  | √  | √  |
| <b>ITNs</b>  |  |  |
| ITN universal coverage   | √  | √ (South and Fringes)  |
| Routine and continuous ITN distribution  | √  | √ (South and Fringes)  |
| Focalized ITN distribution in response to epidemics                            | √  | √ (South and Fringes)  |
| <b>IPTp</b>  |  |  |
| IPTp among pregnant women  | √  | √ (South and Fringes)  |
| <b>Case management</b>   |  |  |
| Diagnostic case confirmation   | √  | √  |
| ACTs for confirmed cases   | √  | √  |
| Radical treatment (ACT plus primaquine) for confirmed cases                    | √ (4 districts: Nosy Be and Sainte Marie, Diego I and Majunga I) | √ (CHL)  |
| <b>Surveillance</b>  |  |  |
| 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 cases) | √ (4 districts: Nosy Be and Sainte Marie, Diego I and Majunga I) | √ (5 districts in CHL)   |

## **5. Updates in the strategy section**

The current NSP 2015-2017 ends in December 2017. The development of the new Malaria Strategic Plan covering 2018-2022 started in November 2016 with the organization of a scientific conference that provided new strategic direction. A Malaria Program Review and an external evaluation are being conducted in June-July 2017. Those findings, along with the integrated input from the malaria scientific conference, as well as intervention coverage data provided from the 2016 MIS, will inform the new NSP planned to be completed in August- September 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 RBM/Southern Africa Regional Network, with the NMCP coordinating all partners. In 2016, more than 94% of malaria resources came from external funding, mainly from PMI and the Global Fund. Under NMCP leadership, a strong local RBM partnership has been established, and committee meetings are held monthly. Over the last six years, RBM partners worked closely to oversee and conduct three Malaria Indicator Surveys (MIS 2011, MIS 2013, and MIS 2016), to plan and design two Malaria Program Reviews (July 2011 and May 2017), to organize and facilitate a national conference on pre-elimination (November 2011) to inform the design of the 2013–2017 NSP, to conduct the 2013 and 2015 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. In preparation of the new NSP, RBM supported the NMCP to conduct the scientific conference in November 2016, which provided additional strategic orientation. RBM is also supporting the NMCP to conduct critical operational research, including investigating reactive case detection in pre-elimination zones of CHL to inform the NCMP’s pre-elimination strategy. Finally, PMI along with RBM partners supported the first quality malaria commodities quantification using Quantimed and Pipeline tools. This will be used by Global Fund and PMI to support commodity procurement over the next three years.

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. RBM is supporting the NMCP to implement their NFM1 grant and to prepare their request for an NMF2 full grant.

With FY 2018 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 and health system strengthening, particularly HMIS and integrated supply chain management strengthening.

## **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.<sup>8</sup>

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**

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

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<sup>8</sup> [http://whqlibdoc.who.int/publications/2007/9789241596084\\_eng.pdf](http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf)

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 MIS in 2011, 2013 and 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 Survey Based Malaria Indicators in Madagascar from 2011 to 2016**

| <b>Indicator</b>   | <b>MIS<br/>2011</b>           | <b>MIS<br/>2013</b>           | <b>MIS<br/>2016</b> |
|--|-------------------------------|-------------------------------|---------------------|
| % Households with at least one ITN   | 80.4                          | 67.9                          | 79.5                |
| % Households with at least one ITN for every two people  | 33.3                          | 29.0                          | 43.9                |
| % Children under five who slept under an ITN the previous night  | 76.5                          | 61.5                          | 73.4                |
| % Pregnant women who slept under an ITN the previous night   | 71.5                          | 61.4                          | 68.5                |
|  |                               |                               |                     |
| % Households in targeted districts protected by IRS  | 79.0                          | 58.5                          | N/A                 |
|  |                               |                               |                     |
| % Children under five years old with fever in the last two weeks for whom advice or treatment was sought                             | N/A                           | 37.5                          | 46.2                |
|  |                               |                               |                     |
| % Children under five with fever in the last two weeks who had a finger or heel stick  | N/A                           | 13.4                          | 15.5                |
| % Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs | 19.2                          | 54.0                          | 16.8                |
|  |                               |                               |                     |
| % Women who received two or more doses of IPTp during their last pregnancy in the last two years                                     | 19.5                          | 18.4                          | 22.3                |
| % children under five with parasitemia (by <b>microscopy</b> , if done)  | 6.2                           | 9.1                           | 7.0                 |
| % children under five with parasitemia (by <b>RDT</b> , if done)   | 8.7                           | 10.0                          | 5.2                 |
| <b>Indicator</b>   | <b>DHS<br/>2003-<br/>2004</b> | <b>DHS<br/>2008-<br/>2009</b> |                     |
| Under-five mortality rate per 1,000 live births  | 94                            | 72                            |                     |

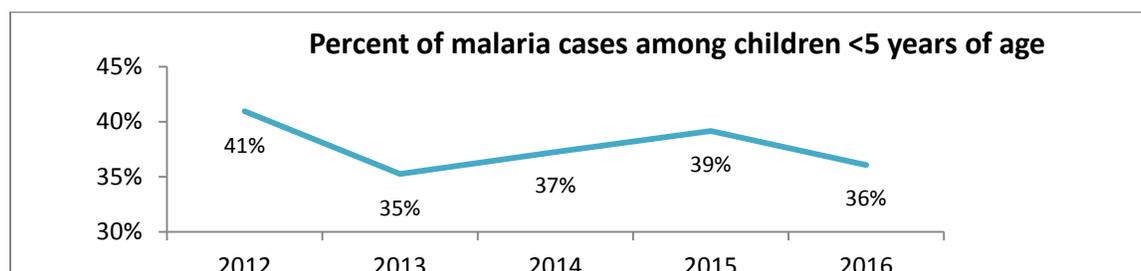
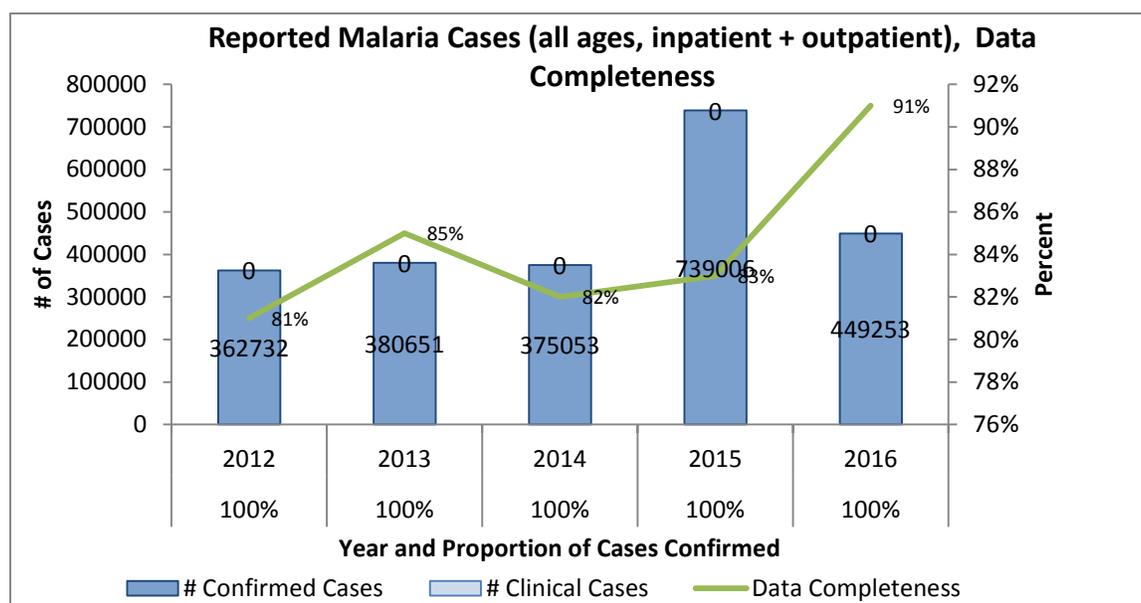
**Table 3: Evolution of key malaria indicators reported through routine surveillance systems in Madagascar from 2012 to 2016**

| Indicator                        | 2012    | 2013    | 2014    | 2015    | 2016    |
|----------------------------------|---------|---------|---------|---------|---------|
| Total # Cases                    | 362,732 | 380,651 | 375,053 | 739,006 | 449,253 |
| Total # Confirmed Cases          | 362,732 | 380,651 | 375,053 | 739,006 | 449,253 |
| Total # Clinical Cases*          | 0       | 0       | 0       | 0       | 0       |
| Total # <5 Cases                 | 148,527 | 134,209 | 139,754 | 289,392 | 162,126 |
| Total # inpatient malaria deaths | 608     | 627     | 579     | 855     | 358     |
| Data Completeness** (%)          | 81%     | 85%     | 82%     | 83%     | 91%     |
| Test Positivity Rate (TPR)       | 41%     | 35%     | 37%     | 39%     | 36%     |

\*Not applicable in Madagascar, as only confirmed cases are reported

\*\*Percentage of health facilities reporting each month

**Figure 4: Trends in Key Routine Based Malaria Indicators**



## 9. Other relevant evidence on progress

**Household surveys:** A cross-sectional study conducted in 2012 and 2013 to evaluate the efficacy and impact of malaria interventions included collecting blood samples and administering household questionnaires to 15,465 participants in 62 sites throughout the country.<sup>9</sup> 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. Recently, as part of an end-of-project evaluation, a bilateral partner conducted a cross-sectional survey in September 2016, which sampled over 4,500 households in 33 districts of 7 regions. The results showed the following: 87.6% of children under five and 83.6% of women aged 15-49 years slept under bed-nets the day before the survey compared to 73.4% and 68.5%, respectively, in MIS 2016 results.

**Health facility survey:** A nationally representative cross-sectional cluster survey of 65 outpatient public health facilities conducted in October-December 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 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. 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 health workers tested 97.4% of patients for whom malaria was suspected, and that health workers administered or prescribed ACTs to 86.1% of patients diagnosed with uncomplicated malaria. Weighted analysis showed that 32.3% of patients diagnosed with uncomplicated malaria were properly counseled on the use of ITNs; 19.4% returned to the health facility if signs of severe disease were present or if symptoms worsened; 32.3% returned to the health facility for a follow-up visit after two days; 23.7% fully completed treatment; and the proportion who continued to eat while sick was relatively low. Approximately two-thirds of health facilities supervised their CHVs and provided or delivered supplies to them.

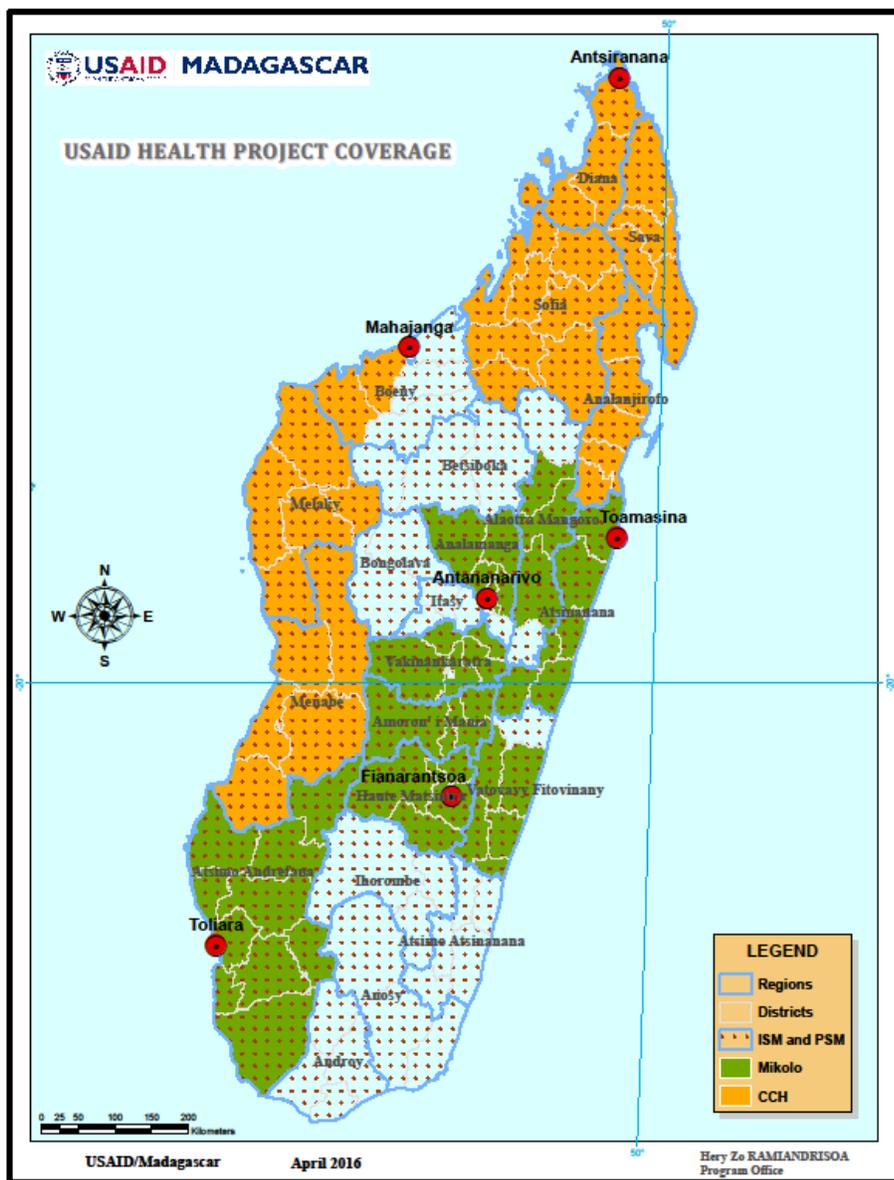
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<sup>9</sup> <http://www.malariajournal.com/content/13/1/465>

### 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 7 regions in the West, Central and East of the country (see Figure 5). 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 5: 15 Priority PMI and USAID Regions**



## 1. Vector monitoring and control

### NMCP/PMI objectives

Under the 2013–2017 NSP, Madagascar supports both ITNs and IRS vector control interventions, along with entomological monitoring in sites throughout the country. Madagascar has adopted 1 ITN for every 2 persons to achieve universal coverage for the 92 districts targeted for ITNs. The NMCP, with Global Fund financing, implements focal IRS in the eight districts that meet WHO pre-elimination criteria. PMI supports IRS implementation in high burden districts, and since 2014, has been spraying in the East and South Eastern Coastal Districts. 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

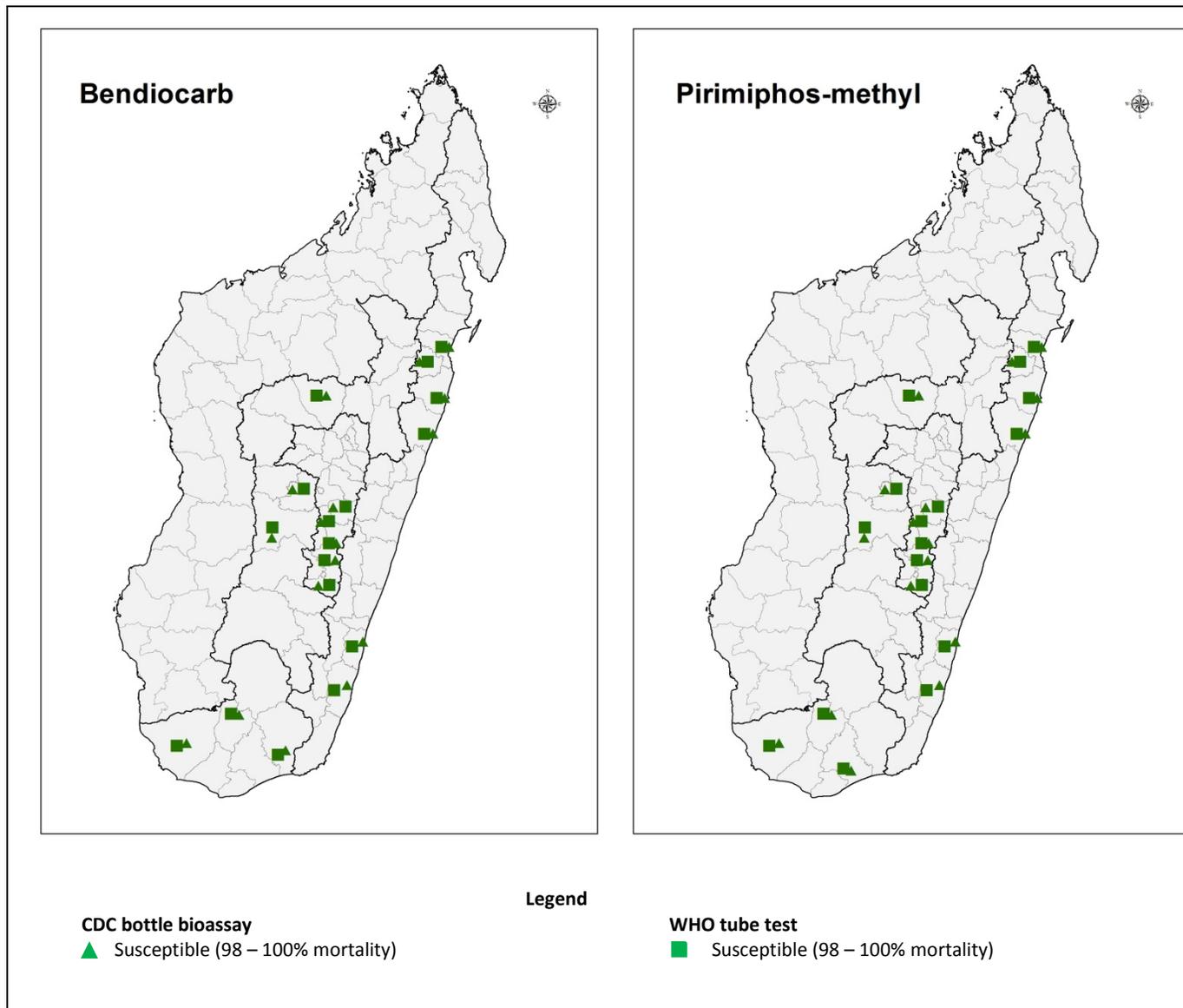
PMI provides ongoing support for collection of basic entomological indicators, including resistance monitoring and the residual efficacy of IRS. Currently, there are eleven PMI-supported entomology sentinel sites. The NMCP's Vector Control Committee selects the entomological monitoring sentinel sites annually, in discussion with PMI and partners, including *Institut Pasteur* of Madagascar (IPM), who also supports different entomological sentinel sites. Routine insecticide susceptibility monitoring of insecticides has guided the country's IRS program and has justified switching insecticides to a longer-lasting organophosphate.

#### Progress during the last 12-18 months

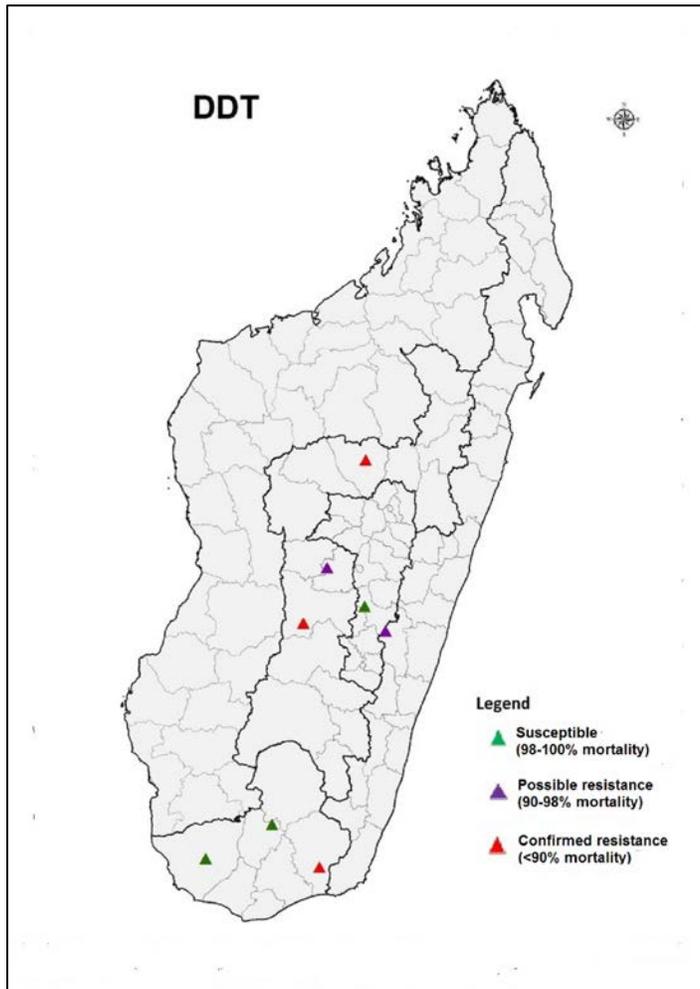
PMI-supported entomological monitoring has occurred at 11 sentinel sites: 4 in the CHL, 1 in the South, and 6 along the East Coast. Both IRS-targeted and 'similar' comparison sites were included to monitor indicators such as vector-insecticide resistance and the duration of residual efficacy to assess IRS impact. The majority of the entomological monitoring sites are consistent from year to year with the exception of a few adjustments due to issues such as security as well as changes in IRS targeting plans. All sites monitor basic indicators: vector taxonomy, density, behavior, and insecticide susceptibility. Data on advanced indicators are collected, including parity, age, and sporozoite rate, and PCR is used for molecular identification of species and to determine the resistance mechanism.

According to the 2016 entomological monitoring report, 7,436 mosquitoes were collected and analyzed as part of the monitoring activity. These included approximately 50% *Anopheles*, of which around 30% were major malaria vectors: *An. gambiae* s.l., *An. funestus*, and *An. mascarensis*. All populations of *An. gambiae* s.l. tested were susceptible to carbamate and organophosphate insecticide classes, supporting the decision to use an organophosphate insecticide for IRS (Figure 6). In contrast, resistance to DDT and pyrethroid class products is sporadic (Figure 7). *An. funestus* and *An. masacrensis* remain fully susceptible to pirimiphos-methyl and two pyrethroids (deltamethrin and permethrin). Testing for mechanisms of resistance using synergist pre-exposure and molecular methods showed no evidence of *kdr* mutations, but did suggest a role for elevated p450-mediated oxidative metabolism in observed resistance patterns. Resistance intensity tests using permethrin provided evidence for 2x levels of resistance in some populations of *An. gambiae* s.l.

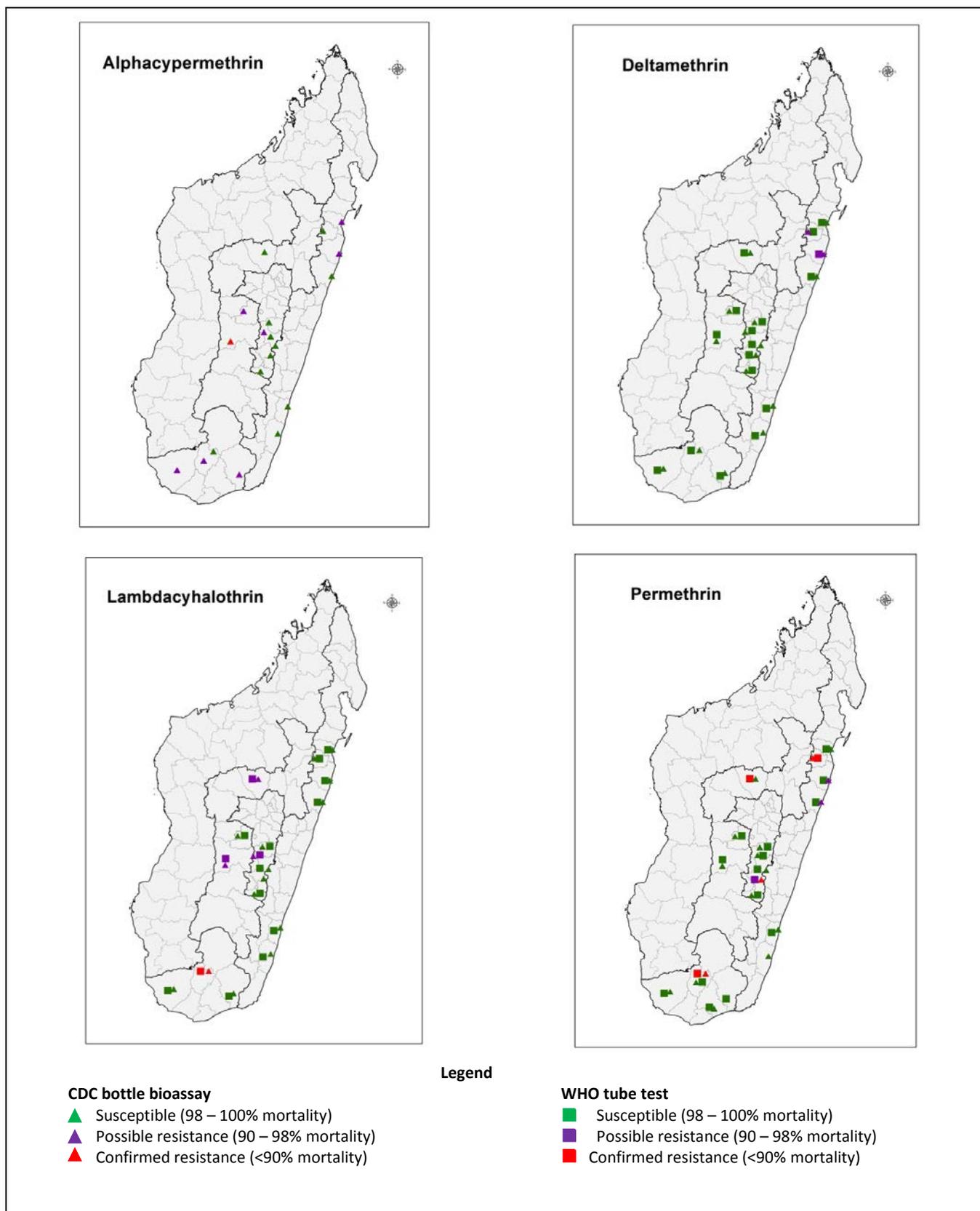
**Figure 6: Distribution of bendiocarb and pirimiphos-methyl resistance of *An. gambiae* s.l. in Madagascar tested between 2013 and 2016 monitored in two rounds using both WHO and CDC bottle bioassays**



**Figure 7: Distribution of DDT resistance of *An. gambiae* (s.l.) in Madagascar 2013–2014 monitored during one transmission period using CDC bottle bioassay**



**Figure 8: Distribution of pyrethroid resistance of *An. gambiae* s.l. in Madagascar tested between 2013 and 2016 monitored in two rounds using both WHO and CDC bottle bioassays.**



Cone bioassay tests conducted during the first week of the 2016 IRS campaign indicated that the quality of spraying in the South East and East Coast Regions was good, with test mortality rates of 100% for all structures. Monthly monitoring of insecticide decay rate showed long duration of the organophosphate used for IRS: up to seven months on all surface types in Madagascar.

### Plans and justification

With FY 2017 and FY 2018 funds, PMI will continue to build the NMCP's capacity to implement routine, robust entomological monitoring. Technical assistance, as requested by the NMCP Entomology Team, will include coordinating entomological reporting conducted by the PMI implementing partner and the IPM, in order to be used for vector control decision making. With FY 2018 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 2018 funding: (\$364,500)

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 tests 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. (\$350,000)
2. *Technical assistance to vector control activities:* Support for technical assistance to monitor and evaluate vector control activities (\$14,500)

### **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 two ITNs per household according to MIS 2011. This resulted in high ownership with 80% 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 68% of households owned at least one ITN, with 62% of children under five years of age sleeping under an ITN the previous night.<sup>10</sup>

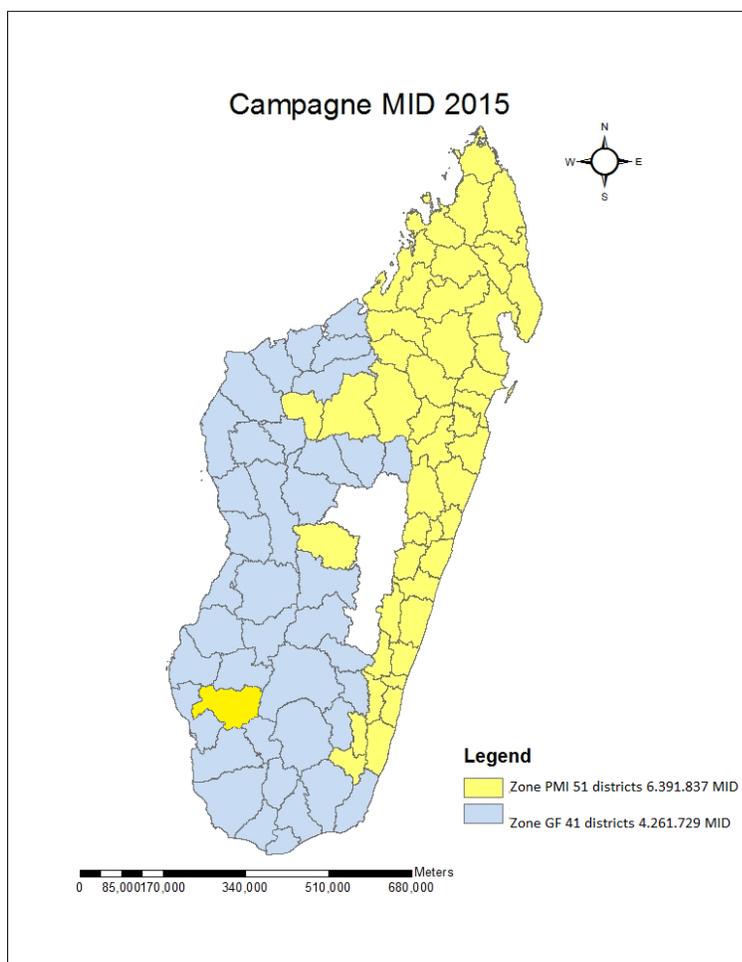
The 2015 mass distribution campaign was conducted between September and December 2015 and covered all 92 ITN target districts (using 1 ITN per 1.8 persons). With a combination of FY 2013 and FY 2014 funds, PMI supported the September to December 2015 mass distribution campaign with 6.39 million ITNs 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

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<sup>10</sup> MIS 2013

South, and Southwest. This was the first time Madagascar conducted a mass distribution covering all 92-targeted ITN districts over a period of three months. 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 8. The MIS 2016 conducted after the 2015 mass distribution campaign found that 80% of households owned at least one ITN and 73% of children under five years of age were sleeping under an ITN the previous night;<sup>11</sup> these findings are similar to the 2013 MIS results.

**Figure 9: Distribution of districts covered during the 2015 ITN mass distribution campaign**



PMI has supported two durability monitoring activities in Madagascar in 2013 and 2015 following mass ITN campaigns. In 2013, 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. Results of the 3,000 ITNs monitored indicated that at the 12-month data point, there was practically no insecticidal content among all nets. However, the physical durability data indicated that at the 24-month data point,

<sup>11</sup> MIS 2016

a good portion of nets (77% - 99%) were still considered "serviceable"<sup>12</sup>." The same study showed that survivorship for nets does not depend on the quality of the nets but rather on the care of the nets (i.e., frequency of washing, drying in the sun). At the country level, the results were presented to NMCP and RBM partners to inform program decisions on maintaining high ITN coverage. NMCP and RBM partners decided to conduct an anthropologic study to better understand possible reasons of insecticidal loss on nets in some geographic areas; development of revised/updated SBCC materials to focus on net care, and NMCP's decision to systematically conduct the bio-efficacy test of all new nets upon arrivals in the country. In 2015, PMI supported additional net durability studies at four sites on one net brand among the two brands distributed during the 2015 campaign. Data was collected at three- and 12-month intervals thus far. Preliminary results show that the mortality results at three months ranged from 94% - 99% at the four sites. The mortality results at the 12-month interval ranged from 50% -70% at the four sites. Net survivorship at the 12-month interval ranged from 73% - 79% at the four sites.

The ITN durability assessments of nets distributed during mass campaigns 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.

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 Southeastern region hardest hit by cyclones and resulting flooding. In 2017, PMI distributed 40,000 nets to respond to emergencies including malaria outbreaks while Global Fund-procured nets were used to respond to cyclones. The current channels supported by PMI in Madagascar are listed in Table 4. Social marketed nets are supported under the Global Fund malaria grant. PSI distributes the social-marketed ITNs at subsidized prices of ~ \$1/net through its private sector outlets in targeted districts with perennial transmission and in urban areas. The distribution is accompanied by mass communication campaigns. PMI does not fund any costs associated with the social marketing of nets.

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<sup>12</sup> Serviceable is defined as nets that are in good condition or have minimum damage but are still usable, according to the WHO physical damage thresholds

**Table 4: Madagascar national ITN distribution strategies**

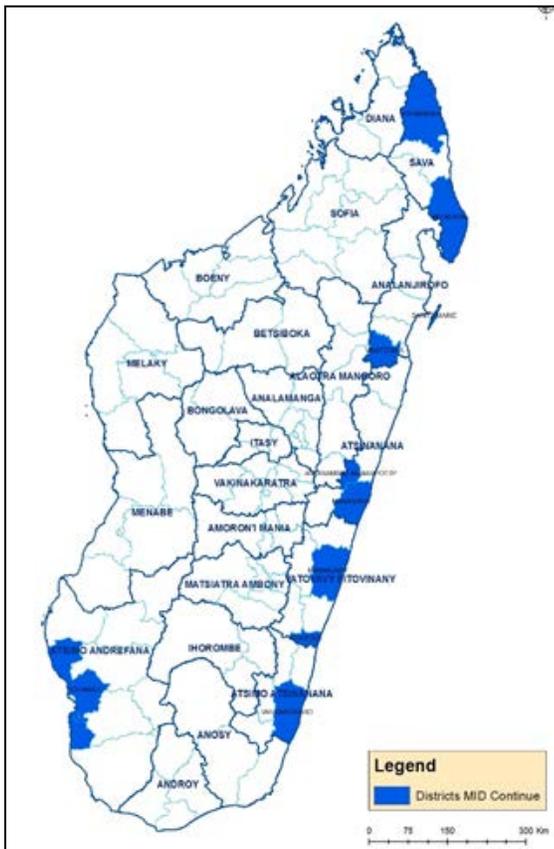
| Type of ITN Distribution | Strategy           | Approach   | Target Population  |
|--------------------------|--------------------|--|--|
| Free Distribution        | Catch-Up           | Mass Campaign  | One ITN per two persons in 92 lowland and coastal districts  |
|                          | Keep-Up            | 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 and school children                         | All residents in 92 lowland and coastal districts to cover every uncovered sleeping spaces; currently implemented in 10 east coast and southwest 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*

Madagascar has the second highest ITN ownership among PMI countries; however, it still has a low rate of ITN universal coverage. To improve coverage and ownership of ITNs, PMI supported the scale-up of continuous net distribution through a school-based approach in ten high burden districts on the East Coast and in the Southwest. With FY17 funding, PMI is expanding the school-based distribution approach to reach 20 high-burden districts in 2018. The community-based and school-based distribution approaches aim to help mitigate ITN gaps in households, particularly during the non-mass campaign years. The MoH implements this continuous distribution approach in partnership with the Ministry of Education and with the participation of 1,000 village committees in 112 municipalities and more than 1,300 public primary schools involving their teachers and students. School children of select grades are the entry point for reaching families with both communication messages and determining any net gaps at the household level that need to be filled (e.g., students help identify any uncovered sleeping spaces). The children are effective actors for behavioral change for malaria prevention and appropriate educational tools were developed and distributed to students to support this work. The school-based continuous distribution campaign was officially launched in December 2016 jointly by the Minister of Health and the USAID Health Population and Nutrition Office Director along with relevant government and ministry officials in Ambohibe, district of Vavatenina. From October 2016 to March 2017, over 654,000 ITNs were distributed through this channel and protected 2,219,413 people. Based on findings and lessons learned from this approach, PMI will advocate for NMCP to scale up this approach to other districts.

**Figure 10: 10 High Burden Districts targeted with ITNs for Continuous Distribution in 2016-2017**



The NMCP began its planning for the next mass distribution campaign scheduled for October 2018. With FY 2016 and FY 2017 funds, PMI intends to procure 6 million ITNs to support the total estimated need of 11.5 million nets for distribution in the 92 ITN districts. PMI is also covering the associated warehousing and distribution costs for the PMI-procured nets. The Global Fund has confirmed its commitments to provide 6 million nets to fill the ITN gap for the 2018 mass campaign through the country's next malaria grant. However, PMI will continue to advocate with NMCP, Global Fund and other donors for support of additional nets to address the quantities of all nets needed for the 2018 campaign. Currently the country is in the early stages of the ITN campaign preparations. The ITN campaign coordination committee of which PMI is a key participant will discuss microplanning for the campaign and any technical assistance needs. The NMCP and the committee will use the results from the national census to be completed by January 2018 for micro planning. In addition, the committee will consult with the Expanded Program for Immunization on its experiences with detailed enumeration to inform the micro-planning. The committee seeks to ensure greater coverage of hard to reach districts through innovative approaches including possibly collaborating with the Ministry of Agriculture, Fishing and Environment.

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**

| <b>Calendar Year</b>  | <b>2017</b>        | <b>2018</b>        | <b>2019</b>        |
|---|--------------------|--------------------|--------------------|
| Total Targeted Population <sup>1</sup>                              | 20,265,334         | 20,832,763         | 21,416,081         |
| <b>Continuous Distribution Needs</b>                                |                    |                    |                    |
| Channel #1: ANC <sup>2</sup>  | 729,552            | 796,853            | 819,165            |
| Channel #2: EPI <sup>3</sup>  | 632,278            | 649,982            | 668,182            |
| Channel #3: CHV / School Based Continuous Distribution <sup>4</sup> | 3,195,000          | 0                  | 956,093            |
| Channel #4: Social Marketing <sup>5</sup>                           | 450,000            | 450,000            | 450,000            |
| Channel #5: Cyclone & Disaster Response                             | 50,000             | 50,000             | 50,000             |
| <b>Estimated Total Need for Continuous</b>                          | <b>5,056,830</b>   | <b>1,946,835</b>   | <b>2,943,439</b>   |
| <b>Mass Distribution Needs</b>                                      |                    |                    |                    |
| 2018 mass distribution campaign <sup>6</sup>                        | 0                  | 11,573,757         | 0                  |
| <b>Estimated Total Need for Campaigns</b>                           | <b>0</b>           | <b>11,573,757</b>  | <b>0</b>           |
| <b>Total Calculated Need: Continuous and Campaign</b>               | <b>5,056,830</b>   | <b>13,520,593</b>  | <b>2,943,439</b>   |
| <b>Partner Contributions</b>  |                    |                    |                    |
| ITNs carried over from previous year                                | 0                  | 0                  | 0                  |
| ITNs from Government  | 0                  | 0                  | 0                  |
| ITNs from Global Fund Round NMF1(7)                                 | 2,682,002          | 0                  | 0                  |
| ITNs from UNICEF  | 2,600              | 0                  | 0                  |
| ITNs planned with PMI funding                                       | 650,000            | 6,000,000          | 1,000,000          |
| <b>Total ITNs Available</b>   | <b>3,334,602</b>   | <b>6,000,000</b>   | <b>1,000,000</b>   |
| <b>Total ITN Surplus (Gap)</b>                                      | <b>(1,722,228)</b> | <b>(7,520,593)</b> | <b>(1,943,439)</b> |

Footnotes:

<sup>1</sup>Estimated population in ITN districts is derived from a 2.8 % annual increase applied to the INSTAT 1993 census population

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<sup>2</sup> Needs based on expected 80% ANC-1 coverage in 2017 and projected 5% annual increase in 2018; no increase applied in 2019

<sup>3</sup> Needs based on expected 80% EPI coverage in 2017

<sup>4</sup> Estimated nets needed for school based distribution in 10 districts in 2017 aiming to replace 25% of ITNs; no continuous distribution planned in 2018 due to the mass ITN campaign; estimated nets needed for up to 20 districts in 2019

<sup>5</sup> Needs for social marketing ITNs based on sales history numbers

<sup>6</sup> ITN needs for 2018 mass campaign are obtained by dividing the total population in ITN districts by 1.8; and no mass distribution is planned in 2017 and 2019

<sup>7</sup> Global Fund NFM ends in June 2018; estimated quantities of ITNs to be procured in 2018 and 2019 are not known at this time.

### Plans and justification

With FY 2018 funding, PMI will procure 1 million ITNs to support the continuous distribution channel by expanding the school-based approach up to 20 high burden East Coast and Southwest ITN districts based on epidemiological data. PMI will continue to strengthen the routine distribution channels (ANC and EPI) and provide technical assistance to improve coordination between the two MoH programs responsible for distributing ITNs through the routine channels (costs referenced in the pharmaceutical supply chain section). PMI will also cover associated warehousing and distribution costs for these nets. 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). PMI will continue to support the monitoring of ITN durability including physical integrity, survivorship and insecticidal efficacy of nets distributed in the 2018 mass campaign.

### Proposed activities with FY 2018 funding: (\$ 4,005,000)

1. *Procure ITNs for 2019 continuous distribution:* To procure 1 million ITNs for continuous distribution in up to 20 districts in high transmission districts on the East Coast and in the Southwest. (\$2,880,000)
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 (\$1,000,000)
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 2018 and bio efficacy study. (\$125,000)

### **c. Indoor residual spraying**

#### Progress since PMI was launched

The national strategy, recently revised for 2015–2017, recommends IRS in the epidemic-prone CHL, where targeting decisions are based on health facility malaria cases, RDT positivity rates, and epidemic alert reporting. PMI has been supporting IRS since 2008, and initially supported this strategy by providing blanket and then focalized IRS in the CHL and Fringe areas, in collaboration with the Global Fund. In 2012, when vector insecticide susceptibility monitoring began to show increased resistance to pyrethroid insecticides, carbamate insecticides were substituted in an effort to manage resistance, and preserve ITNs. Due to the short residual efficacy, however, carbamates were phased out in 2014, being replaced by organophosphate insecticides. PMI supported IRS shifted in 2014 to the higher burden areas of the East Coast and South East Coast in response to epidemiological data which indicated high malaria in the area, despite the implementation of ITN distribution and use programs.

**Table 6: PMI-supported IRS activities 2014 - 2019**

| Calendar Year | Number of Districts Sprayed                         | Insecticide Used          | Number of Structures Sprayed | Coverage Rate | Population Protected |
|---------------|---|---------------------------|------------------------------|---------------|----------------------|
| <b>2014</b>   | 40 communes<br>( <i>focal IRS</i> )<br>(CHL+Fringe) | Pyrethroid &<br>Carbamate | 125,125                      | 97%           | 749,965              |
|               | 3 districts (East)                                  | Organophosphate           | 149,408                      | 95%           | 557,419              |
| <b>2015</b>   | 3 districts (East)                                  | Organophosphate           | 172,120                      | 92%           | 654,861              |
|               | 1 district (South East)                             | Organophosphate           | 75,782                       | 93%           | 361,980              |
| <b>2016</b>   | 3 districts (East)                                  | Organophosphate           | 190,467                      | 96%           | 662,655              |
|               | 2 districts (South East)                            | Organophosphate           | 119,751                      | 92%           | 551,032              |
| <b>2017*</b>  | 3 districts (East)                                  | Organophosphate           | ~198,689                     |               | ~704,272             |
|               | 5 districts (South East)                            | Organophosphate           | ~300,518                     |               | ~1,402,098           |
| <b>2018*</b>  | 5 high burden districts                             | TBD                       | ~300,000                     |               | ~1,200,000           |
| <b>2019*</b>  | 5 high burden districts                             | TBD                       | ~300,000                     |               | ~1,200,000           |

\*Represents targets based on the 2017 IRS work plan, and/or projected targets based on national strategic plan and/or discussions with the NMCP.

#### Progress during the last 12-18 months

PMI supported blanket spraying with organophosphates in three high burden districts of the East Coast Region, plus two additional high burden districts in the South East Region from August to September 2016 (see table 6 for results). Strong collaboration with partners, including the Peace Corps, and engagement of local traditional leaders contributed to reduced refusal rates and improved coverage. The IRS campaign continued to use innovative technologies in an effort to maximize efficiencies and improve implementation of IRS: mobile soak pits for environmental compliance in remote areas, lightweight Tyvek personal protective equipment, a mobile phone-based performance management tracking tool, e-inventory system to manage insecticide stock, 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 efficacy monitoring at seven months post-spray, in the South East and East respectively indicated sustained mortality greater than 80%.

In collaboration with the NMCP, PMI conducted an epidemiological analysis using HMIS data from 2013-2016 to compare IRS- district versus non-IRS districts in the East Coast. Results showed a decrease in RDT-confirmed malaria cases among children under 5 years in IRS districts. There was also a significant

decrease in malaria incidence when combining IRS and ITNs. Data were shared with RBM to support the continuation of this strategy.

The Global Fund, due to grant disbursement issues and delays in insecticide procurement, was unable to support IRS from 2013-2016.

#### Plans and justification

With FY 2017 funds, PMI plans to continue IRS in up to five districts in the East and South East, with support from the UNITAID funded NgenIRS Project. 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, WHO-recommended new insecticides on the market, and in conjunction with Madagascar's insecticide resistance management plan.

With FY 2018 funds, PMI plans to continue blanket IRS in up to five high burden districts in Southwest and Southeast (where IRS was implemented in 2016 and 2017), in order to continue the strategy of using combined IRS plus ITNs in areas where the burden of malaria remains stubbornly high. Districts will be selected by the NMCP and IRS stakeholders based on entomological and epidemiological data, as well as environmental considerations. Former PMI-supported IRS areas will receive PMI support via reinforced surveillance and additional SBCC messages around consistent ITN use. The September to October 2018 universal coverage campaign, in addition to the continuous distribution of ITNs in approximately 20 districts, should ensure sufficient ITN coverage in former IRS areas. In addition, the surveillance subcommittee will closely monitor HMIS data for any upsurges, and couple the information with additional 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.

#### Proposed activities with FY 2018 funding: (\$ 6,055,500)

1. *Conduct IRS:* PMI will support the implementation of IRS in up to five high burden districts. 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), ecologically sensitive areas and density of the population. (\$6,055,500)

## **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 policy excludes the remaining 19 districts in the Central Highlands, which have low prevalence and are epidemic prone.

According to the NSP, the MoH aims to support the following objectives:

- 80% of pregnant women attending ANC receive IPTp3

- 85% of pregnant women sleep under ITNs the night before the survey
- No stock outs of SP at facility and community levels

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. With the WHO updating of the IPTp policy, PMI and the NMCP have supported efforts, such as revisions to the ANC registers, to update routine reporting on frequency of IPTp treatments, including IPTp3. 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 (6 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 with ACT 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) are coordinating 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

While the overall coverage of IPTp2 has remained low, there are signs of progress with a slight increasing trend over the last five years: IPTp2 coverage was 20% in 2011, decreased to 18% in 2013 and increased again to 22% in 2016 (from the last three national malaria indicator surveys). According to the 2016 MIS, IPTp2 coverage in the endemic transmission zone (i.e. areas where IPTp is likely to be implemented) is 26%. And among three of the four epidemiological zones where IPTp is implemented, IPTp2 coverage is 30% in the equatorial zone, 23% in the tropical zone, and 30% in the sub-desert zone. The percentage of pregnant women who reported sleeping under an ITN has remained consistently high and increased from 61% in 2013 to 69% in 2016. Among households with at least one ITN, the percentage of pregnant women who slept under an ITN was 89% in 2016. Receiving SBCC messages about malaria prevention interventions was reportedly low among women of reproductive age (15-49 years of age); 17% of women surveyed had heard a message about IPTp and 34% had heard a message about the use of an ITN for the prevention of malaria during the last 12 months. In coordination with NMCP, PMI implementing partners have developed MIP SBCC messages targeting pregnant women and women of reproductive age which are integrated into their malaria and health SBCC messages and used by CHVs and health providers. PMI also partners with Peace Corps Volunteers, women's association, and community leaders to disseminate and improve SBCC messages promoting IPTp uptake at the community level.

In November 2014, the MoH issued a ministerial note to reflect the 2012 WHO IPTp recommendations for improved IPTp uptake. The NMCP revised the monthly HMIS reporting form to capture the number of women who receive three doses of SP for IPTp to monitor progress towards this goal. PMI supported these MOH efforts in the rollout of MIP training for health providers.

The NMCP prioritizes provision of ITNs to pregnant women at their first ANC visit as part of routine distribution. However, there are challenges with the supply chain system to ensure sufficient ITNs are available for pregnant women at the facility level. The 2016 MIS reported the majority of households received an ITN through a mass distribution campaign (72%) while less than 1% of survey respondents

reported receiving an ITN at an ANC visit. PMI continues to support strengthening the supply chain system to address these challenges.

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 and FY 2016 funding, PMI and partners have 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, aiming to strengthen and improve IPTp uptake at the health facility level and ensuring promotion of MIP at the community level by CHVs. In the other 38 IPTp districts, PMI is coordinating with the NMCP on strengthening health provider practices in focused antenatal care, including the distribution of updated IPTp guidelines and IPTp job aids. PMI and implementing partners worked closely with the MoH on this national policy change, including updating MIP guidelines and ensuring the training of health facility providers on the new policy. To date, approximately 1,752 health facility staff, including health providers and district malaria teams, have benefited from an integrated malaria case management and malaria in pregnancy training supported by PMI. With Global Funds support, the NMCP plans to reach the remaining 38 districts by March 2018.

CHVs play an essential role in promoting ITN use and encouraging pregnant women to attend ANC services early and request SP for IPTp, promoting early initiation of IPTp at ANC, and taking 3 or more doses of SP during the 2nd and 3rd trimester services through education and community sensitization. With FY 2016 funds, PMI supported more than 14,000 trained CHVs to deliver SBCC MIP messages on the importance of seeking antenatal care (early and frequent visits), taking monthly doses of IPTp, and consistent use of ITNs. These messages reached a third of the country population living in hard to reach places. 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.

Since 2016, a USAID implementing partner has supported efforts to increase the uptake of IPTp by reaching out to 90 of its 200 private ANC health providers, members of the “Top Réseau” network of private sector health providers, with training on focused antenatal care and the updated IPTp policy, and providing Global Fund-procured SP to ensure sufficient stocks of SP are available in the ANC clinics. A five-year UNITAID-funded project will conduct an operations research study with the NMCP and WHO on community-based IPTp to assess the feasibility of delivering SP at the community level by trained CHVs following the first treatment dose provided at the CSB. PMI and UNITAID partners are also revitalizing the national MIP ANC technical working group to review programming barriers and challenges to IPTp coverage and uptake. To improve health provider practices and encourage uptake of IPTp at the facility level, a PMI implementing partner piloted a job aid for determining gestational age during pregnancy in one district. Findings from the pilot will help inform the finalization of the job aid, which is intended for broader dissemination to PMI countries.

**Table 7: Status of IPTp policy in Madagascar**

| Status of training on updated IPTp policy  |  | Number and proportion of HCW trained on new policy in the last year if training on new policy is not yet completed                                      | Are the revised guidelines available at the facility level?  | ANC register updated to capture 3 doses of IPTp-SP | HMIS/ DHIS updated to capture 3 doses of IPTp-SP |
|--|--|---|--|--|--|
| Completed/Not Completed  | Date (If completed, when, if not completed, when expected) |   |  |  |  |
| Not Completed (training is completed in the 55 USAID-supported districts; the NMCP will complete training by 2018 in the remaining 38 districts) | <u>March 2017</u>  | 526 ANC providers and 1226 CSB officers in-charge – (about 50% of all health providers in USAID target zones and 37% of total providers in Madagascar). | The new IPTp recommendation is included in the curriculum. The guidance was sent to Regional and District levels. The District staff is currently sharing the guidance at the CSB level. | Yes  | Yes  |

Commodity gap analysis

To ensure availability of SP for IPTp and contribute to the annual SP needs, PMI procured 600,000 SP treatments with FY 2015 funding for distribution in 2016 to public health facilities as well as approximately 300 non-governmental (NGO) and faith-based organization (FBO) clinics that are currently part of a USAID Maternal Child Health program network. With FY 2016 funding, PMI will procure 650,000 SP treatments and plans to procure an additional 300,000 SP treatments with FY 2017 funding, depending on the national need and available supply. The Global Fund has procured 629,000 SP treatments, which arrived in January 2017 for distribution to MOH health facilities and will procure another 1.074 million treatments for 2018.

The NMCP estimates the annual SP needs for implementation of IPTp for 2019 will be approximately 1.59 million treatments for more than 819,000 pregnant women attending ANC clinics. Since future procurement plans including for SP under the new Global Fund grant are uncertain at the time of this MOP, PMI will plan to contribute approximately 360,000 SP treatments to the annual need in 2019. If additional SP treatments are needed, PMI will consult closely with NMCP and Global Fund about filling any remaining gaps.

**Table 8. SP Gap Analysis for Malaria in Pregnancy**

| <b>Calendar Year</b>                                       | <b>2017</b>      | <b>2018</b>      | <b>2019</b>        |
|--|------------------|------------------|--------------------|
| Total Population <sup>13</sup>                             | 17,282,422       | 17,740,671       | 18,205,879         |
| <b>SP Needs</b>  |                  |                  |                    |
| Total number of pregnant women attending ANC <sup>14</sup> | 777,709          | 798,330          | 819,265            |
| <b>Total SP Need (in treatments)<sup>15</sup></b>          | <b>1,283,220</b> | <b>1,436,994</b> | <b>1,597,567</b>   |
| <b>Partner Contributions</b>                               |                  |                  |                    |
| SP carried over from previous year                         | 0                | 0                | 0                  |
| SP from Government   | 0                | 0                | 0                  |
| SP from Global Fund  | 629,000          | 1,074,000        | 0                  |
| SP from Other Donors                                       | 0                | 0                | 0                  |
| SP planned with PMI funding                                | 654,220          | 362,994          | 362,994            |
| <b>Total SP Available</b>                                  | <b>1,283,220</b> | <b>1,436,994</b> | <b>362,994</b>     |
| <b>Total SP Surplus (Gap)</b>                              | <b>0</b>         | <b>0</b>         | <b>(1,234,573)</b> |

Footnotes:

\*SP needs were calculated based on the total estimated number of pregnant women x 3 treatments x estimated 55% of pregnant women reached with IPTp3.

#### Plans and justification

With FY 2018 funding, PMI will continue to support MIP implementation at the community and facility levels for promoting early ANC attendance and IPTp uptake as part of integrated malaria case management and MIP activities. PMI will support 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. With FY 2018 funding, PMI will procure approximately 300,000 treatments of SP for use in 2019, 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

<sup>13</sup> Projection from general census in 1993, INSTAT

<sup>14</sup> Pregnant women constitute 4.5% of the population.

<sup>15</sup> Quantification workshop by RBM commodity sub-committee in Moramanga (2017). Objective goal in 2022 should be 80%, with annual increase of 5%, from 55% in 2017.

trimester of pregnancy. PMI will continue to explore different strategies for engaging Peace Corps Volunteers 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 (see SBCC section for more information). With FY17 funds, PMI will support a health facility survey to investigate barriers and challenges in MIP and IPTp programming at the health facility level. The SP stock out situation has improved considerably with both PMI and GF procuring sufficient stocks for the last two years; SP is available at central level but peripheral level stock outs still occur albeit less frequently. With FY18 funds, PMI is also planning to support end use verification surveys which will provide more information about malaria commodities at facility level including SP. In addition, PMI will continue to strengthen supply chain management of SP at the facility level including ensuring availability of SP stocks (costs referenced in the pharmaceutical supply chain management section).

Proposed activities with FY 2018 funding: (\$54,000)

1. *Procure SP*: PMI will procure approximately 360,000 treatments of SP for IPTp in line with WHO IPTp guidelines for pregnant women attending ANC at health facilities. (\$54,000)
2. *Support integrated supportive supervision of community and facility-based case management & MIP referral*: provide support to community health workers and health facilities for malaria case management and MIP; activities include refresher training, M&E integration, and routine supervision of community health workers (costs in case management section).
3. *Support private sector MIP and malaria case management*: improve malaria case management and MIP uptake in private sector health facilities (costs in case management section).

### **3. Case management**

#### **a. Diagnosis and treatment**

NMCP/PMI objectives

The objective 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 for diagnosis at all government primary health care facilities. In hospitals, where severe cases are managed, microscopy is used for parasitemia calculation and species identification. CHVs are required to use RDTs for diagnosis before treatment of malaria at the community level.

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. Madagascar uses combination RDTs (HRP2/pLDH) to detect *falciparum* infections, other infections, and mixed *falciparum*/other infections. The 2016 MIS found that among cases tested by real-time PCR, which included those positive by RDT or microscopy (n=473) and a sample of negative cases (n=742), a total of 449 were positive: 99% of these infections detected by PCR were *P. falciparum*, 0.5% were *P. malariae*, and 0.5% were mixed *P.*

*falciparum* and *P. malariae*. 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*.<sup>16</sup>

According to the national case management guidelines, last updated in July 2016, AS+AQ combination therapy is the first-line antimalarial treatment for uncomplicated malaria in Madagascar, and artemether/lumefantrine (AL) is the second-line therapy (see Table 9 below). Pregnant women in their first trimester should be treated with quinine, and those in second and third trimesters with AS+AQ (or second-line AL). The 2014 therapeutic efficacy study (TES) that PMI funded indicated that AS+AQ was 100% effective for treating uncomplicated malaria, and a 2016 TES conducted by the NMCP also found 100% efficacy in study sites (see Table 10 below). For severe malaria, including for pregnant women, intravenous artesunate is first-line treatment and quinine is the second-line treatment. Intramuscular artesunate (at facility level) and rectal artesunate (at community level) is recommended for pre-referral treatment of severe malaria for children under five years old. Although CHVs have received some training on rectal artesunate, it is not yet available in Madagascar and they will need refresher trainings when it becomes available. In the pre-elimination districts in the CHL, the national strategy 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. PMI will continue to work with the NMCP to ensure that health facility workers and CHVs are well supported to accurately diagnose and manage cases of malaria in health facilities and at the community level.

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<sup>16</sup> 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>)

**Table 9: Status of Case Management Policy in Madagascar**

| <b>Status of Case Management Policy in Madagascar according to July 2016 Case Management Guidelines</b>  |  |
|--|--|
| What is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria?   | AS+AQ (Artesunate Amodiaquine Tab) except among pregnant females in their first trimester<br><br>In pre-elimination areas : ASAQ + single low dose of Primaquine |
| What is the second-line treatment for uncomplicated <i>P. falciparum</i> malaria?  | AL (Artemether Lumefantrine)   |
| What is the first-line treatment for severe malaria?   | Injectable Artesunate  |
| In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester?  | Oral quinine   |
| In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters?                                | AS+AQ (Artesunate Amodiaquine Tab)   |
| In pregnancy, what is the first-line treatment for severe malaria?   | Injectable Artesunate  |
| Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?   | Yes, injectable artesunate   |
| Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?  | Rectal artesunate for children < 5 years (as part of new strategic plan); currently unavailable in the country   |
| If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administering to those ≥ 6 years) | Rectal artesunate children <5 years  |
| Treatment for <i>P. vivax</i>  | ACT - 3 days<br>rapid test - G6PD<br>Radical treatment with low dose primaquine for 14 days in pre-elimination zones   |

**Table 10: PMI-funded TESs**

| Year | Site   | Antimalarial(s) | Efficacy  |
|------|--|-----------------|-----------|
| 2010 | Vatomandry and Miandriavazo                          | AS+AQ           | 98.8-100% |
| 2012 | Ampasimpotsy, Matanga                                | AS+AQ           | 98-100%   |
| 2013 | Ankazomborona (DLP)<br>Anjoma Ramartine              | AS+AQ           | 98-100%   |
| 2014 | Farafangana (IPM)Mananjary<br>Brickaville            | AS+AQ           | 100%      |
| 2016 | Tsaratanana ,<br>Antanimbary (DLP)                   | AS+AQ           | 100%      |
| 2017 | Ampasimpotsy, Matanga<br>Ankazomborona (DLP and IPM) | AS+AQ and AL    | --        |

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. Under the restrictions, PMI provided support to two bilateral projects that focused on community delivery of health services, including 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. The 2 USAID health bilateral projects cover 15 of the 22 regions in Madagascar, and the Global Fund supports similar activities in the remaining 8 regions. One bilateral project covers 100% of the communes in its 7 regions, which encompass 3,023 *fokontanys* (villages) and approximately 3.4 million people. The other bilateral can only reach about 64% of the population in its 8 regions (5.5 million out of 8.5 million people), due to difficult accessibility and insecurity. The new bilateral is expected to ensure full coverage of all districts in each region, including all communes in the district.

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. A PMI-supported health facility survey in December 2014 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. Another PMI-supported health facility survey is planned for 2017–2018 to assess malaria case management practices and commodity stocks.

The 2016 MIS survey showed that the proportion of children under five years old with fever who seek advice and treatment was 46% (similar to 44% in 2013), with 36% taken to the public sector and 11% to the private sector. Of children with fever given an antimalarial (10.1%) overall, only 1.7% were reported to have been given an ACT. Madagascar has a robust private sector for health services and commodities. A 2015 ACT Watch outlet survey estimated that about 64% of antimalarials were distributed through the private sector, primarily through drug shops; about half of the antimalarials distributed through the private sector were SP. Using non-PMI funding, the USG supports a network of nearly 250 private, franchised “Top Réseau” health clinics to deliver a variety of services primarily family planning/reproductive health, Integrated Management of Childhood Illnesses (IMCI), youth services, and malaria. The support aims to expand access to quality health care services through training, quality assurance, capacity building, supervision, promotional support and access to financing.

With that said, case management remains challenging in Madagascar. Both the NMCP through its new 2018-2022 malaria strategy (being finalized) and PMI/Madagascar recognize the need to scale up access and coverage to quality malaria testing and treatment. In addition to strengthening SBCC around care-seeking, and expanding the program in private sector, PMI will continue to support DLP to improve the malaria commodity supply chain for greater malaria commodities availability and improve the decentralization so that more malaria management responsibilities are taken at the district levels. In addition, PMI will coordinate with GF on CHVs training in the non-PMI supported regions. As part of PMI direct supports, USAID/Madagascar’s new strategy will ensure a full coverage of all districts in each region targeted by PMI interventions, which means “filling in the map” and covering all communes in each district. PMI will expand its community approach to ensure that both clinical governance and services delivery are properly managed at each health district and an effective referral and counter referral system between district hospitals, CSBs and CHVs to ensure complementary between services delivery points in each district. PMI community supports will be enhanced as a new revised policy on community health will be available by mid-September to guide the CHVs works. Diagnostic confirmation of malaria with RDTs and treatment with ACTs is the standard of care in the public sector. According to a PMI-supported health facility survey in December 2014, just after the sanctions were lifted, health workers tested 97.4% of patients for whom malaria was suspected; however, they did not suspect malaria in 52% of patients who presented with fever or history of fever. Of those patients who tested positive for malaria, all were administered or prescribed an antimalarial (86% ACTs) for treatment of uncomplicated malaria. HMIS data from 2016 reveal that 93% of patients who tested positive received appropriate antimalarials. 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, Vatomaniry and Miandriavazo, showed 98.8-100% efficacy. In 2012/13 TES funded by Global Fund in four sites representing different transmission areas showed 98-100% efficacy. The latest PMI-funded TES studies in three sites in 2014 showed 95-100% efficacy of AS+AQ. In 2016, the NMCP conducted a TES in two sites and found 100% efficacy of ASAQ. The next PMI-funded TES study is scheduled to start in late 2017 and will assess both first-line (AS+AQ) and second-line (AL) malaria treatments in 3 sites.

### Progress during the last 12-18 months

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 over refresher training for existing health workers. Beginning in 2016, health facility staff started to be trained on injectable artesunate for severe malaria and on the updated WHO IPTp policy, with reprogrammed PMI FY 2016 funds. In 2016, PMI supported training of 11 national trainers and 265 regional trainers in all 22 regions on integrated case management and MIP management; additionally, 350 heads of facilities were trained in 6 regions. With PMI funds, the NMCP also updated its case management guidelines in July 2016 to reflect artesunate as recommended treatment for severe malaria. Since 2016, PMI supported training of 526 MIP providers and 1,221 chefs CSBs (facility in-charges), out of 1,850 chefs CSBs in USG supported regions, in MIP and severe malaria case management.

At the community level, PMI supports two bilateral activities that have well-developed iCCM programs. The first bilateral, recently re-bid, focuses on (re)-establishing activities in seven regions in the north and west where it operates, covering 6.1 million people (approximately 23.3% of Madagascar's population). A survey revealed 6,062 CHVs working in these areas. In the first quarter of 2017, this bilateral provided iCCM refresher training to 2,916 CHVs; these CHVs tested 27,880 children under five with fever. Of these children, 13,834 (50%) were malaria RDT positive and 11,355 (82%) were treated with an ACT. The second bilateral manages approximately 6,700 CHVs and works in eight of Madagascar's regions in the southwest and the east. In 2016, 3,888 of 5,113 (76%) CHVs received refresher training on RDTs. In 2016, CHVs in these areas tested 127,815 febrile children under five with an RDT, and 49% were positive; of these, 72% received an ACT. During the first six months of FY 2017, 54,221 febrile children were tested with RDT, out of which 26,260 (48%) were RDT-positive, 21,676 (83%) of whom received ACT treatment. This project ends in July 2018; the design of a follow-on activity is underway with the insurance of overlap between the two activities.

In the last three years, the capacity of the national laboratory has improved; they routinely do expert microscopy, as well as molecular analysis for two TES sites. With recent PMI support for reagents and consumables, the functionality of the national laboratory has continued to grow. In 2016, two staff members attended a WHO-funded training on RDT lot testing in Ethiopia.

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 supportive supervision. These trainers facilitated the first round of outreach training and supportive supervision in 24 health facilities around Antananarivo in 2015/2016. Supervisors for outreach training and supportive supervision at the regional levels were trained 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. Through this process, health district laboratory technicians sent slides to the regional level for QA/QC, and discordant slides were sent from the regional level to the national level for QA/QC. This process was ineffective and poorly managed. The new NMCP plan for laboratory QA/QC will be funded with the Global Fund NMF2 grant and will use three WHO-accredited lab technicians from the national level to perform onsite QA/QC and training at the district level. PMI is no longer providing support for laboratory QA/QC at the district level to avoid duplication of efforts. However, PMI will continue to support laboratory technical training, development and implementation of standard operating procedures, and laboratory equipment maintenance as complementary to Global Fund QA/QC support. In 2016, 118 laboratory technicians and 4,024 CHVs were trained in malaria diagnostics with PMI funding.

In 2016, PMI also procured and distributed 942,516 ACTs and 1,925,925 RDTs for CHVs, public health facilities, and FBO/NGO facilities.

Commodity gap analysis

A gap analysis was recently completed by partners, using historical consumption data (for RDT and ACT needs). RDT needs were calculated using service statistics on the number of malaria cases and an assumption of one malaria case per four fever cases tested. To meet the needs for 2017, PMI proposes to buy an additional one million RDTs using pipeline, and to buy another one million RDTs (through reprogramming) in 2018. All remaining ACT and RDT gaps in 2018 are covered by Global Fund. PMI does not plan to buy any RDTs for 2019, as it is anticipated that Global Fund will cover the RDT needs for 2019; Global Fund will plan their activities in October/November 2017 (NFM2 full proposal). However, PMI will re-assess the needs and potential gap during the MOP19 visit for coverage through reprogramming as appropriate.

PMI will plan to purchase 700,000 treatment courses of ACTs in 2019 to cover the ACT needs in 2019; the Global Fund will not need to purchase ACTs. Any surplus ACTs can be kept for the following year or used for active case detection strategies (e.g., reactive case detection or focal mass drug administration) in the central highlands. The tables below present the upcoming RDT and ACT needs and partner contributions through 2019.

**Table 11: RDT Gap Analysis**

| <b>Calendar Year</b>                       | <b>2017</b>      | <b>2018</b>        | <b>2019</b>        |
|--|------------------|--------------------|--------------------|
| <b>RDT Needs</b>                           |                  |                    |                    |
| Total country population                   | 23,688,902       | 24,352,191         | 25,034,053         |
| Population at risk for malaria             | 23,688,902       | 24,352,191         | 25,034,053         |
| PMI-targeted at-risk population            | 23,688,902       | 24,352,191         | 25,034,053         |
| Total number of projected fever cases      | 5,500,522        | 5,680,849          | 5,864,632          |
| Percent of fever cases tested with an RDT* | N/A              | N/A                | N/A                |
| <b>Total RDT Needs</b>                     | <b>5,156,732</b> | <b>5,829,660</b>   | <b>4,581,728</b>   |
| <b>Security/buffer stock</b>               | <b>0</b>         | <b>4,372,245</b>   | <b>0</b>           |
| <b>Partner Contributions</b>               |                  |                    |                    |
| RDTs carried over from previous year       | 2,071,900        | 11,943             | 0                  |
| RDTs from Government                       | 0                | 0                  | 0                  |
| RDTs from Global Fund                      | 2,096,775        | 4,462,299          | Not yet known**    |
| RDTs from other donors                     | 0                | 0                  | 0                  |
| RDTs planned with PMI funding              | 1,000,000        | 1,000,000          | 0                  |
| <b>Total RDTs Available</b>                | <b>5,168,675</b> | <b>5,474,242</b>   | <b>0</b>           |
| <b>Total RDT Surplus (Gap)</b>             | <b>11,943</b>    | <b>(4,727,663)</b> | <b>(4,581,728)</b> |

Note: Estimated RDT needs based on routine data on malaria cases and assuming a fever: malaria ratio of 4:1.

\* This indicator not used to calculate RDT needs.

\*\* The gap for RDT in 2018 needs was covered by GF (until December 2018). The needs for RDT in 2019 will be clarified and confirmed during MOP FY19 visit by both PMI and GF and resources will be allocated through reprogramming.

**Table 12: ACT Gap Analysis**

| <b>Calendar Year</b>                    | <b>2017</b>      | <b>2018</b>      | <b>2019</b>      |
|---|------------------|------------------|------------------|
| <b>ACT Needs</b>                        |                  |                  |                  |
| Total country population                | 23,688,902       | 24,352,191       | 25,034,053       |
| Population at risk for malaria          | 23,688,902       | 24,352,191       | 25,034,053       |
| PMI-targeted at-risk population         | 23,688,902       | 24,352,191       | 25,034,053       |
| Total projected number of malaria cases | 1,289,183        | 1,457,415        | 1,145,432        |
| <b>Total ACT Needs*</b>                 | <b>1,267,267</b> | <b>1,432,639</b> | <b>1,125,960</b> |
| <b>Security /buffer stock**</b>         | <b>0</b>         | <b>1,074,479</b> | <b>0</b>         |
| <b>Partner Contributions</b>            |                  |                  |                  |
| ACTs carried over from previous year    | 593,150          | 1,941,548        | 1,061,879        |
| ACTs from Government                    | 0                | 0                | 0                |
| ACTs from Global Fund                   | 2,146,665        | 1,627,449        | 0                |
| ACTs from other donors                  | 0                | 0                | 0                |
| ACTs planned with PMI funding           | 469,000***       | 0                | 700,000          |
| <b>Total ACTs Available</b>             | <b>3,208,815</b> | <b>3,568,997</b> | <b>1,761,879</b> |
| <b>Total ACT Surplus (Gap)</b>          | <b>1,941,548</b> | <b>1,061,879</b> | <b>635,919</b>   |

Note: \*total ACT needs based on estimated malaria cases from routine data adjusted for incomplete community data; assumes that 98.3% of projected number of malaria cases are treated with an ACT and 1.7% are severe malaria.

\*\*To mitigate the risks of stock out, the national policy requires a min of 9 months and max of 13 months of commodities stock at national level (SALAMA), which includes 3 months buffer stock for each product. At the end 2018 NMCP projects a balance of over one million ACTs, insufficient to cover the ACT needs for 2019 (1,200,000). PMI plans to procure 700,000 ACTs in 2019 to cover this gap. In addition, PMI procured ACTs will allow at least 5 months in stock at end of 2019 as a bridge and security stock to cover the program needs until Global Funds NMF2 resources are effectively mobilized.\*\*\* ACTs purchased for reactive case detection operational research study.

### Plans and justification

By the end of 2017, all health workers nationally should have received refresher training on severe malaria case management and on the updated malaria pregnancy guidelines. With FY 2017 funds, PMI will continue to support enhanced supervision for case management at community and facility levels through its two health bilateral projects. In addition, PMI will support another health facility survey, four

years after the last one in 2014, to assess malaria case management in public health facilities. In 2016, the Ministry of Health issued a letter restricting training events for health center staff personnel to one week per quarter. Because of this new restriction, the NMCP is requesting that there not be any refresher training for malaria supported with FY 2018 funds; instead, they recommend investing in more intensive supportive supervision to reinforce malaria case management skills and knowledge. However, refresher trainings might be allowed especially for pre-referral treatment of severe cases for CHVs.

With FY 2018 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 enhanced supervision on malaria case management 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. 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.

With FY 2018 funds, PMI will procure approximately 700,000 ACT courses to ensure all ACT needs are met in 2019. Additional stocks can be used in case of upsurges in malaria or if active case detection/treatment strategies are deployed as part of pre-elimination activities in the central highlands. PMI will also procure injectable and rectal artesunate for treatment (and pre-referral treatment) of severe malaria. Finally, PMI will use FY 2018 funds to target improvements in malaria case management in the private sector, which provides the majority of antimalarials in Madagascar. After a desk review and scoping exercise, PMI funding will support a targeted intervention to improve malaria diagnosis and treatment, likely within registered private pharmacies.

*Proposed activities with FY 2018 funding: (\$4,925,000)*

1. *Procure ACTs:* PMI will purchase approximately 700,000 treatments of ACTs to ensure that ACT needs are covered in 2019. Any surplus stocks could be used for active case detection strategies implemented in pre-elimination districts. (*\$490,000*)
2. *Procure severe malaria drugs:* To support the scale-up of rectal artesunate at the community health volunteer level, PMI will purchase approximately 100,000 capsules of rectal artesunate, equivalent to approximately 100,000 pre-referral treatments. In addition, PMI will purchase approximately 10,000 treatments with injectable artesunate for severe malaria. (*\$350,000*)
3. *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. The national reference laboratory will analyze TES samples and assist with supportive supervision of microscopy at regional and district levels. (*\$25,000*)
4. *Strengthening routine supervision and M&E of CHVs and health facility staff:* Strengthen case management and MIP activities at community and facility levels through the two USAID-funded implementing partners in 15 regions by supporting 15,000 community health volunteers (CHVs) as well as health care providers in approximately 1200 CSBs/health facilities. In addition, PMI will strengthen service delivery at the community and facility levels through supportive supervision of district health officers, and health facility staff at all levels (~15,000 supervisions per year). Finally, these funds will be used for training and refresher training of CHVs and facility staff to develop, update, and reinforce their malaria case management and MIP skills and

knowledge in accordance with MOH and NMCP guidelines, should the MOH and NMCP decide that targeted refresher training is warranted (~2,500 trainings at all levels)<sup>17</sup>. A supervision strategy will be included in the NMCPs new National Strategic Plan. (\$3,450,000)

5. *Training and supervision for laboratory technicians:* PMI will build capacity for laboratory technicians at the national, regional and district level with training and supervision. (\$300,000)
6. *Targeted support to private sector:* PMI will work closely with selected private sector providers, potentially including private pharmacies and registered drug shops, to improve malaria case management. (\$300,000)
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 stock outs in public health facilities for ACTs and SP.

The Madagascar Central Medical Store (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. Integration of health commodities (including those procured by USG) into the public sector supply chain will involve unified quantification and supply plans, direct support for the transportation of health commodities from SALAMA to the *Pharmacie de gros de district*/ District pharmaceutical depot (PhaGDis), as well as from PhaGDis to PhaGeCOM, support for data collection and consolidation for monitoring health commodity availability at the district level, and capacity building at all levels on management and supervision of the supply chain system.

### 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 are based on a push system down to the districts. At the district level, the district pharmaceutical depots are the intermediary points

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<sup>17</sup> Training: CHVs, CBS, COSAN, CCDS, SSD, DRS, Partners Team including the new community health policy. Supervision: Cascade supervision at all levels of the system including community level.

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. Currently, free and donated malaria commodities are all distributed through SALAMA and PhaGeDis. However, 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 up to six months of the year during the rainy season, thus require advanced planning to ensure a reliable supply of health commodities. The absence of a clear distribution schedule leads to periodic stockouts, as indicated in the July 2014 PMI-funded health facility assessment. Other assessment findings included: (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.

PMI has been contributing to the CHV parallel supply chain system, in *fokontany* that are at least five kilometers from the nearest public health facility, 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. 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 for the treatment of diarrhea among children under five years of age; cotrimoxazole tablets, and cotrimoxazole oral suspension 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 at a moderate pace. Through a decree signed on March 30, 2017, the MoH adopted the pull distribution model to improve commodity availability at both CSBs and CHVs and avoid stock outs/over stocks. This shift from a push to a pull system aims also to increase the responsibility of the MoH staff at district level in the estimation of their needs of malaria health commodities based on their data.

*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 fulfilling 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*.

#### Progress during the last 12-18 months

PMI, with other USAID health funding, is supporting the MoH to redesign the public sector integrated health commodity supply chain and to lead that process (discussed above). The Road Map was presented

to General Secretary of the Ministry of Health (MoH) followed by a meeting with his Advisors for their appropriation and leadership in March 2017.

PMI continues to support 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 led technically by the Direction of Pharmacy, Laboratory and Traditional Medicines, and includes representatives from SALAMA and other technical partners, including PMI and USAID partners. The committee continued to facilitate coordinated commodity management for the integrated supply chain. Recently, the Logistic Management Unit conducted procurement planning and quantification exercises via QUANTIMED and PIPELINE software of malaria commodities for the next three years. The results were shared with PMI, Global Fund, and all RBM partners and will serve as the foundation for future donor community support for on malaria commodities.

With PMI support, a malaria commodity dashboard was created and used by the NMCP supply chain committee to better monitor the stock status and take preventive or corrective measures when necessary. Data are shared regularly with RBM partners to analyze the levels of risks (stock outs, shortages and overstocks) to take appropriate decisions.

PMI continued to support commodity distribution mostly through SALAMA's scheduled distribution plan. However, in emergency situations such as malaria outbreaks and especially for hard to reach districts, PMI supported emergency distribution to ensure appropriate malaria case management in these areas. From January to March 2017, over 4,000 packs of ACTs and 8,400 RDTs were distributed using private transporter (Colis Express) to these areas, 3 months ahead of SALAMA's regular distribution plan scheduled in June 2017. PMI will continue this type of support as needed to reduce the impact of malaria in these remote areas.

PMI funding continued to fill commodities gaps in 2016, and procured approximately 1,900,000 RDTs and laboratory consumables for the national laboratory.

#### Plans and justification

PMI and other USG funding streams will continue to support the integrated supply chain and distribution of malaria commodities at the CSB and community levels. PMI partners will bolster the "pull" system at both the CSB and CHV levels, by using supportive supervision at each level to reinforce supply chain management best practices and discourage stock outs of commodities. PMI also plans to support the rebuilding of a QA/QC system, through the National Medicines Quality Control Laboratory via implementing partners. PMI support may include re-instatement of the medicine quality monitoring if defined as NMCP priority in the new NSP being finalized and potentially leverage other donors such as GF. (Additional details can be found in the case management section).

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

1. *Strengthen the supply chain for malaria commodities:* PMI will ensure the continuous supply of RDTs, ACTs, ITNs, and SP 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. (\$1,500,000)

#### **4. Health system strengthening and capacity building**

PMI supports several health system strengthening activities which cut across intervention areas, such as capacity building and training for the NMCP and health workers, strengthening supply chain management systems, improving health information management systems, and monitoring drug quality. PMI also collaborates with U.S. Peace Corps Volunteers (PCV) to promote malaria prevention activities in their communities.

##### NMCP/PMI objectives

The NMCP leads national malaria control efforts through the formulation of policies and strategies and coordination of the RBM partnership comprised of PMI, UNICEF, WHO, Global Fund, private sector companies, local and international NGOs, research institutions, and other government services. Other donors also support the NMCP with capacity building efforts; for example, the Principality of Monaco funded the construction of a National Training Center at the NMCP site.

The NMCP is the secondary recipient of most of the Global Fund malaria grants which cover health system strengthening activities, including improving community health services, improving the supply chain, and strengthening epidemiological surveillance. Sustaining gains in malaria control and advancing towards pre-elimination requires an efficient health system that effectively coordinates the activities of several government directorates at all levels of service. PMI supports the efforts of the MoH and the NMCP to improve health systems efficiency, particularly among the agencies and key departments responsible for disease control, including health districts (DDS), maternal and child health (*Direction de la Santé de la Famille: DSFa*), epidemiological surveillance (DVSSE), and supply chain management (*Direction des Pharmacies et Laboratoires, et de la Médecine Traditionnelle: DPLMT*). Specific activities supported by PMI include program management and oversight, reporting, refresher training and supervision of service providers.

##### Progress since PMI was launched

Following five years of political crisis, budget constraints and a previous hiring freeze (since 2009 which has been lifted), the MoH has experienced critical staff shortages at all levels of the public health system, and particularly for service provision at the district and community levels in rural and remote areas. Furthermore, over 65% of the population lives farther than five kilometers from a health facility, frequently in very difficult-to-reach communities. To improve access to health services, PMI, along with Global Fund and UNICEF (funded through the European Union), helped train a cadre of CHVs to provide a package of services in these remote communities. The CHVs offer preventive services and treat uncomplicated cases of the three most common childhood illnesses: pneumonia, diarrhea, and malaria; they refer severe cases of illness to the nearest CSB. However, staffing shortages continue to affect the quality of services at each level of delivery.

PMI and Global Fund have supported formative supervision, supply chain strengthening, therapeutic efficacy studies, and quality assurance/quality control (QA/QC) of laboratory diagnostic services. The MoH is currently working on improving the quality of the health management information system (HMIS), as well as strengthening epidemiological surveillance capacity at all levels of service. However, the national health infrastructure, including the private and non-governmental sectors of the system, is weak. Areas of weakness include the health information management system, supply chain and commodity management system, logistics systems, and the capacity to forecast, plan, and collect and use data for program management and decision-making. Finally, 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 2014. Along with other USAID health funding, PMI contributed to the assessment of maternal and child health services in health facilities. With FY 2017 funding, PMI will support one NMCP/MoH candidate to participate in a two-year regional Field Epidemiology and Laboratory Training Program (FELTP). Lastly, PMI closely collaborates with the U.S. Peace Corps, and has provided funding and technical support for malaria prevention activities of PCVs for several years.

**Table 13: Health Systems Strengthening Activities**

| <b>HSS Building Block</b>                                     | <b>Technical Area</b>        | <b>Description of Activity</b>  |
|---|------------------------------|---|
| <b>Health Services</b>  | Case Management              | Improve, through in-service training and supportive supervision for health workers and CHVs, QA/QC systems to monitor laboratory diagnostic service quality.  |
| <b>Leadership, Management &amp; Governance</b>                | Health Systems Strengthening | Build NMCP technical and managerial capacity at all levels, both through implementing partners and support to the NMCP to increase effectiveness; support development of national policies and strategies.  |
| <b>Health Workforce</b>                                       | Health Systems Strengthening | Support short- and long-term training of individuals to build capacity at the NMCP in epidemiology, M&E, and other malaria program functions including pharmaceutical and supply chain management.  |
| <b>Health Information</b>                                     | Monitoring and Evaluation    | Strengthen routine health data & disease surveillance systems, planning, and program management, through health staff M&E training, and support of for web-based data collection and management, data quality assurance.  |
| <b>Essential Medical Products, Vaccines, and Technologies</b> | Case Management              | Support improved forecasting, procurement, quality control, storage and distribution of malaria commodities (ITNs, SP, ACTs, injectable artesunate, and RDTs); strengthen logistics management systems.   |
| <b>Health Financing</b>                                       | Health System Strengthening  | Support for health sector financing assessment, development of a health financing strategy, and district-level pilot implementation of universal health coverage underway to inform design of framework (includes malaria services); support development of National Health Accounts. |

*Progress during the last 12-18 months*

PMI works with USAID Madagascar to strengthen specific health system areas, including supply chain management, HMIS, epidemiological surveillance, in-service training and supervision, and leadership/management and governance. PMI funds contributed to a USG assessment of the pharmaceutical supply chain in July/August 2014. As a result, support to SALAMA, the national non-profit parastatal in charge of health commodities and the national supply chain, is underway. This support includes training, facilitating restructuring, piloting a new distribution scheme that runs from the central to the commune level, and reforming the cost recovery system (known in French as FANOME). In addition, the European Union has pledged to contribute to building a new SALAMA warehouse and procuring trucks to deliver commodities. In light of these developments, the MoH has also developed a new national pharmaceutical policy.

USAID is supporting the MoH to update the National Health Policy and the National Community Health Policy, as well as to strengthen the management capacity of human resources for health and health financing. USAID funds supported an assessment of the health finance sector and will assist the MoH in the development of a national health financing strategy, as well as a financing mechanism scheme for universal health coverage.

USAID and PMI are also supporting the MoH to develop and validate a national health information system, which will unify and integrate various parallel information systems (including health information, finance, human resources for health, infrastructure, and equipment) into one web-based system using DHIS2. This effort is the result of an HMIS assessment completed in December 2015, which included a thorough review of data collection tools and processes, organizational structure, and staff training needs. With the support of PMI, the MoH has validated a new national surveillance strategic plan, and USAID and PMI plan to support the updating of the national health information system strategic plan.

USAID is providing technical support to the MoH with updating the National Community Health Policy to integrate and harmonize the community-based services provided by trained CHVs into the national public health system. PMI is working closely with the MoH to strengthen linkages between CHVs and CSBs. For example, each CHV would be affiliated with a nearby CSB, and CSB staff would provide CHV training and supervision, support CHV reporting, and facilitate commodity distribution to CHVs.

PMI supported the NMCP's entomological monitoring capacity by building an insectary, and training entomologists to rear and maintain mosquito colonies. This work was done with assistance from the PMI entomologist from the Centers for Disease Control and Prevention (CDC).

With FY17 funding, PMI is supporting one NMCP/MoH candidate to participate in a regional FELTP program beginning in 2018 for a two-year period to build capacity in malaria epidemiology and surveillance. PMI supported malaria PCVs with FY 2016 funds, and plans to support three volunteers with FY 2017 funds. Three PCVs are seconded to PMI implementing partners, and one coordinator leads PCV malaria activities in Madagascar.

#### 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 support to the NMCP and other government partners. PMI will support improvement of community and clinical 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 2018-2022 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, and to periodically review, update, and harmonize malaria behavior change communication messages (costs referenced in SBCC section).

To help the NMCP reach prevention and treatment coverage targets for key malaria interventions, PMI will continue to collaborate with other partners. Specific goals include increasing capacity to plan, implement, supervise, and forecast commodity needs; improve distribution systems; coordinate with partners; strengthen the HMIS; and monitor and evaluate malaria activities at all levels of the health care system. 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 to strengthen NMCP training and supportive supervision capacity of malaria case management and diagnostics at the central, regional, and district levels (costs referenced in Case Management section). In particular, PMI will support the strengthening of the MoH pharmaceutical and commodity management system, including support for SALAMA's capacity to store, distribute, and forecast commodity needs (costs referenced in Pharmaceutical and Commodity Management section). PMI will support capacity building of laboratory technicians at the national, regional and district-levels with training and supervision (costs referenced in Case Management section). PMI will continue to build NMCP epidemiology capacity by supporting an FELTP, or an equivalent training program, participant with FY17 funding for a two-year period beginning in 2018. PMI also plans to continue collaborating with PCVs and supporting malaria projects through the small projects assistance (SPA) funding.

Proposed activities with FY 2018 funding: (\$40,000)

1. *Support for Malaria Peace Corps Volunteers:* Support three third year Peace Corps Volunteers embedded into USAID implementing partners, including one third year volunteer in charge of coordinating malaria activities supported by PCVs in Madagascar. (\$30,000)
2. *SPA activities for Peace Corps Volunteers:* Support the SPA activities by Peace Corps volunteers to promote malaria activities. (\$10,000)

**5. Social and behavior change communication**

NMCP/PMI objectives

The NMCP supports SBCC as an essential component of its malaria prevention and control interventions with the established 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 is 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. Following a mid-term review in 2014, the NSP was revised, and the communication action plan was subsequently updated. Key parts of the revised plan for 2016 and 2017 include: 1) Targeting migrant populations; 2) Emphasizing the implementation of interpersonal communication (IPC) through CHVs; 3) Engaging traditional leaders in health communication activities; 4) Developing an approach for targeted SBCC through the schools (in collaboration with the Ministry of Education); 5) Consideration of new social media communication tools; and 6) intensified SBCC during the peak transmission season especially in the CHL, fringe districts and southern part of the country.

A new SBCC action plan is currently being drafted in conjunction with the new NSP 2018-2022 and will be finalized by the end of 2017. Activities are expected to remain the same and will continue to reinforce community mobilization. The Global Fund and PMI who are the main donors supporting the NMCP's SBCC activities will support its implementation.

#### *Progress since PMI was launched*

At the community level, each village or *fokontany* has identified two CHVs focusing on maternal and child health. Nationwide, approximately 34,000 CHVs 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.

Using the same materials, another 10,000 CHVs are supported by Global Fund to provide SBCC in non-USG supported regions leaving approximately 9,000 CHVs located in hard to reach regions with no substantial supports to conduct their activities.

PMI supports an integrated “healthy family” 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 has carried out quantitative and qualitative studies, whose results have been considered during the elaboration of new SBCC plan in 2015 and during the scientific discussion in 2016. They showed that use of bed nets is conditioned by perception of comfort, cultural factors and taboos.

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.

#### *Progress during the last 12-18 months*

PMI supports outreach and awareness activities at all levels, from the national level down to the community. At the national level, PMI has been instrumental in reinvigorating the in-country SBCC Technical Working Group, which includes the SBCC focal persons of PMI implementing partners and NMCP and MoH counterparts. The members of the group represent a good variety of partners' geographical coverage of malaria activities, and together the group reviews key malaria messages to harmonize among projects. In 2016, PMI supported the revision of SBCC tools for all intervention strategies, which particularly helped to strengthen implementation of the ITN routine distribution in

2016. In collaboration with the MoH's directorate of health promotion, PMI also has set up an "Armoire Virtuelle" at MoH level, which virtually stores images and standard messages for CHVs and health facility workers and are available for all the stakeholders. Furthermore, PMI and stakeholders advocate at different levels of the MoH in order to secure their participation in PMI activities and extend collaboration with the Ministry of Defense, Ministry of Population, Ministry of Education, and Ministry of Environment for SBCC message dissemination. Overall, PMI SBCC strengthening support to the NMCP included the development of the new communication strategy, support for enhanced communication during world malaria days at both national and district levels, development of SBCC tools (production and distribution) such as for ITN continuous distribution and mass campaigns, and support for the NMCP's participation in the RBM SBCC workshops. At the regional and district levels, partners advocated for the involvement of regional and district MoH officials in the dissemination of malaria messages prior to and during continuous distribution of ITNs.

At the community level, partners employ community dialogues to involve traditional leaders and key community members. In 2016 PMI supported refresher training for CHVs on SBCC. PMI also broadcast radio and TV spots to raise awareness of the continuous distribution of ITNs and produced signposts to indicate distribution points. As part of World Malaria Day events in April 2017, PMI partners organized community based mobilization activities such as mini-World Malaria Day celebrations in selected communes affected by malaria. PMI also contributed to the development of malaria SBCC messages for dissemination through mobile phones on a monthly basis. This activity will start in the third quarter of 2017 in collaboration with local mobile service providers. In collaboration with Peace Corps, PMI supported grassroots soccer matches in public schools at the *fokontany* level and distributed SBCC materials translated into Malagasy for easier use by PCVs and counterparts.

Data are key to inform national strategies for behavior change communication. In 2016, PMI supported an anthropological study to identify socio-cultural barriers to ITN utilization in different areas of the country. Although the results revealed generally good knowledge of malaria and use of ITNs, obstacles like the nature of the fabrics (e.g. rigid versus soft) and color remain to the use of impregnated mosquito nets. However all these barriers are not generalizable across all of Madagascar and typically only affect certain areas or ethnic groups. Among those who did receive nets, it was found that they were frequently stored for 3 to 12 months until the households perceived that their old net was no longer efficacious. Further, it was found that net maintenance practices were inadequate, compromising the protective effects of the nets. Additional factors contributing to non-utilization of bed nets included heat (from October to December); perceived vulnerability of pregnant/nursing women and children under five; sleeping arrangements; and the seasonal calendar of economic activities and social events.

The next mass ITN campaign, scheduled for October 2018, will use the MIS and anthropologic study results to design and refine distribution strategies and forecasting as well as SBCC campaign messages to address identified barriers to ITN access and use

The most recent MIS 2016 measured exposure to malaria messages, as well as behavior uptake, including ITN usage, IPTp uptake and care seeking behavior. Nearly two-thirds (62%) of the heads of household respondents (11,284) and over half (57%) of women aged 15-49 years old said they heard messages about ITNs at any time during the recent 2015 mass ITN distribution campaign. Among women aged 15-49 years who heard messages about malaria in pregnancy, 16.6% of messages were about IPTp (against 14.9% in MIS 2013), 34.3% about the use of ITNs and 5.7% about other malaria preventive messages. 15.6% of these women said they received these messages from CHVs during the past 12 months, which is 3 times higher than MIS 2013 results. Understanding the causes of malaria and

related preventive measures is key for malaria control. The MIS 2016 results showed that among 2,083 women aged 15-49 years who had a child under five years or were pregnant and who were interviewed, nearly two-thirds (61.5%) respondents named fever as the main malaria symptom, over half of respondents knew that mosquito bites cause malaria, nearly one-third (31.6%) recognized that their children were one of the most vulnerable groups to malaria, and 80.9% knew where they could get a malaria drug. Some of these indicators have improved compared to MIS 2013 while other did not.

These findings will help guide the NMCP and malaria partners in developing a more refined approach to malaria prevention and control in addition to informing the new SBCC action plan (2018-2022) to develop and adapt targeted malaria SBCC messages for different malaria transmission zones.

### Plans and justification

Based on progress and output from the in-country SBCC working group, recent studies, and field visit findings, the NMCP is committed to implementing more efficient SBCC tools and approaches. In addition, findings from the anthropological study that was conducted in 2016 were used during the revision of the communication plan in 2016. These results are also being used during the development of the new strategic plan 2018-2022. 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. As part of the new 2018-2022 communication plan, SBCC activities will be tailored according to national and regional epidemiological profiles to address shortcomings and bottlenecks unique to specific epidemiological zones. 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/prior to the peak transmission season.

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 and treatment messages and to teach personal preventive and care-seeking 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. Public primary school children in targeted grades will learn the adoption of behaviors for ITN use. 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. Additional details by technical area are presented below:

**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. Even if the seasonal calendar of economic activities, social events and cultural factors determine its use, the MIS 2016 shows that 71% of the household still have slept under ITNs. 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. Particular emphasis will be given to the mass net distribution campaign.

**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.

**IPTp:** 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. PMI is supporting a care seeking behavior assessment which will cover all epidemiologic zones to identify gaps, attitudes, and practices that may prevent timely care seeking in the formal health system for febrile illness, and that may lead to non-adherence to national guidelines for malaria treatment in Madagascar. This will provide a better understanding of gaps in service delivery and SBCC approaches. In addition, a health facility survey is planned with FY17 MOP funds, which may provide additional data on issues surrounding low IPTp uptake.

**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.

Proposed activities with FY 2018 funding: (\$1,400,000)

1. *Implementation of malaria SBCC activities nationwide:* Support the development and implementation of the new SBCC strategy 2018-2022. This activity also includes updating and disseminating malaria toolkit messages, support for World Malaria Day, and NMCP SBCC division capacity development. Communication through mass media and social media will use integrated malaria messaging including the key messages related to promoting increased and correct ITN use, acceptance of IRS where applicable, preventing malaria among pregnant women, including promoting uptake of IPTp, and early and prompt diagnosis and treatment for fever. Special efforts will be deployed to increase awareness and promote behavior change among pregnant women and on demand for IPTp. In addition, this activity includes the development of specific and harmonized messages with support tools for pre-elimination zones as per the epidemiology stratification. (\$500,000)
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. Through community mobilization, interpersonal communication, the use of skits and dramas, and radio spots malaria key messages reaching rural areas through community-based CHVs. PMI also support community-based SBCC activities with PCVs. (\$900,000)

## 6. Surveillance, monitoring, and evaluation

### NMCP/PMI objectives

The objective of the revised 2013–2017 National Malaria M&E Strategy is to strengthen systems in order to detect and control 100% of epidemics, and to monitor disease across the country by assuring the quality of at least 80% of data reported from health facilities. These objectives are likely to remain similar as the 2018-22 NSP is finalized, and will include efforts to establish one integrated system that incorporates elements of the various systems currently in place.

### Progress since PMI was launched

Malaria M&E is comprised of: 1) the national HMIS (also referred to as the Routine Health Information System (RHIS) or the *Système d'Information Sanitaire de Routine* [SISR]), in which malaria cases and deaths are reported monthly from health facilities along with other health data to the MoH (*Service Statistique Sanitaire* [MINSANP]); 2) Integrated Disease Surveillance and Response (IDSR, *la Surveillance Intégrée de la Maladie et la Riposte* [SMIR]), which is based on a weekly reporting of select notifiable diseases submitted to the MoH (*Direction de la Veille Sanitaire et de Surveillance Epidemiologique* [DVSSE]); 3) a fever sentinel surveillance network, in which 54 sentinel health facilities (*Centre de Santé de Base* [CSB]), 18 hospitals (*Centre Hospitalier* [CH]) and 118 CHVs submit information electronically on malaria cases and other diseases of epidemic potential and includes submission of laboratory specimens from 10 sites; and 4) population-based surveys such as DHS and MIS. Additional SM&E data include direct reporting of malaria data to the NMCP via a website, insecticide resistance monitoring, and periodic TESSs.

Routine reporting consists of health facilities (and to a limited extent CHVs) submitting monthly paper reports to their district. District personnel compile data from these reports and submit to the MoH via electronic database transfer to GeSIS, the national health data management database. Malaria data stored in GeSIS are available to the NMCP. In 2013, the MoH developed an HMIS strengthening strategy that included harmonizing indicators across health programs, revising and standardizing health facility registers, and updating GeSIS. In addition, Global Fund grants supported data managers to compile malaria data reported via GeSIS. Most RBM partners have access to the NMCP's web-based data and additional surveillance data is available on the NMCP website: <http://www.pnlp-madagascar.mg>. To improve data timeliness, the NMCP maintains a system for reporting malaria-specific indicators from the routine data from the district to the central level. Malaria focal points at the district enter malaria indicators from the monthly reports into a database that is sent to the NMCP each month.

The IDSR, implemented jointly by the MoH division responsible for epidemic surveillance (DVSSE) and the WHO, consists of weekly, paper-based and SMS aggregate reports of suspected and confirmed cases of notifiable conditions including malaria. The IDSR is designed to be nationwide, and serve as an early detection system to facilitate rapid investigation of disease clusters. However, since launching in 2000, funding for IDSR has been limited and unstable, and implementation incomplete. The 2015 Measure Evaluation HMIS survey found that only 55% (n=15) of level 1 CSBs (CSB I), and 77% of level 2 CSBs (CSB II) (n=45) had completed reports. Other major limitations of IDSR include an inability to share data efficiently across health programs, limited data quality control, and lack of supervision.

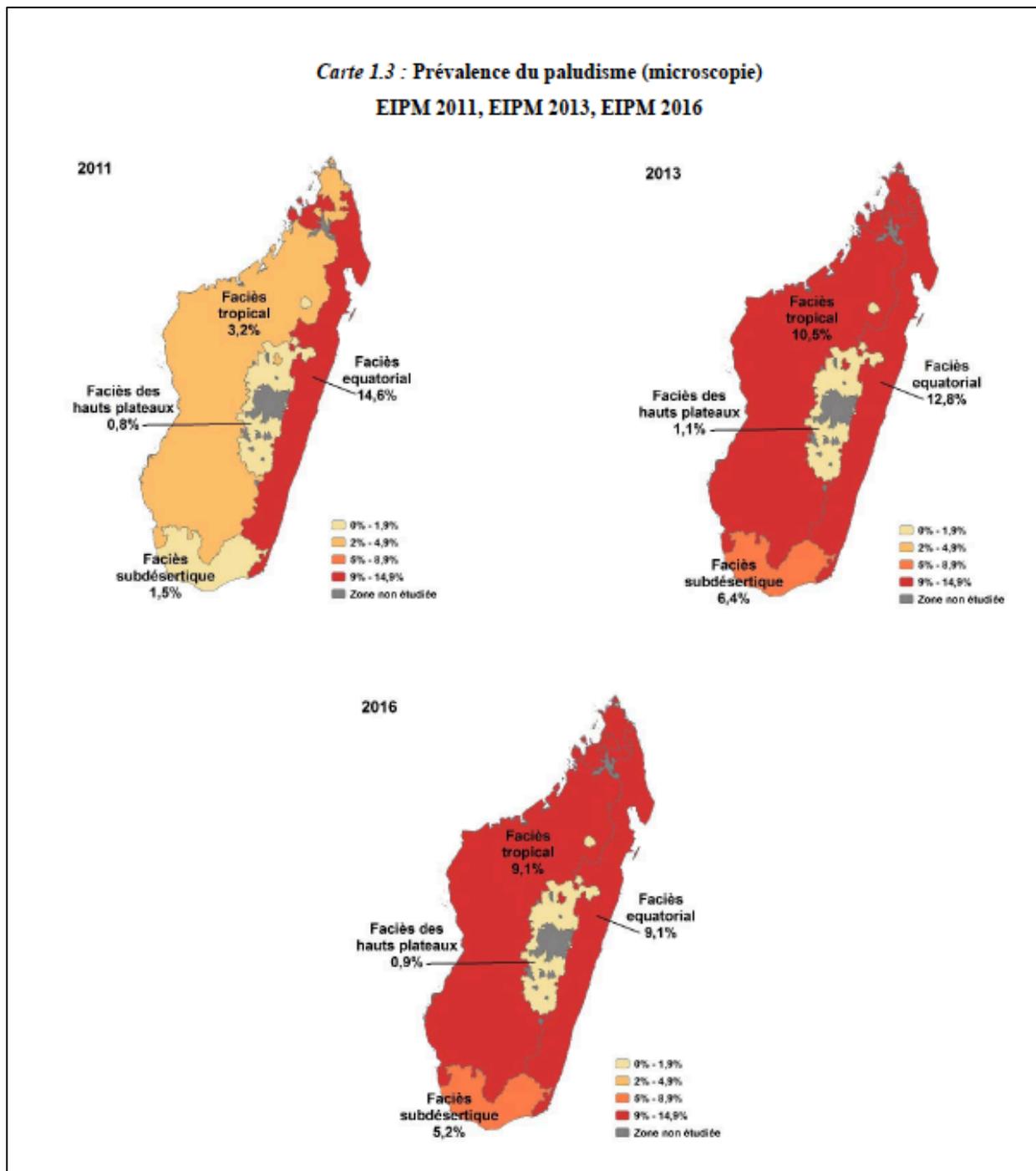
The fever sentinel surveillance network (FSSN), funded in part with PMI funds since FY 2008, and managed by an implementing partner in collaboration with the MoH, has been functioning since 2007.

Data from 54 CSBs, 18 CH and 118 CHVs are submitted electronically, and these data provide information on causes of febrile illness throughout the country. Diagnostic test results are included when available, and laboratory specimens for influenza and arbovirus testing are routinely submitted from 10 sites. Cases are reported as laboratory-confirmed malaria, suspected cases of an outbreak-prone disease (e.g., dengue, influenza, malaria, plague), or other cause of febrile illness. Aggregate counts of febrile illness cases are transmitted daily from outpatient sites using SMS technology; CH data are transmitted via the web. To allow for rapid response, weekly data summaries are provided to sentinel sites and to health partners, and a quarterly newsletter summarizing the data is distributed to RBM partners and other stakeholders. The FSSN is currently the only timely source of malaria morbidity trends available to PMI, and several malaria outbreaks have been detected by this system during 2012-2017. This system is complemented by the Malaria Early Warning System (MEWS) that incorporates analysis of climate and program intervention data for predicting epidemics.

During 2009-2014, when the USG could not support GoM activities due to political difficulties, parallel disease surveillance systems were established to monitor malaria, and FSSN provided the most reliable malaria surveillance data. Reintegration of these parallel systems has been challenging, and has taken longer than expected. Thus, the NMCP requested PMI support FSSN for one additional year, with FY2017 funds, to assure malaria surveillance data quality during the reintegration process.

The baseline national household survey used for tracking malaria indicators is the 2008-2009 DHS. Follow-up national surveys include the 2011, 2013, and 2016 MIS (see following section for 2016 MIS description), and a large household survey to measure progress toward the MDGs in 2012-2013. A summary of MIS parasitemia prevalence in 2011, 2013 and 2016 is shown in Figure 11.

Figure 11: Parasitemia prevalence MIS 2011, 2013, 2016, all age groups



Progress during the last 12-18 months

In 2015, PMI supported a preliminary assessment of the national HMIS and the country’s various disease surveillance networks, including the RHIS, FSSN, and the IDSR. The main findings included a fragmented HMIS with duplication of data collection, and a poorly functioning IDSR with low coverage. In light of these findings, a comprehensive HMIS assessment was done with the Performance of Routine Information System Management (PRISM) tool. The assessment included: 1) a thorough review of the data collection process, organizational structure, and challenges; 2) a review of the

different databases to assess the quality of data reporting; and 3) an assessment of the performance in providing high-quality malaria surveillance data.

The HMIS assessment revealed that completeness, timeliness and quality of reporting were poor across the country for both RHIS and IDSR systems. Factors thought to contribute to poor quality included low motivation of health care staff to collect and report data, lack of staff capacity for surveillance activities, and lack of quality control. In private health facilities, approximately 70% of assessed clinics were not using the standard malaria case definition for diagnosis. Facilities reported limited use of their data: 74% of sentinel sites, 56% of CSB II, and 40% of CSB I, reported using their data for prevention and control activities in the previous 12 months, respectively. An additional concern included poor interoperability among data systems. The updated NSP will likely include efforts to address these findings and to migrate GeSIS to a DHIS2 platform to improve interoperability.

The MoH is committed to developing one integrated surveillance system. To that end, they started pilot projects to inform the design of such a system. One project, funded by the WHO, is an electronic tablet based system for collecting, transmitting and summarizing data on select notifiable diseases, including malaria, from health facilities in 17 districts. An internal evaluation in 2016 revealed that the system could improve reporting timeliness, completeness, and efficiency. Key weaknesses included lack of electricity and network access in some sites, and CSBs that were closed for substantial periods of time. Recommendations for improvement and scale-up were made and the MoH is expanding this pilot to 16 additional districts with resources from the Global Fund and the WHO. A second project, piloted in two districts and supported by *EpiConcept* and the *Commission de l’Ocean Indien*, is completing an evaluation. A third and final project, requested by the MoH and supported by PMI, is piloting a mobile application used by CHVs to improve the quality of and access to data from CHVs’ activities. Fifty users are part of the pilot (35 CHVs, 7 CSB directors, and 8 MoH staff members). An evaluation of this pilot is scheduled for August 2017. PMI will work with the MoH and partners to interpret the results of these pilots, and use the findings to inform planning.

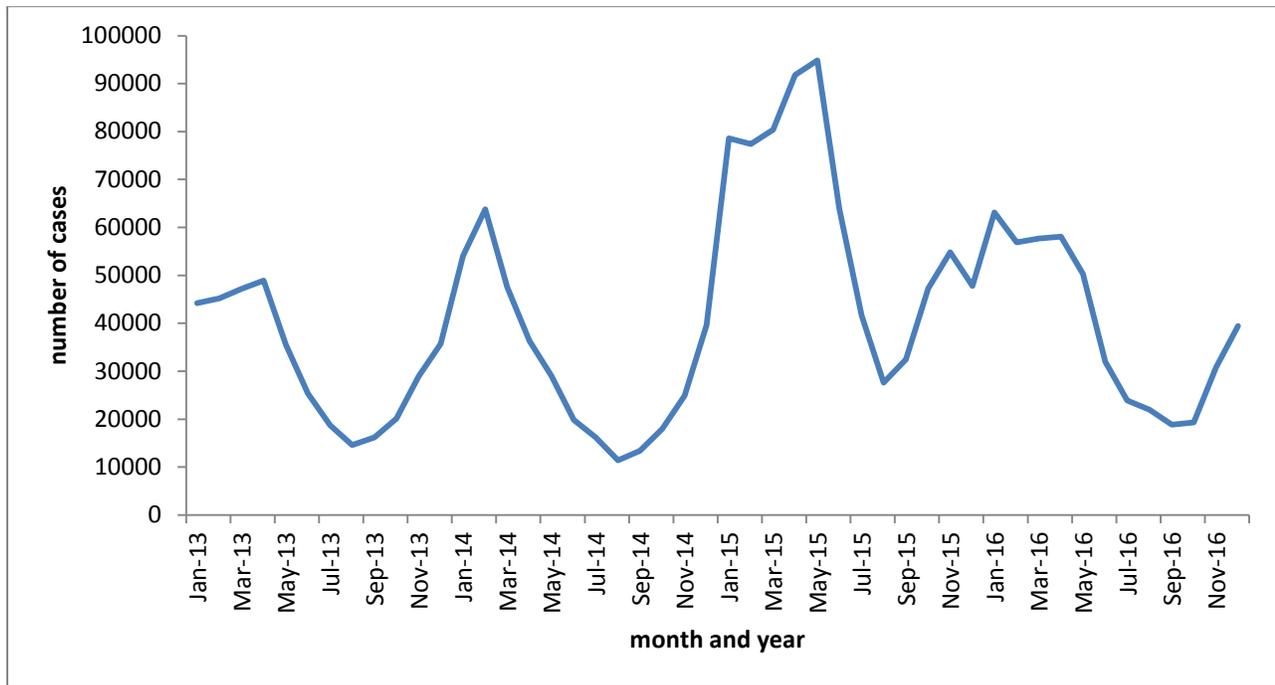
In early 2017, PMI provided technical support to create a surveillance committee comprised of five technical teams including health statistics, surveillance, data quality control, resources, and operational research. The committee is preparing materials for a revised surveillance strategy. Findings from the three pilot surveillance projects noted above will be used to develop and update the strategy. The 2016 MIS, co-funded by PMI, provides the most recent nationwide estimate of parasitemia prevalence. However, comparisons with earlier MIS surveys must be interpreted cautiously because, in contrast to previous surveys, data collection in 2016 was delayed and occurred in the low-transmission season. Furthermore, the 2016 MIS was conducted after the 2015 mass ITN campaign, whereas the 2013 MIS was conducted before the 2012 campaign had been completed. In 2016, parasitemia prevalence in the higher-transmission zones (East and West coasts), was lower among children aged 6-59 months compared with 2013, whereas it was higher in the semi-arid South. Prevalence has remained relatively stable in the low transmission zones of the CHL and the semi-arid South, but has varied in the higher-transmission zones.

In 2014 a cross-sectional cluster survey of 65 outpatient public health facilities, assessed the quality of outpatient malaria care. Results revealed gaps in provider knowledge and skills, fragile stocks of malaria medications, and limited support for CHVs affiliated with facilities. Of note, this survey was conducted after a period during which CHVs required support outside of official channels due to political realities, which likely affected the survey findings. Since 2014, efforts to reintegrate health care service delivery have been underway, and a repeat health facility survey is planned for FY 2018 using PMI funds. In addition, an End-Use Verification (EUV) survey is planned for FY 2018 to describe malaria diagnostic

and treatment commodities at health facilities.

HMIS data through 2016 indicated a seasonal pattern with an increase in cases in early 2015 driven in part by outbreaks in the southwest. Figure 12 shows the most recent HMIS data.

**Figure 12: Trends in Malaria Cases from HMIS (2013-2016)\***



\*91% of facilities reporting, January 1, 2013-December 31, 2016

**Table 14: Surveillance, Monitoring and Evaluation Data Sources**

| Data Source                                     | Survey Activities                        | Year |      |      |      |      |      |      |      |      |
|---|--|------|------|------|------|------|------|------|------|------|
|   |  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Household surveys                               | Demographic Health Survey (DHS)          |      |      |      | X    |      |      |      | (X)  |      |
|   | Malaria Indicator Survey (MIS)           | X    |      | X    |      |      | X    |      | (X)  |      |
|   | Millennium Development Goal survey (MGD) |      |      | X    | X    |      |      |      |      |      |
|   | National Population Census               |      |      |      |      |      |      | X    | (X)  |      |
|   | School-based malaria survey              |      |      |      | X    |      |      |      |      |      |
| Health Facility and Other Surveys               | Health facility survey                   |      |      |      | X    |      |      |      | (X)  |      |
|   | SPA survey                               |      |      |      |      |      |      |      |      |      |
|   | EUV survey                               |      |      |      |      |      |      |      | (X)  |      |
|   | Support to malaria surveillance system   | X    | X    | X    | X    | X    | X    | X    | (X)  | (X)  |
| Malaria Surveillance and Routine System Support | Support to HMIS                          |      |      |      | X    | X    | X    | X    | (X)  | (X)  |
|   | Malaria Impact Evaluation                |      |      |      | X    |      |      |      |      |      |
| Other Data Sources                              |  | X    |      | X    |      |      |      | X    |      |      |
| Therapeutic Efficacy Study                      |  |      |      |      |      |      | X    |      |      |      |
| Anthropological survey of net use               |  |      |      |      |      |      |      |      |      |      |

*Plans and justification*

Madagascar's surveillance goal, as outlined in the National Surveillance Strategic Plan, is to strengthen HMIS and develop one integrated system that incorporates elements from the current vertical systems and pilot projects. PMI will continue to support the design of such a system with the NMCP and

partners. PMI will also support activities for a health facility survey with FY 2017 funds, and will support a DHS/MIS and EUV survey with FY 2018 funds. An EUV survey will be conducted every quarter in collaboration with government directorates and malaria implementing partners because there is no reliable data source for commodity consumption available in Madagascar. The survey questionnaire will be adapted to the Madagascar context. These surveys could not be conducted in prior years due to restrictions on working with the GoM.

HMIS strengthening will include training, supervision, and materials for health facility staff, and the ongoing support for a data warehouse based on a DHIS2 platform. DHIS2 is primarily supported by the existing Global Fund NFM1 grant; however, additional funds are needed to support training and supervision of users at the national, district, and regional levels. The current plan is to design cascade trainings from central to regional, district, CSB and CHVs for proper use of new surveillance tools, monitoring quality and addressing challenges. Numbers of trainings and trainees have not yet been elaborated. PMI funding will continue to support a consultant/technical advisor located at the NMCP to train and assist malaria program staff on how to effectively use program data, including using DHIS2 for malaria data. Using non-PMI funding, a second USG-supported advisor is located at the MoH's *Département d'Etudes et Planification* to support the MOH to strengthen the overall SM&E system and the deployment of DHIS-2.

Proposed activities with FY 2018 funding: (\$1,910,000)

1. *End-use Verification*: Implement quarterly end use verification activities to assess malaria commodity stock status at health facilities. (\$100,000)
2. *Support to DHS, including malaria module*: Support the implementation of the DHS, plus the malaria module, during the malaria season. Of note, biomarkers will be included in the MIS module of the DHS. Due to adding the MIS module to the DHS, the additional \$200,000 from FY 2017 will be needed; no gap in DHS funding is anticipated. (\$700,000)
3. *Strengthen RHIS*: Provide targeted support to the NMCP to strengthen the RHIS. Activities will include data quality improvement, training, supportive supervision and materials. (\$1,000,000)
4. *Organizational capacity development for the NMCP*: Support organizational development at the national level to strengthen leadership and build capacity as requested by the NMCP as an area where they needed assistance.(\$100,000)
5. *Technical assistance to support M&E activities*: One CDC TDY to provide technical support for SM&E activities. (\$10,000)

## 7. **Operational research**

NMCP/PMI objectives

The NMCP Operational Research (OR) objectives were last 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. It is anticipated that the NMCP will update its OR priorities in the new, forthcoming strategic plan.

Progress since PMI was launched

The Central Highlands (CHL) 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 then transitioned in 2013 to focalized spraying, targeting the communes in selected districts

with the highest malaria incidence, 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 health care 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. PMI is currently conducting another large OR study in the CHL to help inform the NMCP's pre-elimination strategy in this area.

#### *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 focal mass drug administration strategies with FY 2014 and FY 2015 funds. The study is comparing reactive case detection to focal 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. The study objectives were modified following country dialogue and agreement to include a focal mass drug administration arm; a change from the original objective of comparing two reactive case detection arms. The study start was delayed due to turnover within both PMI and the implementing partner, and the study had initially been under budgeted. A baseline census for the study areas was conducted in June 2016, and the baseline cross-sectional survey was carried out in March–May 2017. The study is currently undergoing review by the PMI Operational Research Committee.

With FY 2015 funds PMI also supported 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 and were completed in July 2016. Some of the main findings included an insufficient number of ITNs, perceptions that ITNs were only for marriage or covering the deceased, and in one vanilla-manufacturing location, ITNs were replaced by non-treated bednets during the vanilla cultivation season so they would not contaminate the vanilla.

**Table 15: PMI-funded Operational Research Studies**

| <b>Completed OR Studies</b>   |                          |                        |  |
|---|--------------------------|------------------------|--|
| <b>Title</b>  | <b>Start Date (est.)</b> | <b>End Date (est.)</b> | <b>Budget</b>  |
| 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)  |
| <b>Ongoing OR Studies FY 2015</b>   |                          |                        |  |
| <b>Title</b>  | <b>Start Date (est.)</b> | <b>End Date (est.)</b> | <b>Budget</b>  |
| Evaluation of reactive case detection versus focal mass drug administration strategies in the Central Highlands     | May 2016                 | June 2019              | \$150,000 (FY 2014) + \$313,000 (FY 2015) + \$95,000 (FY 2016) + \$470,000 (FY 2017) + \$490,000 (FY 2018) |
| ITN use and barriers in different regions of Madagascar   | April 2016               | July 2016              | \$75,000   |
| <b>Proposed OR Studies FY 2016 and FY 2017</b>  |                          |                        |  |
| <b>Title</b>  | <b>Start Date (est.)</b> | <b>End Date (est.)</b> | <b>Budget</b>  |
| Epidemiological investigation of key populations in the CHL and fringe areas  | October 2017             | September 2018         | \$200,000  |
| <b>Planned OR Studies FY 2018</b>   |                          |                        |  |
| <b>Title</b>  | <b>Start Date (est.)</b> | <b>End Date (est.)</b> | <b>Budget</b>  |
| Cost-effectiveness of community level malaria treatment for children under 15 years of age                          |                          |                        | \$500,000  |

*Plans and justification*

PMI plans to support a study to inform the NMCP on key populations' (e.g., migrants and mine workers) movement and access to health care in selected hotspots across Madagascar with FY 2017 funds. There is currently very little information regarding malaria prevalence, movement, and access to health care among these populations. In line with the NSP, the NMCP requested support for a study to describe the impact of these high-risk and hard-to-access populations on malaria transmission, and identify effective interventions to improve control. 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, health care seeking patterns, and

malaria prevalence. PMI will work with the NMCP and the IPM to flesh out the details of the study methodology. Study results will be used to inform interventions to improve malaria control among these populations.

Care seeking at public health facilities is not optimal in Madagascar, and rates of malaria among children aged 5-15 years are concerning in some areas of the country. Thus, the Ministry of Health has identified as one of its priorities expanding integrated community case management (iCCM) to older-age children (i.e., up to age 15 years). CHVs serve communities throughout the day, including late afternoons and evenings when schoolchildren would be able to seek their services. Among several research priorities of the NMCP, the one most consistent with PMI's OR goals is to evaluate this iCCM expansion. PMI will work closely with IPM to design a study to assess the feasibility, effectiveness, costs, and cost-effectiveness of expanding iCCM for malaria care to children up to age 15 years in areas of higher malaria transmission.

Proposed activities with FY 2018 funding: (\$990,000)

1. *Cost-effectiveness of community-level (CHV) malaria treatment for children up to age 15 years:* PMI will support the evaluation, in terms of feasibility, costs, effectiveness, and cost-effectiveness of a pilot project to expand malaria treatment in the community to age 15 years. (\$500,000)
2. *Reactive case detection operations research:* PMI will support the final year of the reactive case detection study in the CHL, to inform the country's pre-elimination strategy. (\$490,000)

## **8. Pre-elimination**

NMCP/PMI objectives

The NMCP supports efforts to establish pre-elimination zones in Madagascar. However, the criteria for determining pre-elimination status has changed frequently; therefore, the districts targeted for pre-elimination have changed. In 2016, the NMCP targeted five districts in the CHL; one in the north, Diego I; one district in the west, Majunga I, and the islands of Sainte Marie and Nosy Be. These districts were targeted based on a malaria positivity rate of <5%. The current pre-elimination strategy includes active case detection, plus radical treatment of confirmed malaria cases in targeted districts, but these plans have not yet been implemented. The NMCP has been using data presented at the scientific conference in November 2016 to update the National Strategic Plan (2018–2022), which will include a revised pre-elimination strategy. PMI will assist the development of this strategy, with a draft anticipated by the end of 2017. Based on the new strategy, PMI will coordinate with other donors, including Global Fund, to plan implementation with the NMCP.

Progress since PMI was launched

The CHL has been considered a low-transmission area for several years. PMI previously supported IRS in this area, but shifted IRS activities to higher burden areas in 2014; however, the Global Fund has continued to support IRS in selected CHL districts. Malaria surveillance activities in the CHL are currently consistent with surveillance in other areas of the country; PMI will work with the NMCP pre-elimination strategy team to discuss village-based and case-based surveillance for targeted districts.

Progress during the last 12-18 months

PMI provided technical assistance to the NMCP during the scientific conference in November 2016 during which malaria stakeholders selected districts to be targeted for pre-elimination activities. Currently, targeted districts include five in the CHL, one in the north, one in the south and the islands of

Sainte Marie and Nosy Be. The two islands were selected in part for their tourism potential. The NMCP intends to re-assess the pre-elimination criteria for the updated strategy.

The NMCP is currently writing a set of key activities for pre-elimination districts. These activities may include some combination of enhanced surveillance, passive and active case detection, surveillance at entry ports, airports and in hotels, and the use of low-dose primaquine. For the two islands, continuation of ITN distribution and IRS might also be done. The NMCP may also implement mass drug administration in the targeted districts. With NFM2 Global Fund funding, the NMCP plans to set up pre-elimination activities in some targeted districts.

With FY 2016 and 2017 funding, PMI is supporting the NMCP to conduct operational research to assess the effectiveness of reactive case detection and focal mass drug administration in the CHL. The NMCP intends to use the results of this study to inform their pre-elimination strategies. With FY 2017 funding, PMI will support a study on key populations (e.g., migrants and mining workers) to inform the NMCP on targeted interventions for malaria control efforts in low transmission areas, including pre-elimination areas.

**Table 16: Pre-Elimination Activities**

| <b>Technical Area</b>  | <b>Description of Activity</b>   | <b>Geographic Coverage</b>   |
|------------------------|--|--|
| <b>Prevention</b>      | Includes IRS, ITNs, plus other approaches which are still being piloted (ie MDA)   | <ul style="list-style-type: none"> <li>- IRS - CHL, Nosy be and Sainte Marie</li> <li>- ITNs - Diego1, Majunga 1, Nosy be and Sainte Marie</li> <li>- MDA - Diego1, Majunga 1, Nosy be and Sainte Marie</li> </ul> |
| <b>Case management</b> | Reactive case detection OR study is to inform case management interventions; Providers have been trained in radical treatment with low dose primaquine.                        | <ul style="list-style-type: none"> <li>- CHL</li> <li>- 9 Districts</li> </ul>   |
| <b>SBCC</b>            | Targeted SBCC for key populations including miners, migrants.  | <ul style="list-style-type: none"> <li>- Mining sites (# of districts to be confirmed later)</li> </ul>  |
| <b>SME</b>             | Surveillance and screening at ports, airports and hotels- approach is to be determined; Capacity building at district level on surveillance and investigation of malaria cases | <ul style="list-style-type: none"> <li>- 9 Districts</li> <li>- 9 Districts</li> </ul>   |
| <b>OR</b>              | Support for RCD/fMDA comparative study; proposed OR study on targeting key at-risk populations (miners, migrants) with interventions.  | <ul style="list-style-type: none"> <li>- CHL and areas with large populations of migrant workers and miners</li> </ul>   |

*Plans and justification*

PMI will support the NMCP to develop a pre-elimination strategy for the targeted pre-elimination districts and to PMI will assist the NMCP to operationalize the strategy. Furthermore, PMI will advise on research to inform the strategy including comparing the effectiveness of reactive case detection and focal mass drug administration, and describing effective interventions among key populations (activities are described in the OR section). PMI will continue to strengthen CHV and health provider case management practices, and malaria surveillance activities to ensure prompt diagnosis and effective

treatment of all cases and timely reporting (activities described in the case management and M&E sections).

Proposed activities with FY 2018 funding: (\$200,000)

1. *Support package of pre-elimination activities in selected district(s):* PMI will support the NMCP to develop a strategic plan for pre-elimination, and to implement the activities of the plan which may include enhanced surveillance, data management, training and other pre-elimination activities, as requested by the NMCP, in selected districts. (\$200,000)

## **9. 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 2018 funding: (\$1,556,000)

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. (\$1,556,000)

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

| <b>Mechanism</b>                    | <b>Geographic Area</b> | <b>Activity</b>                                    | <b>Budget (\$)</b> | <b>%</b> |
|-------------------------------------|------------------------|--|--------------------|----------|
| TBD - New Vector Control IDIQ       | Nationwide             | Entomological monitoring                           | \$350,000          | 28%      |
|                                     | Sample of 92 Districts | ITN durability monitoring                          | \$100,000          |          |
|                                     | Up to 5 Districts      | IRS implementation in 5 districts                  | \$6,055,500        |          |
| 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 & administration                          | \$225,000          |          |
| GHSC/PSM                            | Up to 20 Districts     | Procurement of ITNs for continuous distribution    | \$2,880,000        | 17%      |
|                                     | 93 Districts           | Procurement of SP                                  | \$54,000           |          |
|                                     | Nationwide             | Procurement of ACTs                                | \$490,000          |          |
|                                     |                        | Procurement of severe malaria medicines            | \$350,000          |          |
|                                     |                        | Procurement of laboratory consumables and reagents | \$25,000           |          |
| TBD - Total Market Initiative (TMI) | Up to 20 Districts     | Warehousing and distribution of ITNs               | \$1,000,000        | 15%      |
|                                     | Nationwide             | Support private sector malaria case management     | \$300,000          |          |
|                                     |                        | Supply chain management                            | \$1,500,000        |          |
|                                     |                        | Support malaria SBCC activities                    | \$500,000          |          |
|                                     |                        | End user verification                              | \$100,000          |          |
| TBD - Post IPM Award                | Sample of 92 Districts | ITN durability monitoring                          | \$25,000           | 2%       |
|                                     | Nationwide             | Support for Malaria Peace Corps Volunteer          | \$10,000           |          |
|                                     | CHL and fringe areas   | Reactive Case Detection OR                         | \$490,000          |          |

|                            |                   |  |                     |             |
|----------------------------|-------------------|--|---------------------|-------------|
| MAHEFA<br>MIARAKA          | 7 Regions         | Integrated supportive supervision of community and facility-based case management & MIP referral | \$1,150,000         | 7%          |
|                            |                   | Support for Malaria Peace Corps Volunteer  | \$10,000            |             |
|                            |                   | Implementation of malaria SBCC activities  | \$400,000           |             |
| TBD - Post Mikolo Award    | Nationwide        | Integrated supportive supervision of community and facility-based case management & MIP referral | \$2,300,000         | 12%         |
|                            |                   | Support for Malaria Peace Corps Volunteer  | \$10,000            |             |
|                            |                   | Implementation of malaria SBCC activities  | \$500,000           |             |
| TBD - Case Management IDIQ | Nationwide        | Training and supervision for laboratory technicians  | \$300,000           | 1%          |
| Peace Corps                | Nationwide        | SPA activities for Peace Corps Volunteers  | \$10,000            | 0%          |
| MEASURE/DHS                | Nationwide        | Support to DHS, including malaria module   | \$700,000           | 3%          |
| MEASURE/EVAL               | Nationwide        | Strengthen RHIS  | \$1,000,000         | 4%          |
| TBD                        | Nationwide        | Organizational capacity development for the NMCP   | \$100,000           | 3%          |
|                            | Nationwide        | Cost effectiveness of community level malaria treatment for children under 15 years              | \$500,000           |             |
|                            | Up to 8 Districts | Malaria elimination activities   | \$200,000           |             |
| USAID                      | Nationwide        | Staffing & administration  | \$1,331,000         | 6%          |
| <b>Total</b>               |                   |  | <b>\$22,975,000</b> | <b>100%</b> |

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

| Proposed Activity   | Mechanism                           | Budget (\$)      |             | Geographic Area    | Description   |
|---|-------------------------------------|------------------|-------------|--------------------|---|
|   |                                     | Total            | Commodity   |                    |   |
| <b>PREVENTIVE ACTIVITIES</b>  |                                     |                  |             |                    |   |
| <b>VECTOR MONITORING AND CONTROL</b>                                |                                     |                  |             |                    |   |
| <b>Entomologic monitoring and insecticide resistance management</b> |                                     |                  |             |                    |   |
| Entomological monitoring  | TBD - New Vector Control IDIQ       | \$350,000        |             | Nationwide         | Conduct comprehensive vector surveillance, assess resistance and monitor the residual efficacy of IRS in 11 sites across the country. |
| Technical assistance to vector control activities                   | CDC/IAA                             | \$14,500         |             | Nationwide         | One CDC TDY to provide technical support for LLIN durability monitoring and entomological monitoring.                                 |
| <b>Subtotal Ento monitoring</b>                                     |                                     | <b>\$364,500</b> |             |                    |   |
| <b>Insecticide-treated Nets</b>                                     |                                     |                  |             |                    |   |
| Procurement of ITNs for continuous distribution                     | GHSC/PSM                            | \$2,880,000      | \$2,880,000 | Up to 20 Districts | Procure 1 million bednets to contribute to the continuous distribution.   |
| Warehousing and distribution of ITNs                                | TBD - Total Market Initiative (TMI) | \$1,000,000      |             | Up to 20 Districts | Provide warehousing and distribution for ITNs procured for continuous distribution.   |

|   |                               |                     |                    |                        |  |
|---|-------------------------------|---------------------|--------------------|------------------------|--|
| ITN durability monitoring                     | TBD - New Vector Control IDIQ | \$100,000           |                    | Sample of 92 Districts | Facilitate ITN durability monitoring of nets that will be distributed in Oct 2018.   |
|   | TBD - Post IPM Award          | \$25,000            |                    | Sample of 92 Districts | Conduct entomological activities related to the ITN durability studies.  |
| <b>Subtotal ITNs</b>                          |                               | <b>\$4,005,000</b>  | <b>\$2,880,000</b> |                        |  |
| <b>Indoor Residual Spraying</b>               |                               |                     |                    |                        |  |
| IRS implementation in 5 districts             | TBD - New Vector Control IDIQ | \$6,055,500         | \$2,000,000        | Up to 5 Districts      | Conduct blanket IRS in up to 5 high burden districts, to be selected by the NMCP and stakeholders based on entomological and epidemiological data. |
| <b>Subtotal IRS</b>                           |                               | <b>\$6,055,500</b>  | <b>\$2,000,000</b> |                        |  |
| <b>SUBTOTAL VECTOR MONITORING AND CONTROL</b> |                               | <b>\$10,400,000</b> | <b>\$4,880,000</b> |                        |  |
| <b>Malaria in Pregnancy</b>                   |                               |                     |                    |                        |  |
| Procurement of SP                             | GHSC/PSM                      | \$54,000            | \$54,000           | 93 Districts           | Procure 300,000 treatments of SP.  |
| <b>Subtotal Malaria in Pregnancy</b>          |                               | <b>\$54,000</b>     | <b>\$54,000</b>    |                        |  |
| <b>SUBTOTAL PREVENTIVE</b>                    |                               | <b>\$10,454,000</b> | <b>\$4,934,000</b> |                        |  |
| <b>CASE MANAGEMENT</b>                        |                               |                     |                    |                        |  |
| <b>Diagnosis and Treatment</b>                |                               |                     |                    |                        |  |
| Procurement of ACTs                           | GHSC/PSM                      | \$490,000           | \$490,000          | Nationwide             | Procure 700,000 treatments of ACTs to be distributed by the public health system (SALAMA).   |

|  |                                     |                    |                  |            |   |
|--|-------------------------------------|--------------------|------------------|------------|---|
| Procurement of severe malaria medicines  | GHSC/PSM                            | \$350,000          | \$350,000        | Nationwide | Procure rectal and injectable artesunate for severe malaria, to be administered as pre-referral treatment by CHWs and as definitive treatment at higher-level facilities, respectively.   |
| Procurement of laboratory consumables and reagents   | GHSC/PSM                            | \$25,000           | \$25,000         | Nationwide | Procurement of laboratory supplies and reagents to support the revitalization of the national reference laboratory.   |
| Integrated supportive supervision of community and facility-based case management & MIP referral | MAHEFA MIARAKA                      | \$1,150,000        |                  | 7 Regions  | Provide support to CHWs and health facilities for malaria case management. Activities will include refresher training, M&E integration, and routine supervision of CHWs. Activity will be co-funded by other USAID funding streams. |
|  | TBD - Post Mikolo Award             | \$2,300,000        |                  | Nationwide |   |
| Training and supervision for laboratory technicians  | TBD - Case Management IDIQ          | \$300,000          |                  | Nationwide | Conduct supportive supervision, training, development of SOPs for laboratory technicians at the national, regional and district level.  |
| Support private sector malaria case management   | TBD - Total Market Initiative (TMI) | \$300,000          |                  | Nationwide | Improve malaria case management and MIP uptake in private sector health facilities.   |
| Technical assistance to case management activities   | CDC/IAA                             | \$10,000           |                  | Nationwide | One CDC TDY to provide technical support for case management.   |
| <b>Subtotal Diagnosis and Treatment</b>  |                                     | <b>\$4,925,000</b> | <b>\$840,000</b> |            |   |
| <b>Pharmaceutical Management</b>   |                                     |                    |                  |            |   |

|  |                                     |                    |                  |            |  |
|--|-------------------------------------|--------------------|------------------|------------|--|
| Supply chain management                                | TBD - Total Market Initiative (TMI) | \$1,500,000        |                  | Nationwide | Support integrated supply chain strengthening activities to improve national capacity. Activities include national coordination support, quantification, training of providers and managers, commodity management tools, LMIS, transport of commodities down to the health facility level. |
| <b>Subtotal Pharmaceutical Management</b>              |                                     | <b>\$1,500,000</b> |                  |            |  |
| <b>SUBTOTAL CASE MANAGEMENT</b>                        |                                     | <b>\$6,425,000</b> | <b>\$840,000</b> |            |  |
| <b>HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING</b> |                                     |                    |                  |            |  |
| Support for Malaria Peace Corps Volunteers             | TBD - Post IPM Award                | \$10,000           |                  | 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.   |
|  | MAHEFA MIARAKA                      | \$10,000           |                  | 7 Regions  |  |
|  | TBD - Post Mikolo Award             | \$10,000           |                  | Nationwide |  |
| SPA activities for Peace Corps Volunteers              | Peace Corps                         | \$10,000           |                  | Nationwide | Support SPA activities by Peace Corps volunteers to promote malaria activities.  |
| <b>SUBTOTAL HSS &amp; CAPACITY BUILDING</b>            |                                     | <b>\$40,000</b>    |                  |            |  |
| <b>SOCIAL AND BEHAVIOR CHANGE COMMUNICATION</b>        |                                     |                    |                  |            |  |

|  |                                     |                    |  |            |  |
|--|-------------------------------------|--------------------|--|------------|--|
| Support malaria SBCC activities                  | TBD - Total Market Initiative (TMI) | \$500,000          |  | Nationwide | Support the development and implementation of the new SBCC strategy 2018-2022. Activity also includes updating and dissemination of malaria toolkit messages.  |
| Implementation of malaria SBCC activities        | MAHEFA MIARAKA                      | \$400,000          |  | 7 Regions  | Support the implementation of harmonized malaria messages at the community level and health facility levels.   |
|  | TBD - Post Mikolo Award             | \$500,000          |  | Nationwide |  |
| <b>SUBTOTAL SBCC</b>                             |                                     | <b>\$1,400,000</b> |  |            |  |
| <b>SURVEILLANCE, MONITORING, AND EVALUATION</b>  |                                     |                    |  |            |  |
| End user verification                            | TBD - Total Market Initiative (TMI) | \$100,000          |  | Nationwide | Implement quarterly end use verification activities to assess malaria commodity stock status at health facilities.   |
| Support to DHS, including malaria module         | MEASURE/DHS                         | \$700,000          |  | Nationwide | Support the implementation of the DHS, plus the malaria module, during the malaria season.   |
| Strengthen RHIS                                  | MEASURE/EVAL                        | \$1,000,000        |  | Nationwide | Provide targeted support to the NMCP to strengthen the RHIS. Activities will include data quality improvement, training, supportive supervision and materials. |
| Organizational capacity development for the NMCP | TBD                                 | \$100,000          |  | Nationwide | Support organizational development at the national level, to strengthen leadership and build capacity.   |
| Technical assistance to                          | CDC/IAA                             | \$10,000           |  | Nationwide | One CDC TDY to provide technical support for M&E   |

|  |                      |                    |  |                      |   |
|--|----------------------|--------------------|--|----------------------|---|
| support M&E activities   |                      |                    |  |                      | activities.   |
| <b>SUBTOTAL SM&amp;E</b>   |                      | <b>\$1,910,000</b> |  |                      |   |
| <b>OPERATIONAL RESEARCH</b>  |                      |                    |  |                      |   |
| Cost effectiveness of community level malaria treatment for children under 15 years of age | TBD                  | \$500,000          |  | Nationwide           | Conduct a study on the feasibility and cost-effectiveness of expanding malaria treatment at the community level to children under 15 years of age.                            |
| Reactive Case Detection OR   | TBD - Post IPM Award | \$490,000          |  | CHL and fringe areas | Implementation of the last year (year 4) of the reactive case detection operational research, to guide the country's pre-elimination strategy.                                |
| <b>SUBTOTAL OR</b>   |                      | <b>\$990,000</b>   |  |                      |   |
| <b>PRE-ELIMINATION</b>   |                      |                    |  |                      |   |
| Malaria elimination activities   | TBD                  | \$200,000          |  | Up to 8 Districts    | Support the NMCP elimination agenda. Activities include strategy development, training, QA, outbreak response, enhanced surveillance, radical treatment, and data management. |
| <b>SUBTOTAL PRE-ELIMINATION</b>  |                      | <b>\$200,000</b>   |  |                      |   |
| <b>IN-COUNTRY STAFFING AND ADMINISTRATION</b>  |                      |                    |  |                      |   |
| Staffing and administration support  | CDC/IAA              | \$225,000          |  | Nationwide           | Support for annual staffing and administration, including ICASS.  |
|  | USAID                | \$1,331,000        |  |                      |   |

|                                     |  |                     |                    |  |  |
|-------------------------------------|--|---------------------|--------------------|--|--|
| <b>SUBTOTAL IN-COUNTRY STAFFING</b> |  | 1,556,000           |                    |  |  |
| <b>GRAND TOTAL</b>                  |  | <b>\$23,000,000</b> | <b>\$5,774,000</b> |  |  |