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## Madagascar

## Malaria Operational Plan FY 2023

Suggested Citation: U.S. President's Malaria Initiative Madagascar Malaria Operational Plan FY 2023. Retrieved from [www.pmi.gov](http://www.pmi.gov)

This FY 2023 Malaria Operational Plan has been approved by the Acting U.S. Global Malaria Coordinator and reflects collaborative discussions with national malaria control programs and other partners. Funding available to support outlined plans relies on the final FY 2023 appropriation from U.S. Congress. Any updates will be reflected in revised postings.

This document was prepared in the early months of 2022 as the COVID-19 pandemic continued to evolve worldwide, including in PMI-partner countries. The effects of the pandemic on malaria control and elimination work in 2023 are difficult to predict. However, because U.S. Congressional appropriations for PMI are specific to work against malaria and any appropriations for work against the COVID-19 are specific for that purpose and planned through separate future U.S. government planning processes, this FY 2023 MOP will not specifically address the malaria-COVID-19 interface and will reassess any complementary work through timely reprogramming in countries.

## CONTENTS

<b>ABBREVIATIONS.....</b>	<b>4</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>6</b>
U.S. President’s Malaria Initiative .....	6
Rationale for PMI’s Approach in Madagascar.....	6
Overview of Planned Interventions .....	6
<b>I. CONTEXT AND STRATEGY .....</b>	<b>10</b>
1. Introduction .....	10
2. U.S. President’s Malaria Initiative (PMI).....	10
3. Rationale for PMI’s Approach in Madagascar.....	11
<b>II. OPERATIONAL PLAN FOR FY 2023 .....</b>	<b>15</b>
1. Vector Monitoring and Control .....	15
2. Malaria in Pregnancy .....	23
3. Drug-based Prevention .....	25
4. Case Management.....	26
5. Health Supply Chain and Pharmaceutical Management.....	36
6. SBC .....	40
7. SM&E.....	46
8. OR and Program Evaluation .....	50
9. Capacity Strengthening.....	52
10. Staffing and Administration .....	53
<b>ANNEX: GAP ANALYSIS TABLES .....</b>	<b>54</b>

## ABBREVIATIONS

ACT	Artemisinin-based Combination Therapy
AC	<i>Aide Clinique</i>
ACCESS	Accessible Continuum of Care and Essential Services
AL	Artemether-Lumefantrine
ANC	Antenatal Care
AQS	Service Quality Assurance
ASAQ	Artesunate-Amodiaquine
ASC	<i>Accompagnateur de Santé Communautaire</i>
BERCER	Bienvenue (Welcome); Entretien (Interview); Renseignement (Information); Choix (Choice), Explication (Explanation); Retour/Suivi (Return/Follow-up)
CDC	Centers for Disease Control and Prevention
CHU	<i>Centre Hospitalier Universitaire</i>
CHW	Community Health Worker
CHRD	<i>Centre Hospitalier de Référence du District/District Reference Hospital</i>
CSB	<i>Centre de Santé de Base</i>
CY	Calendar Year
DHP	Dihydroartemisinin-Piperaquine
DHIS2	District Health Information Software 2
DHS	Demographic and Health Survey
eLMIS	Electronic Logistics Management Information System
EPI	Expanded Program for Immunization
EUV	End-Use Verification
FETP	Field Epidemiology Training Program
FY	Fiscal Year
GAS	<i>Gestion des Achats et Stock</i>
G2G	Government-to-Government
G6PD	Glucose-6-Phosphate Dehydrogenase
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	Health Management Information System
HNQIS	Health Network Quality Improvement System
IPTp	Intermittent Preventive Treatment for Pregnant Women
IRS	Indoor Residual Spraying
ITN	Insecticide-Treated Mosquito Net
LDP+	Leadership Development Program Plus
LMIS	Logistics Management Information System
LSM	Larval Source Management
mCCM	Malaria Community Case Management

MDA	Mass Drug Administration
MIP	Malaria in Pregnancy
MIS	Malaria Indicator Survey
MOH	Ministry of Health
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
NMSP	National Malaria Strategic Plan
OR	Operational Research
OTSS+	Outreach Training and Supportive Supervision Plus
PBO	Piperonyl Butoxide
PE	Program Evaluation
Pha-G-Dis	<i>Pharmacie de Gestion des Districts</i>
Pha-Ge-Com	<i>Pharmacie de Gestion de Communauté</i>
PMI	U.S. President's Malaria Initiative
ProCCM	Proactive Community Case Management
RBM	Roll Back Malaria
RDQA	Routine Data Quality Assessment
RDT	Rapid Diagnostic Test
SBC	Social and Behavior Change
SM&E	Surveillance, Monitoring, and Evaluation
SMC	Seasonal Malaria Chemoprevention
SMS	Short Message Service
SP	Sulfadoxine-Pyrimethamine
SPARS	Supervision, Performance Assessment and Recognition Strategy
TA	Technical Assistance
TES	Therapeutic Efficacy Study
TIPTOP	Transforming Intermittent Preventive Treatment for Optimal Pregnancy
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization

## EXECUTIVE SUMMARY

To review specific country context for Madagascar, please refer to the [Country Malaria Profile](#), which provides an overview of the country malaria situation, key indicators, the National Malaria Control Program (NMCP) strategic plan, and the partner landscape.

### U.S. President's Malaria Initiative

Launched in 2005, [U.S. President's Malaria Initiative \(PMI\)](#) supports implementation of malaria prevention and treatment measures as well as cross-cutting interventions. PMI's 2021–2026 strategy, [End Malaria Faster](#), envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 24 countries in sub-Saharan Africa and three programs across the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Madagascar began implementation as a PMI partner country in fiscal year (FY) 2009.

### Rationale for PMI's Approach in Madagascar

The proposed PMI FY 2023 budget for Madagascar is \$25 million. Developed in consultation with the NMCP and Roll Back Malaria (RBM) stakeholders, proposed activities reflect current national and PMI strategies and draw on best-available data. It will scale proven interventions tested in Madagascar, strengthen its elimination activities, leverage the Government of Madagascar as well as other donors' resources, build the program's resilience to shocks and initiate government-to-government (G2G) financing.

### Overview of Planned Interventions

The proposed FY 2023 PMI funding for Madagascar is \$25 million. PMI will support the following intervention areas with these funds:

#### 1. Vector Monitoring and Control

PMI will support the collection of entomological monitoring data which will be shared with the NMCP and stakeholders for informed vector control implementation. PMI will strengthen laboratory and field efforts at the national and district levels and facilitate a national vector control working group. PMI will support insecticide procurement and implementation of indoor residual spraying (IRS), procurement and distribution of long-lasting insecticide-treated mosquito nets (ITNs), and a feasibility assessment and evaluation of larval source management (LSM) in aquatic agriculture (rice paddies).

## **2. Malaria in Pregnancy**

PMI supports the government's strategy for prevention of malaria in pregnancy (MIP), which aligns with World Health Organization (WHO) recommendations for antenatal care (ANC) beginning at 13 to 16 weeks of gestation, at least eight ANC visits, and at least three rounds of intermittent preventive treatment for pregnant women (IPTp). With FY 2023 funds, PMI/Madagascar plans to continue supporting: distribution of ITNs to pregnant women via ANC; IPTp at the health facility and community levels; management of malaria illness among pregnant women; and social and behavior change (SBC) to encourage ANC, IPTp, ITN use, and care-seeking for malaria illness among pregnant women. Building on the success of the Transforming Intermittent Preventive Treatment for Optimal Pregnancy (TIPTOP) project, which attained more than twice the national IPTp3+ coverage in three districts in 2021, PMI/Madagascar will support community health workers to deliver SBC and IPTp in additional localities.

## **3. Drug-based Prevention**

PMI has not begun supporting drug-based prevention other than IPTp as a routine intervention for malaria prevention in Madagascar, but in MOP 2022, funding was allocated to assess pilot implementation of seasonal malaria chemoprevention (SMC) in southern Madagascar. This project's concept, including both implementation and assessment, was early in the planning phase at the time of this writing and additional funding is not planned in FY 2023 MOP. The NMCP has intermittently deployed mass drug administration (MDA) in response to malaria upsurges, including in 2021 and 2022. Because these activities have occurred outside the context of operational research (OR), in alignment with PMI policy, these efforts have not been supported by PMI.

## **4. Case Management**

PMI continues to support the previous case management efforts for Madagascar, including support to procure commodities and provide technical assistance (TA) for the associated supply chain, train health workers and community health workers (CHWs), provide outreach training and supportive supervision plus (OTSS+), build lab capacity related to microscopy and molecular analysis, conduct elimination activities in five districts as well as therapeutic efficacy studies (TESs). PMI will also help the NMCP implement their new strategies, such as extension of malaria community case management (mCCM) to people of all ages, proactive community case management, and management of severe malaria cases using rectal artesunate in 92 high-burden communities in U.S. Agency for International Development (USAID)/PMI regions.

## **5. Health Supply Chain and Pharmaceutical Management**

PMI supports NMCP strategy aiming to ensure continual availability of quality products needed for malaria control and elimination (artemisinin-based combination therapies

[ACTs], rapid diagnostic tests [RDTs], sulfadoxine-pyrimethamine [SP], injectable artesunate, rectal artesunate, and ITNs) at health facilities and community level. To this, PMI leverages and works in coordination with the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), to support the NMCP to improve the supply chain at national, regional, and district levels. With FY 2023 funds, PMI will continue to support core supply chain activities including quantification, information systems to scale up the use of the new Logistics Management Information System (LMIS) tool for warehousing and distribution, training and supportive supervision at all levels and training/roll-out of the quantification analytical tool. PMI will continue to enhance private sector engagement in health products markets, sustain drone delivery of products to reach the unreached, implement End-Use Verification (EUV) and support the finalization and resources mobilization of the new supply chain strategic plan (2023–2027) resulting from the 2022 USAID/PMI and other donors' supported supply chain assessment.

## **6. Social and Behavior Change**

PMI continues its support for activities designed to increase knowledge and adoption of preventive behaviors and malaria care-seeking at the community level (Be M'Ray approach) and works with the MoPH and RBM partners to establish an innovative and effective program to empower and mobilize communities. With FY 2023 funds, PMI will collaborate with NCMP and its implementing partners to continue to strengthen community-based SBC approaches for malaria prevention and treatment and emphasize interpersonal communication methods which include promotion of the Be M'Ray approach, with particular emphasis on community-level management of malaria, implementation of harmonized key messages around malaria prevention, and care-seeking at the community and health facility levels. PMI will continue to mobilize religious community leaders and civic organizations to support and promote malaria prevention and control, and will also collaborate with the Peace Corps on activities to leverage health facilities as a platform to improve treatment-seeking and prevention of malaria. Finally, Global Fund will support the NMCP to cover SBC activities in regions not supported by PMI.

## **7. Surveillance, Monitoring, and Evaluation**

PMI continues its support to NMCP with the same objectives to reduce malaria morbidity and mortality. PMI support mainly focuses on strengthening the health information system by providing data of good quality to inform decision-making and by improving the surveillance system to a more accurate and timely response to outbreak or shocks. PMI will also support NMCP in progressive digitalization to improve data use and a more comprehensive health information system.



## **8. Operational Research and Program Evaluation**

PMI/Madagascar support for program- and policy-relevant operational research (OR) and program evaluation (PE) intends to: test promising new tools and approaches for remote locations; evaluate scale-up of malaria interventions in remote areas; identify effective combinations of interventions to reduce malaria transmission in remote areas and in those with highest incidence; identify effective local solutions to vector control and case management challenges; and advance toward malaria elimination. Several PMI-funded OR and PE activities were under way in Madagascar at the time of this writing, including: an assessment of the impact and acceptability of extending community management of malaria illness to all age groups; an evaluation of the epidemiological and entomological impacts and feasibility of drone-based larviciding; early planning for an assessment of the calendar year (CY) 2023 pilot implementation of SMC; and an evaluation to understand the feasibility and impacts of a new model of CHW supervision. Additional OR/PE activities are not planned in the FY 2023 MOP.

## **9. Capacity Strengthening**

PMI/Madagascar's approach to strengthening capacity includes facilitating increased collaboration with other Ministry of Health (MOH) directorates and government ministries, donors, and the private sector to strengthen the public health system across the country; supporting efforts to improve NMCP leadership and technical and organizational capacity; supporting in-country coordination through functional RBM and technical working groups (TWGs) platforms; and coordinating investment in surveillance and OR with NMCP and the Global Fund to inform policy and strategy decisions. PMI/Madagascar will continue to support these activities in FY 2023 MOP to strengthen capacity. Additionally, PMI/Madagascar will support approximately 10 frontline Field Epidemiology Training Program (FETP) fellows to bolster epidemiologic capacity at the district level and plan investments through a G2G mechanism currently under development.

# I. CONTEXT AND STRATEGY

## 1. Introduction

Madagascar began implementation as a U.S. President’s Malaria Initiative (PMI) partner country in fiscal year (FY) 2008. This FY 2023 Malaria Operational Plan (MOP) 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. The activities that PMI is proposing build on investments made by partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). This document provides an overview of the strategies and interventions in Madagascar, describes progress to date, identifies challenges and relevant contextual factors, and provides a description of activities planned with FY 2023 funding. For more detailed information on the country context, please refer to the Country Malaria Profile, which provides an overview of the country’s malaria situation, key indicators, the NMCP strategic plan, and the partner landscape.

## 2. U.S. President’s Malaria Initiative (PMI)

PMI is led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC). Launched in 2005, PMI supports implementation of 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), intermittent preventive treatment for pregnant women (IPTp), and drug-based prevention—as well as cross-cutting interventions such as surveillance, monitoring, and evaluation (SM&E); social and behavior change (SBC); and capacity strengthening. PMI’s 2021–2026 strategy, [End Malaria Faster](#), envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 24 countries in sub-Saharan Africa and three programs in the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Over the next five years, PMI aims to save lives, reduce health inequities, and improve disease surveillance and global health security.

Under the strategy, and building upon the progress to date in PMI-supported countries, PMI will work with NMCPs and partners to accomplish the following objectives by 2026:

- Reduce malaria mortality by 33 percent from 2015 levels in high-burden PMI partner countries, achieving a greater-than-80-percent reduction from 2000.

- Reduce malaria morbidity by 40 percent from 2015 levels in PMI partner countries with high and moderate malaria burden.
- Bring at least 10 PMI partner countries toward national or subnational elimination and assist at least one country in the Greater Mekong Subregion to eliminate malaria.

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

1. **Reach the unreached:** Achieve, sustain, and tailor deployment and uptake of high-quality, proven interventions with a focus on hard-to-reach populations.
2. **Strengthen community health systems:** Transform and extend community and frontline health systems to end malaria.
3. **Keep malaria services resilient:** Adapt malaria services to increase resilience against shocks, including COVID-19 and emerging biological threats, conflict, and climate change.
4. **Invest locally:** Partner with countries and communities to lead, implement, and fund malaria programs.
5. **Innovate and lead:** Leverage new tools, optimize existing tools, and shape global priorities to end malaria faster.

### 3. Rationale for PMI's Approach in Madagascar

#### 3.1. Malaria Overview for Madagascar

Madagascar is an island nation with a population of 28.2 million (National Institute of Statistics, 2021). Malaria is primarily transmitted between December and April, and 100 percent of the population is at risk. Malaria remains the fourth leading cause of mortality and the fourth most frequent reason for health facility visits in Madagascar (NMCP 2019). The number of reported malaria cases increased from 0.8 million in 2017 to 1.95 million in 2020 and 2.34 million in 2021, with approximately 500 to 600 malaria-related deaths each year (NMCP 2021). The malaria prevalence is estimated to be 7.5 percent (Demographic and Health Survey [DHS] 2021) and incidence to be 83.2/1,000 population/year (NMCP annual report 2021). However, incidence is heterogeneous, with some districts experiencing an incidence >400/1,000 population/year and others nearing elimination. The number of districts meeting pre-elimination criteria (defined locally as ≤1 case per 1,000 population per year) increased from 9 to 13 between 2017 and 2021.

The primary malaria parasites in Madagascar are *Plasmodium falciparum* and *P. vivax*; nationally, approximately 95 percent of infections are caused by *P. falciparum*. Primary vectors include *Anopheles gambiae* s.s., *An. arabiensis*, and *An. funestus*. Other potential vectors include *An. coustani* and *An. mascarensis*. Because it is linked via trade to affected countries, Madagascar is considered to be at high risk for introduction

of *An. stephensi*, a vector resistant to many key insecticides and considered an invasive species in Africa. *An. gambiae* s.l. is the predominant vector, and it has recently exhibited low- to moderate-intensity resistance to deltamethrin and/or permethrin in five districts, although susceptibility was fully restored with piperonyl butoxide (PBO).

For more detailed information on malaria indicators, please refer to the Country Malaria Profile.

### **3.2. Key Challenges and Contextual Factors**

Since 2020, the number of malaria cases has persistently increased. Certain districts in the southeastern and southern regions of Anosy, Vatovavy, Fitovinany, Ihorombe, and Haute Matsiatra are experiencing the highest incidence. While no formal assessment has been done to identify the causes of these increases, some common factors have been identified: insecurity, poor road infrastructure, frequent stockouts, limited human resources, and the poor quality of the nets distributed in 2018. Concurrently, care-seeking behaviors have remained fairly stable (DHS 2021 compared to Malaria Indicator Survey [MIS] 2016 data). The COVID-19 pandemic also disturbed implementation of the overall malaria strategy through prioritization of the COVID-19 supply chain at international and national levels, declines in service utilization, overloading of human resources (e.g., reassignment of staff to respond to COVID-19, staff ill and absent after contracting COVID-19), limits on travel hampering oversight at peripheral levels, inefficiencies in transitioning to virtual meetings, and insufficient protection of health staff.

Several factors affect health outcomes in Madagascar. Impacts of climate change manifest regularly as cyclones in the western and eastern areas, and drought in the south. These hazards have negative impacts on health outcomes in general and may particularly impact malaria, such as when drought caused populations to flee Androy region, where malaria incidence is low, to Taolagnaro, where malaria incidence is high. In terms of politics, since its independence in 1960, Madagascar has experienced bloody coups d'état almost every decade, which slows its development. Since 2014, when the U.S. government resumed official collaboration with the Government of Madagascar, six ministers have run the Ministry of Health (MOH), resulting in frequent changes in priorities and staff turnover at the directorate level. Finally, the government-led COVID-19 response and management of the Global Fund grant has revealed some issues with mismanagement.

### **3.3. PMI's Approach for Madagascar**

Madagascar's malaria national strategic objectives include reducing malaria morbidity at  $\geq 30$  percent and mortality at  $\geq 50$  percent between 2018 and 2022 through improvements in leadership, management, and coordination at all levels; making

malaria commodities available in  $\geq 95$  percent of health facilities at all levels; protecting at least 90 percent of the population through appropriate prevention measures; testing  $\geq 95$  percent of suspected malaria cases and treating 100 percent of identified cases; attaining correct malaria prevention and control behaviors among 90 percent of the population; reducing locally acquired malaria in the 13 pre-elimination districts by  $\geq 30$  percent; responding to  $\geq 80$  percent of urgent or epidemic situations within 15 days of notification; and reinforcing monitoring and evaluation quality to guide appropriate decisions at all levels. Madagascar's approach has included prioritizing and leveraging community health services and engaging the private sector to improve access to malaria interventions, and coordinating across sectors, partners, and administrative levels.

PMI/Madagascar's approach aligns closely with these objectives and approaches:

- **Invest locally:** (Leadership Development Program Plus [LDP+], government-to-government [G2G] partnership, and Roll Back Malaria (RBM) support and coaching).
- **Reach the unreached:** support 18,500 community health workers (CHWs) (including expanded activities like Transforming Intermittent Preventive Treatment for Optimal Pregnancy (TIPTOP), and age extension, etc.); delivery supplies via drone.
- **Strengthen community health systems:** support 18,500 CHWs (with expanded activities including TIPTOP, age extension, new supervision model).
- **Strengthen health systems:** support large CHW networks and expand services.
- **Innovate and lead:** deliver supplies via drone; conduct larval source management (LSM) operational research (OR), malaria community case management (mCCM) OR, multidisciplinary team investigation of disease outbreaks, and integrated biological surveillance of sites.

Since 2019, PMI has supported the NMCP's goal of progressive elimination of malaria as defined in the National Malaria Strategic Plan (NMSP) 2018–2022. PMI has supported pilot elimination activities in three districts, focusing on building a strong foundation of malaria prevention, case management with appropriate and high-quality diagnostics, surveillance, and response to upsurges and outbreaks at all levels. PMI supported coordination of interventions with functional elimination technical working groups (TWGs) at the national level and for each of the three pilot districts, implementation of a quantitative assessment of malaria risk factors in the three districts, provision of cyclical training and supervision of health providers via outreach training and supportive supervision plus (OTSS+) on malaria diagnosis and case management, foci investigations in the three districts, and training for health workers in bordering

districts in malaria case management to reduce importation of malaria cases from control districts to pilot elimination sites. The malaria incidence in the three pilot districts has remained ~1 per 1,000 people per year in 2020–2021. PMI also supported an exercise to identify high-risk populations to better focus the prevention and response efforts.

Given the challenges with turnover at the central level, poor infrastructure, and natural and sociopolitical disruptions, PMI has been prioritizing strengthening the health systems via local capacity development, reaching the unreached, and innovating. PMI continues to coordinate with key donors and with the in-country RBM partnership through regular calls with the Global Fund and RBM and active participation in the national strategic monitoring committee for community case management. PMI also designed with NMCP a regional coaching system to better support the district and health centers. An NMCP staff member and a partner are collaborating to help regional and district staff quantify commodities, implement resurgence response, and improve reporting. PMI also participates in cross-cutting USAID working groups for disaster and epidemic management, gender, and environment, and collaborating with faith-based organizations. Finally, PMI supports the NMCP to test new tools and processes and scale those that work (e.g., LSM, cIPTp, mCCM, and proactive community case management [ProCCM]), implement new initiatives to reduce stockouts, and adopt evidence-based approaches such as using data to stratify/segment areas for tailored combinations of interventions.

### **3.4. Key Changes in This MOP**

No substantial changes in strategy, activities, or budget are proposed, although the aims of the FY 2023 MOP are to incrementally increase local investment through a G2G mechanism, begin moving toward diagnosis and management of *P. vivax* infections, and expand access to malaria-related services via CHWs.

## **II. OPERATIONAL PLAN FOR FY 2023**

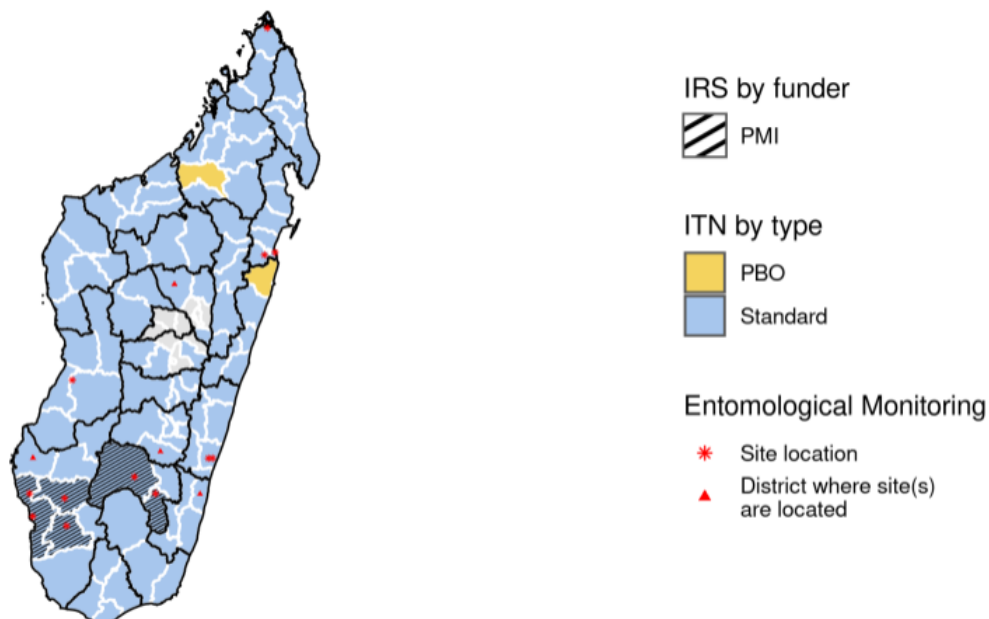
### **1. Vector Monitoring and Control**

#### **1.1. PMI Goal and Strategic Approach**

PMI supports the NMCP's goal as described in the revised NMSP 2018–2022. Madagascar recommends both IRS and ITNs as the two major insecticide-based vector control interventions with an emphasis on using insecticides that are effective against the malaria vectors. PMI continues to support entomological monitoring in 13 sentinel sites to evaluate vector bionomics, susceptibility of local vectors to World Health Organization (WHO)–approved insecticides, quality IRS campaigns, and residual efficacy of insecticides. Since 2008, PMI has supported focal IRS in 48 communes (on average) in low transmission districts of central highlands of Madagascar. From 2016, PMI shifted its support with blanket IRS in high-transmission districts of coastal regions (average five to nine districts per year). In calendar year (CY) 2022, PMI will support the IRS in five districts. The NMCP also recommends LSM as a complementary vector control tool to address outdoor biting behaviors; PMI is supporting an LSM OR study in the two districts of Morombe and Ankazobe to determine feasibility and impact of LSM in rice paddies. The NMSP objective is to protect at least 90 percent of the population in targeted areas with ITNs and ensure a minimum 85 percent coverage with high-quality IRS operations in targeted districts. Both PMI and the Global Fund support these vector control intervention efforts in Madagascar. A summary of activities for CY 2021 can be seen in Figure 1.

**Figure 1. Map of Entomological Monitoring Sites and Vector Control Activities Supported by PMI in Madagascar**

Vector Control Activities (2021)



**1.2. Recent Progress (January 2021 to March 2022)**

- Between October 2021 and January 2022, PMI-supported entomological monitoring conducted in nine sentinel sites in eight districts and five regions. Data on vector species composition, density, and behavior indoors and outdoors were collected using human landing catches. Data on vector resting behavior was collected using Prokopack and mouth aspirators indoors and outdoors around suspected natural mosquito resting places and constructed pit shelters deployed outdoors. Additional mosquito larval surveys were conducted in an additional 24 sites (12 control, 12 with larvicide implementation) as part of an LSM study in the two districts of Morombe and Ankazobe in 2022.
- From 2020 to 2021, entomological monitoring was conducted in 12 sites which included: 1) four IRS sites and two control (non-IRS) sites; 2) two sites in areas where IRS was withdrawn in 2019 (Antsikafoka, commune of Mahambo, Fenerive Est district and Ampasimpotsy, Manakara district) after four and three years of IRS blanket coverage, respectively, in each site; 3) two control sites in areas where IRS was withdrawn in 2019 (Vavatenina and Marofarihy); 4) one site in a district in an elimination setting (Anamakia, Antsiranana I district; non-IRS); and 5) and one site in a district where the



NMCP adopted only mass distribution of ITNs as unique malaria vector control strategy (Ankilivalo, Mahabo district). For more information about entomological monitoring from 2020 to 2021, please refer to the 2021 Entomological Report ([www.pmi.gov](http://www.pmi.gov)).

- PMI supports longitudinal entomological monitoring in Antsiranana I, one of the three elimination districts.
- Community-based entomological surveillance activities planned for 2020 and 2021 were previously postponed due to COVID-19, but PMI supports regional training of entomologists and NMCP in community-based entomological surveillance. Existing CHW networks are leveraged to support mobilization and entomological monitoring for IRS and a pilot LSM implementation.
- PMI supports technical assistance (TA) to NMCP for IRS and a pilot larviciding implementation and evaluation.
- Along with the Global Fund, PMI contributed to the distribution of over 13 million ITNs to 101 districts (standard and PBO nets) to protect more than 27 million people during the 2021 mass distribution campaign. PMI's contribution included the procurement and distribution of 3.67million nets, including 275,350 PBO nets, to target over 7.8 million people.
- Procured more than two million surgical masks to help prevent COVID-19 during the 2021 ITN mass distribution campaign.
- Completed the community-based ITN distribution activity initiated in FY 2020: In total, 786,281 ITNs including 111,400 PBO nets were distributed in 12 districts to protect more than four million people.
- Supported ITN durability monitoring, including collection of 36-month bioefficacy of the DawaPlus® 2.0 and PermaNet® 2.0 nets distributed in 2018 and bioefficacy of Olyset Plus®, Yahe LN, and PermaNet® 2021 upon arrival in Madagascar in 2021.
- Supported community SBC activities focused on correct use and consistent care of ITNs. Supported community-level SBC activities including mass- and mid-media approaches aimed to increase the number of household champions correctly using ITNs. For more information, please refer to the **SBC section** below.
- Supported community mobilization during the IRS activity.
- Supported the planning, implementation, and evaluation of IRS in five districts, covering 213,922 structures and protecting 885,814 people during the 2021 spray campaign. For more information about the IRS activity, please refer to the [2021 End of Spray Report](#).

**Table 1. Insecticide-Treated Mosquito Net Distribution from 2018 to 2021**

Year	Level Nationwide / Region / State / Province	Mass Campaign	Antenatal Care	Expanded Program for Immunization	School 1F	Community	Other	Brand
2018	106 districts	12,392,831			N/A			Dawa plus Permanet 2.0 SafeNet Yorkool
2019	106 districts		199,788	331,670	N/A			SafeNet Yorkool
2020	101 districts		305,849	636,370	N/A		12,660	SafeNet Yorkool Royal Sentry Olyset Plus
2020	12 districts				N/A	735,144		Royal Sentry Olyset Plus
2021	12 districts				N/A	51,137		Royal Sentry Olyset Plus
2021	101 districts	13,318,689						Yahle Permanet 3.0 Olyset Plus SafeNet
2021	11 districts (emergency)						8,200	SafeNet
2021	101 districts		388,059					SafeNet
2021	101 districts (social marketing)						42,225	SafeNet

### 1.3. Plans and Justification for FY 2023 Funding

The FY 2023 funding tables contain a full list of vector monitoring and control activities that PMI proposes to support in Madagascar with FY 2023 funding. Please visit [www.pmi.gov/resources/malaria-operational-plans-mops](http://www.pmi.gov/resources/malaria-operational-plans-mops) for these FY 2023 funding tables.

#### 1.3.1. Entomological Monitoring

PMI will conduct entomological monitoring in 36 sites in districts receiving ITNs, IRS, and LSM, as well as in associated control sites and one elimination district. Activities include vector bionomics, insecticide resistance, larval surveillance, and insecticide

residual efficacy monitoring. Activities for enhanced surveillance of *An. stephensi* will also be included in accordance with the PMI *An. stephensi* action plan guidance for high-risk countries. Insecticide resistance monitoring will be conducted in the 20 sites typically monitored each year and six additional sites included in the 2022 LSM OR project. By using question-driven entomological monitoring, subsequent data will provide key information to make informed decisions about vector control implementation in Madagascar across the different regions and ecological zones. PMI will also continue to provide TA and bridge capacity of local research institutions

### **Summary of Distribution and Bionomics of Malaria Vectors in Madagascar**

As of 2021, while *An. gambiae* s.l. is the primary vector, the *Anopheles* diversity is high across the country with *An. funestus* s.l. and *An. mascarensis* also known as vector species. One species, *An. coustani*, has been incriminated as a potential emerging vector in the country and is commonly found across all ecosystems and with infective sporozoites, suggesting a role of *An. coustani* in malaria transmission. *An. funestus* s.l. is found in humid/tropical and equatorial settings as well as in subdesert zones. *An. coustani*, was collected in humid/tropical settings, in subdesert zone (Bezaha) and in the fringe of the Central Highlands with tropical high-altitude climate, and *An. mascarensis* was predominantly found from the Central Highlands through the humid/tropical east and southern subdesert and dry forests, although detections from around the island have been reported. *An. gambiae* s.l. is the primary vector collected in all sites using all collection methods for both indoor and outdoor collections. Vector densities and biting rates are highest indoors and outdoors in March and April in all the sites. Indoor resting density of *An. gambiae* s.l. was very low (0 to 1.4 vector[s] per room per day), and outdoor resting has also been observed. In CY 2022 outdoor resting collections were conducted in eight districts surveyed in the Atsimo Andrefana and Ihorombe regions, and all sites had vectors resting outdoors in natural or pit shelters (98.8 percent of vectors were *An. gambiae* s.l. and the remaining were *An. funestus* s.l. and *An. coustani*). *An. gambiae* s.l. biting rates were highest during the first part of the night, as early as 8pm through 11pm and both indoors and outdoors, regardless of the site or interventions used.

### **Status of Insecticide Resistance in Madagascar**

Insecticide resistance monitoring in Madagascar is focused on insecticides used in ITNs and IRS as these are the primary vector control interventions. In CY 2021 (from September 2020 to July 2021) *An. gambiae* s.l. was susceptible to pirimiphos-methyl, clothianidin, and chlorfenapyr in all 13 sites where the tests were conducted. Some degree of susceptibility to pyrethroids (deltamethrin and/or permethrin) remained in 10 districts; however, *An. gambiae* s.l. showed low-to-moderate intensity resistance to deltamethrin and/or permethrin in five districts. PBO fully restored susceptibility to both pyrethroids tested in the areas of resistance.

### 1.3.2. ITNs

PMI will continue to support the procurement of ITNs and provide technical support to the country's CY 2024 mass distribution campaign. In response to evidence of insecticide resistance in select entomology monitoring sites, PMI/Madagascar will continue to transition to new types of ITNs (e.g., PBO synergist or dual-insecticide ITNs) in coordination with the Global Fund. TA will include PMI participation in the national committee for the campaign coordination (*Comité national de coordination de la campagne*) for donors' coordination and resource mobilization. PMI will also support efforts to increase ITN ownership through improved census, quantification, community mobilization activities, and establishment of a distribution site for each *fokontany*. PMI will support the NMCP's monitoring and evaluation unit to digitize the reporting system successfully piloted during the CY 2021 campaign. PMI will support collection of the 36-month data point in the durability monitoring of ITNs distributed in 2021, including PermaNet White 3.0 (PBOs) in the Tamatave II district, Safenet White in the Vangaindrano district, and Generique Net White (Yahe) in the Mananjary district.

Finally, behaviors around ITN care and use have changed slightly, including slight decreases in reported ITN use among pregnant women and children in the DHS 2021, and frequent use of markedly torn ITNs as documented in durability monitoring assessments following the CY 2018 ITN distribution campaign. To maintain appropriate behaviors, PMI will focus its SBC efforts on known facilitators, including self-efficacy and promoting positive social norms around ITN use and care.

Please see the **SBC section** below for details on challenges and opportunities to improve intervention uptake and maintenance.

#### **ITN Distribution in Madagascar**

In Madagascar, ITNs are distributed via mass campaigns every three years. The next mass distribution campaign is planned in CY 2024. Continuous distribution channels include: 1) to general community using a voucher/coupon system with schools as the pick-up site, which involves collaboration between the MOH and the Ministry of Education; 2) to pregnant women at antenatal care (ANC) visits; 3) During EPI encounters for fully vaccinated children; and 4) to children under five years of age in outpatient clinics. Other channels include social marketing, distribution during emergencies such as cyclones, for internally displaced people in the south, and for key populations as defined in the NMSP. In CY 2022, 2.9 million standard ITNs will be distributed in 10 elimination districts that did not benefit from the 2021 mass distribution campaign. Due to funding limitations, the country began transitioning to PBO ITNs in only two of the districts with evidence of insecticide resistance through continuous distribution in 2020, and distributed only PBO ITNs to these districts during its 2021 mass distribution campaign. In consultation with the Global Fund, there are plans to begin distributing dual-insecticide ITNs in select districts in the South and Southeast

regions through the 2024 mass distribution campaign based on resistance data and sustained elevations in malaria incidence.

Please refer to the **ITN Gap Analysis Table** in the [annex](#) for more detail on planned quantities and distribution channels.

Streamlined DM will be introduced with the CY 2021 ITN campaign starting Aug./Sept. 2022. For the CY 2018 ITN campaign, a full durability monitoring protocol was implemented; results are summarized in Table 2.

**Table 2. Durability Monitoring**

Campaign Date	Site	Brand	Cone Bioassay Mean Mortality at 24 hours				
			On Arrival*	Baseline (1-month)	12-months	24-months	36-months
Sept. 2018	Bekily	DawaPlus® 2.0 (deltamethrin)	86.4	84.0	45.9	29.0	44.5
	Farafangana	DawaPlus® 2.0 (deltamethrin)		84.5	43.3	24.0	37.3
	Maintirano	DawaPlus® 2.0 (deltamethrin)		84.9	50.8	21.2	35.5
	Taolagnaro	PermaNet® 2.0 (deltamethrin)	83.9	-	44.5	25.8	47.7

\*Since 2018, the NMCP has recommended systematically testing all ITN brands on arrival.

### 1.3.3. IRS

In CY 2024, PMI will support the planning, implementation, and evaluation of IRS in approximately five districts using susceptible, WHO-prequalified insecticides: clothianidin, clothianidin + deltamethrin, and organophosphates. Selection of districts and insecticides will depend on entomological data, malaria burden, and other factors, including complementary interventions and accessibility.

IRS support will include appropriate SBC messages to encourage acceptance of IRS and refraining from washing/plastering walls along with continued ITN use.

**Table 3. PMI-supported IRS Coverage**

Calendar Year	District	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide Active Ingredients
2021	Ihosy, Iakora, Betioky Sud, Tulear II, Sakaraha	213,922	98.5%	885,814	Clothianidin + deltamethrin, Clothianidin, Pirimphos-methyl CS

Calendar Year	District	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide Active Ingredients
2022**	Ihosa, Iakora, Ivohibe, Isandra and Fort Dauphin	182,210	TBD	TBD	Clothianidin, Clothianidin + deltamethrin, Pirimphos-methyl CS
2023**	5 districts	TBD	TBD	TBD	TBD
2024**	5 districts	TBD	TBD	TBD	TBD

\*\* Planned

### IRS Insecticide Residual Efficacy in Madagascar

Wall bioassays were conducted monthly following the CY 2021 IRS campaign and at T4 the results were: 95 percent mosquito mortality for Fludora Fusion; 100 percent mosquito mortality for Sumishield; and 98 percent mosquito mortality for Actellic. Residual efficacy monitoring will continue until mortality falls below the 80 percent mortality threshold for two consecutive months.

### Other Vector Control

In CY 2022, PMI supported OR to evaluate the feasibility and impact of LSM in aquatic agriculture in two districts with high malaria burden where ITN coverage is high, rainy seasons are <6 months, and where aquatic agricultural sites are relatively few, fixed, and findable in Madagascar. The three key objectives of the study include:

1. Evaluate the cost, logistics, cost effectiveness, and feasibility of drone application of larvicide in Madagascar.
2. Evaluate whether complementary larviciding of aquatic habitats/rice paddies in combination with pyrethroid-only ITNs (in these locations vectors are still susceptible to pyrethroids) provides additional control of malaria vectors in Madagascar by reducing larval and adult densities, indoor and outdoor human biting rates, sporozoite rate, and the entomological inoculation rate.
3. Evaluate whether complementary larviciding reduces malaria transmission as indicated in Health Management Information System (HMIS) data and cross-sectional surveys of prevalence (based on rapid diagnostic test [RDT]) at baseline and endline.

The intervention began in January 2022 and will continue through June 2022, with epidemiologic data collection continuing until June 2023. If the results are favorable, PMI plans to continue to support LSM in one to two districts in subsequent years.

## **2. Malaria in Pregnancy**

### **2.1. PMI Goal and Strategic Approach**

PMI supports the government's strategy for prevention of MIP in PMI intervention areas and complements the investments of other partners such as the Global Fund. MIP interventions in Madagascar include the distribution of ITNs, IPTp at the health facility and community levels, management of malaria illness among pregnant women, and SBC to encourage ANC, IPTp, ITN use, and care-seeking for malaria illness among pregnant women.

Madagascar's national guidelines align with the 2016 WHO ANC recommendations, which include promoting eight antenatal contacts during pregnancy with ANC beginning by 13 to 16 weeks of pregnancy, and include providing IPTp via at least three doses of sulfadoxine-pyrimethamine (SP) given at monthly intervals beginning at 13 weeks of pregnancy. The NMCP is implementing IPTp in 101 districts currently classified as control or pre-elimination districts under its NMSP (2018–2022). In these targeted districts, the NMCP aims to cover 60 percent of pregnant women with IPTp3 in 2022. In 2020, the NMCP updated its treatment recommendations for uncomplicated MIP to allow for the administration of ACTs to pregnant women during the first trimester.

A malaria communication plan has been developed to address the frequency and timing of ANC visits. The plan calls on CHWs and health care providers to encourage pregnant women to begin ANC visits at health facilities during the first trimester.

Barriers to prevention of MIP include limited funding allocated by the NMCP and delays in the release of funds provided through the Global Fund; limited human resources related to high turnover of staff and weaknesses in recruiting, training, and supporting new staff; gaps in support for the MIP strategy at the levels of hospitals and the private sector; continued challenges with the quality of MIP-related data; and sporadic stockouts of SP in some districts.

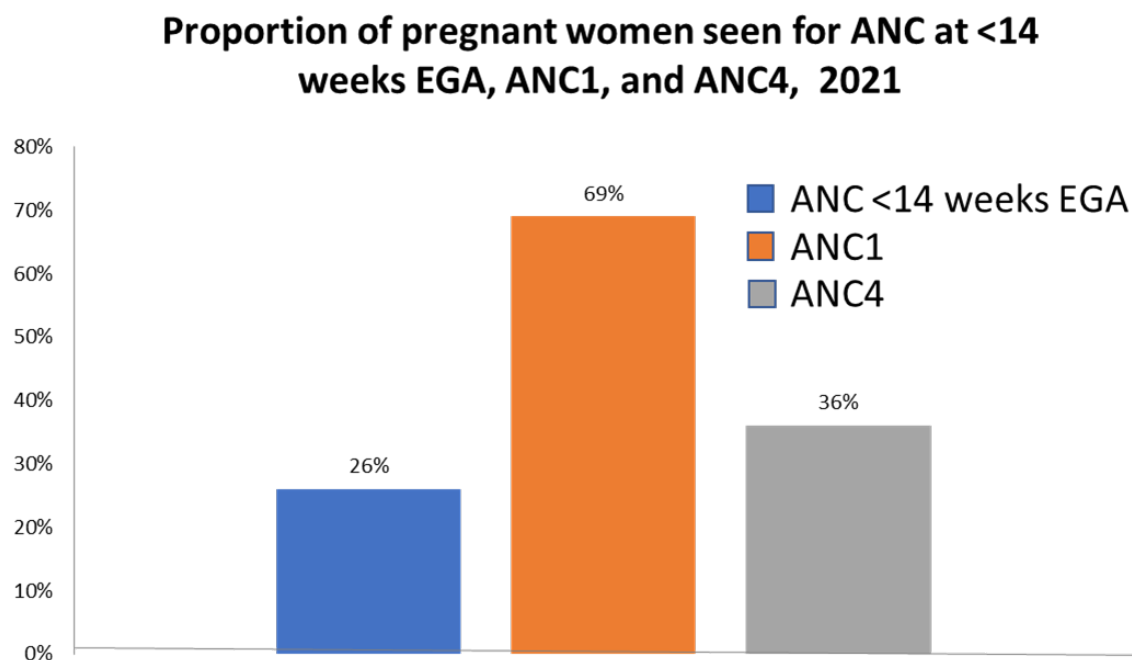
Progress has included continued PMI support to improve supply of SP for IPTp at the district- and basic health facility–levels, coordination between malaria and maternal health programs via a national MIP TWG, and SBC to promote appropriate, timely ANC and uptake of IPTp. PMI also supported strengthening routine reporting of MIP indicators as part of the broader monitoring and evaluation support to the MOH to ensure that core indicators for IPTp1, 2, 3, and 3+ are included in the HMIS and are reported routinely. Additionally, a UNITAID-funded, community-based IPTp project (TIPTOP) began in Mananjary district in CY 2018 and was extended to Vohipeno and Toliary II districts in late CY 2019. The project was completed in CY 2021. In this project, PMI-supported CHWs promoting ANC attendance and provided IPTp at the community level. In CY 2022, PMI plans to assist the NMCP to begin scaling up the

TIPTOP model through support to the MIP TWG to update national policies, training, and support tools to include community-based IPTp. PMI will also facilitate relevant knowledge transfer between implementing partners regarding community-based IPTp and related SBC.

PMI plans to procure 2.2 million SP treatments and 200,000 ITNs for distribution during ANC in CY 2022, complementing support from the Global Fund to ensure adequate stocks.

## 2.2. Recent Progress (CY 2021)

**Figure 2. Attendance for Antenatal Care in Madagascar, 2021**



Based on national routine health data from 2021, early ANC attendance (at <14 weeks estimated gestational age) remained fairly low at 26 percent, although ANC1 reached 69 percent; 36 percent of pregnant women completed at least four ANC visits, and 24 percent of women completed IPTp3. These results are similar to those of the DHS 2021, which estimated that 31 percent of pregnant women received IPTp3+. In contrast, in the three TIPTOP districts from 2018–2021, ANC attendance in the first trimester increased from 18 percent to 40 percent, ANC4 attendance rates increased from 20 percent to 60 percent, and IPTp3 coverage increased from 33 percent to 81 percent.

Results of the TIPTOP project were disseminated at central and district levels and are available [here](#).



### **2.3. Plans and Justification for FY 2023 Funding**

PMI/Madagascar will continue to support MIP activities as described in the **Recent Progress section** and will expand support for community-based MIP activities, including delivery of IPTp and SBC, in localities surrounding the TIPTOP districts.

The FY 2023 funding tables contain a full list of MIP activities that PMI proposes to support in Madagascar with FY 2023 funding. Please visit [www.pmi.gov/resources/malaria-operational-plans-mops](http://www.pmi.gov/resources/malaria-operational-plans-mops) for these FY 2023 funding tables.

Please refer to the **SP Gap Analysis Table** in the [annex](#) for more detail on planned quantities and distribution channels.

Finally, PMI will continue to support SBC related to MIP as part of the support for strengthening malaria SBC to encourage pregnant women to attend at least four ANC visits and complete at least three courses of IPTp. Please see the **SBC section** below for details on challenges and opportunities to improve intervention uptake or maintenance.

### **3. Drug-based Prevention**

PMI has not begun supporting drug-based prevention other than IPTp as a routine intervention for malaria prevention in Madagascar, but in MOP 2022, funding was allocated to assess pilot implementation of seasonal malaria chemoprevention (SMC) in southern Madagascar. This project's concept was in the planning phase at the time of this writing and implementation and assessment are planned for CY 2023. The NMCP has intermittently deployed mass drug administration (MDA) in response to malaria upsurges, but these efforts have not been supported by PMI to date.

#### **3.1. SMC**

##### **PMI Goal and Strategic Approach**

The NMCP's NMSP supports SMC as a standard intervention among children aged 3 to 59 months during peak transmission season in areas with highly seasonal malaria transmission as outlined by WHO, and supports piloting SMC among children aged 6 to 13 years of age as well as migrant adults.

A pilot of SMC implementation in the high-burden southern regions of Madagascar was in the early planning phase at the time of this writing; assessment plans will be developed after the implementation plans are clear. The costs of commodities and implementation are to be covered by the Global Fund; PMI allocated support for TA to assess this pilot in MOP 2022.

### **3.2. Recent Progress (CY 2021)**

Global Fund–supported procurement of sulfadoxine-pyrimethamine + amodiaquine was initiated for the SMC pilot and stakeholders began holding coordination meetings.

### **3.3. Plans and Justification for FY 2023 Funding**

In CY 2023, PMI plans to support the assessment of pilot implementation of SMC as funded in MOP 2022. No additional support for SMC is planned for MOP 2023 pending the results of the pilot.

### **3.4. Other Drug-based Prevention**

Madagascar’s NMSP includes use of MDA during emergency situations or malaria epidemics to be delivered as dihydroartemisinin-piperazine (DHP) in three monthly rounds to persons >2 months of age in the most impacted areas. MDA in Madagascar has been supported by the Global Fund.

### **3.5. PMI Goal and Strategic Approach**

PMI does not currently support implementation of MDA outside the context of OR.

### **3.6. Recent Progress (CY 2021)**

NMCP delivered MDA in 11 of the highest-burden districts in March and June 2021, targeting 660,000 people and achieving 89 percent coverage in both rounds. In April 2022, NMCP delivered one round of MDA in a single district (Taolagnaro). Plans included delivering a second round in Taolagnaro in May 2022 as well as in 10 additional districts pending funding for implementation.

### **3.7. Plans and Justification for FY 2023 Funding**

While no funding has been allocated for MDA in MOP 2023, PMI/Madagascar will continue to provide TA regarding decisions to implement and monitor MDA activities planned by the NMCP.

## **4. Case Management**

### **4.1. PMI Goal and Strategic Approach**

PMI supports all aspects of the NMCP approach through support to national-level policy and programmatic activities, commodity procurement, and improvement of facility- and community-level health worker performance. PMI also supports nationwide procurement of malaria RDTs, ACTs, and injectable and rectal artesunate, accounting for approximately half of the country’s needs.

PMI’s current case management support in Madagascar covers 11 of Madagascar’s 23 regions, which represents an estimated 13,500,000 persons. These regions include an

estimated 18,500 CHWs, 2,995 health workers, 1,524 public and private health facilities, and 118 hospitals. PMI also supports outreach training and supportive supervision activities in three elimination districts and four surrounding districts. In addition, PMI has been supporting laboratory technical training, development and implementation of standard operating procedures, and maintenance of laboratory equipment. The Global Fund has been supporting the development and implementation of the NMCP plan for laboratory quality assurance/quality control.

The NMCP's NMSP and treatment guidelines promote a comprehensive case management strategy including universal, quality-assured parasitological testing of all cases of suspected uncomplicated malaria; prompt and effective treatment of confirmed, uncomplicated cases with ACT; and pre-referral treatment or definitive management of severe febrile illness and severe malaria. Appropriate case management constitutes the second specific objective in Madagascar's NMSP: "To test at least 95 percent of suspected cases by RDT or microscopy, and to treat 100 percent of confirmed cases" at all levels of the health system, including the community level and in the private sector. This aligns with the WHO's "3T" (Test-Treat-Track) model. Madagascar's case management guidelines also align with WHO recommendations.

NMCP directives (NMCP norms and directives for malaria case management, January 2021) require capacity to diagnose malaria using RDTs at all levels. *Centre de Santé de Base* (CSB)<sup>1</sup>, CSB2, *Centres Hospitaliers de Références du District*/district reference hospitals (CHRDs) and *Centres Hospitaliers Universitaires*/university hospitals (CHUs) should also diagnose malaria using microscopy, particularly when cases are suspected of being severe. CHRDs and CHUs are to provide microscopic follow-up of patients on days 3, 7, and 14 after hospital admission. In elimination districts, all cases are to undergo microscopic confirmation of *Plasmodium* species.

In control districts, treatment for uncomplicated malaria includes an ACT. First-line treatment is artesunate-amodiaquine (ASAQ), and second-line treatment is artemether-lumefantrine (AL). According to the country's case management guidelines, *P. vivax* malaria should be treated with ASAQ followed by a 14-day course of primaquine; however, this has not been implemented because of limited availability of microscopy at health facilities to determine parasite species, and lack of glucose-6-phosphate dehydrogenase (G6PD) testing nationwide. Thus, *P. vivax* cases and mixed infections receive the same treatment as *P. falciparum* cases. Discussions regarding radical treatment of *P. vivax* and routine testing for G6PD deficiency have begun and will continue. Routine data from January to December 2021 show that infections likely caused by non-*P. falciparum* species (based on diagnosis using *P. falciparum* / Pan RDTs) are being diagnosed in all 23 regions (median percent of cases caused by non-*P. falciparum* species, by region: 5.2 percent; interquartile range: 3.7–8.4; maximum: 23 percent, Vakinankaratra region).

Severe malaria cases are treated with injectable artesunate followed by an oral ACT. Rectal artesunate was introduced in 2020 at the community level and in health facilities in more than 80 districts for pre-referral treatment of children under five years of age with severe disease; however, due to recent WHO guidance to not extend the coverage of rectal artesunate, the NMCP decided to continue its rectal artesunate program where it is currently deployed and to pause expansion pending further deliberation by MOH.

In the 13 districts with incidence <1/1,000 per year, diagnosis is made by RDT in community health facilities, and microscopy is performed to identify parasite species. Treatment for uncomplicated malaria in these districts includes an ACT plus low-dose primaquine (for treatment of gametocytes) except among pregnant women, who receive only an ACT (this is captured in District Health Information Software 2 [DHIS2] with the newly revised HMIS form since 2021). Low-dose primaquine is contraindicated in pregnant women and among lactating women whose infants are less than six months of age. However, low-dose primaquine is not always given due to stockouts, and microscopy remains limited but is slowly being scaled up.

PMI is currently implementing elimination activities in three districts of Antsirabe II, Antsiranana I, and Faratsiho (see Figure 3 below).

**Figure 3. Clinical OTSS+ Scores by Round and District (Three Elimination Districts). Note: OTSS+ Activities in Faratsiho Began Later Than in the Other Two Districts, so Only Two Rounds of Data Are Available.**

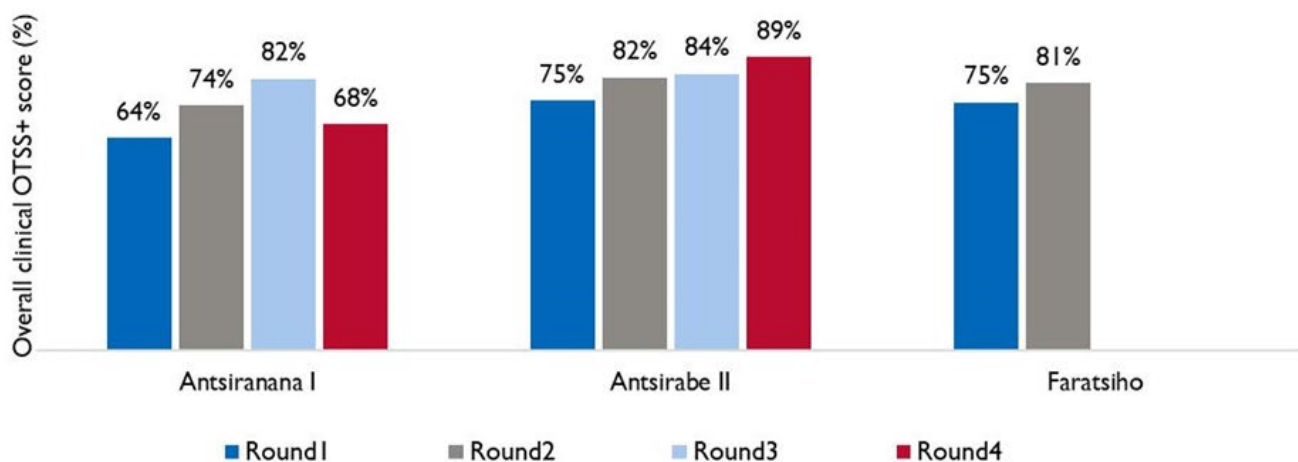


Figure 3 presents the overall results of the clinical OTSS+ visits by round in the three pilot elimination districts. HPs performance gradually increased in all districts, with only one exception in Antsiranana I for round 4 where the decrease may be due to slight changes in the methodology used to implement the clinical OTSS+ outpatient

department checklists (observation versus questions/responses implemented in previous rounds).

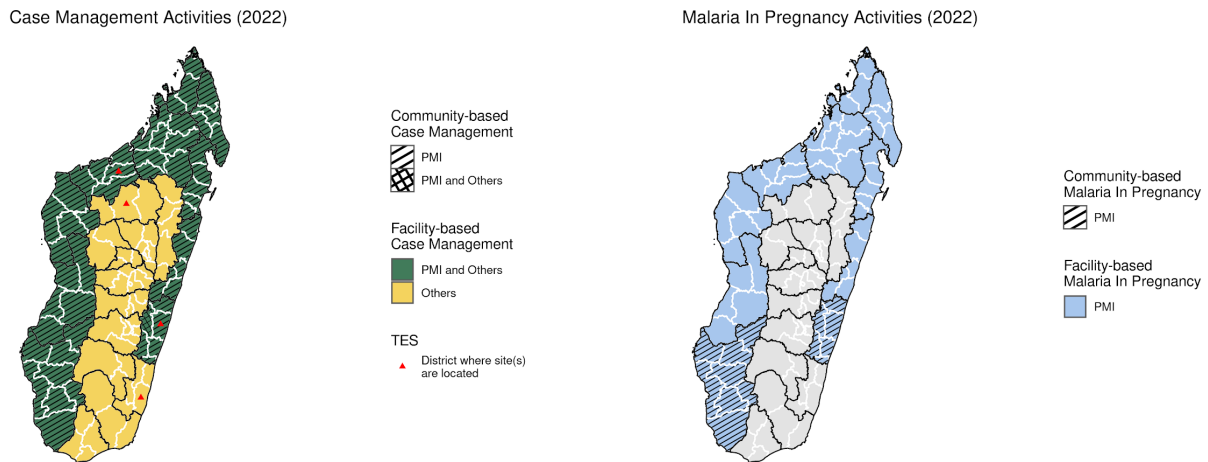
Madagascar has an extensive CHW program with approximately 35,000 CHWs covering the country. The NMSP includes establishing two CHWs per *fokontany*, the smallest administrative level. CHWs conduct sensitization activities on the prevention of communicable diseases, including malaria. They also provide integrated community case management services, including malaria testing and treatment, to approximately 4.5 million children under five years of age. CHWs in targeted areas have been trained on the use of rectal artesunate for pre-referral treatment of children under five years of age with severe disease. Limited supplies of rectal artesunate were distributed in remote high-burden areas in 2021. Additionally, the NMSP calls for CHWs working in remote, high-burden areas to expand testing and treatment for malaria among children up to 14 years of age, which represents nearly 41 percent of the population (MOH National Census 2018).

PMI supports, through equipment, training, and supervision, approximately 18,500 CHWs. These CHWs deliver community-based case management services that include treatment of non-severe malaria cases and pre-referral treatment. PMI does not currently provide direct routine payment to CHWs but is working with the MOH to establish systems to do this effectively in the future. The biggest current challenge faced by the community health system is the lack of coordination among different partners and programs regarding approaches, motivation, and tools. To address that, PMI is engaged with the USAID Health, Population, and Nutrition office to advance the National Health Community Policy and to develop the related documents and tools. To address staffing gaps at the level of the basic health center, PMI is contributing to the establishment of new categories of staff, including the *aide clinique* (AC) and *accompagnateur en santé communautaire* (ASC), to better support CHWs and reduce administrative burdens on the heads of the basic health centers. During this period, PMI trained 315 ACs and 230 ASCs (FY 2021).

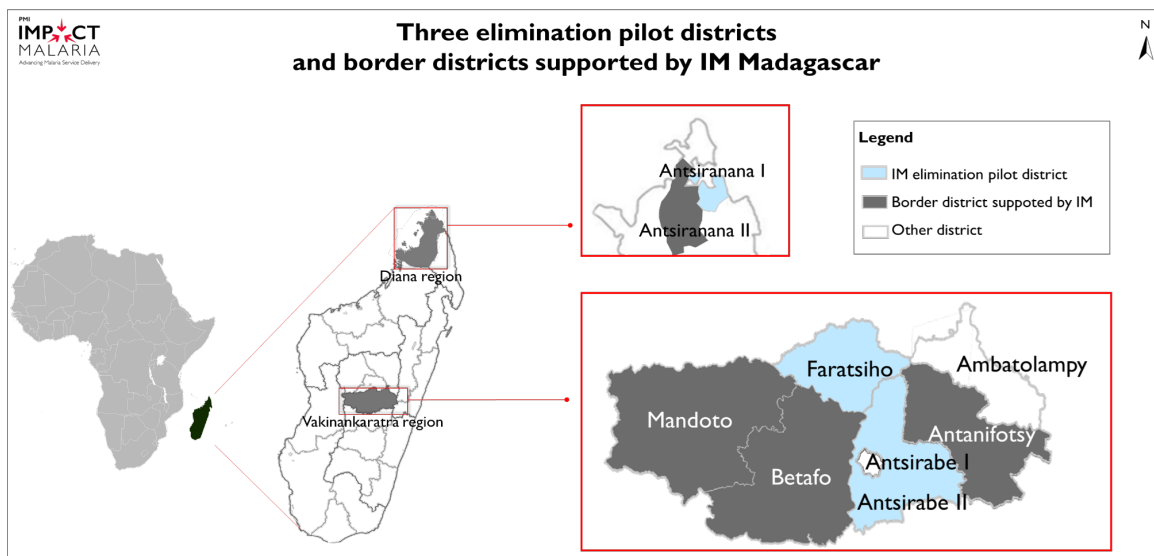
According to the 2021 DHS, 55 percent of children under five years of age with a febrile illness in the previous two weeks sought care from a health provider. Use of traditional healers is common in rural areas of Madagascar.

Private sector facilities (e.g., faith-based and nongovernmental organizations) are more prevalent in urban and peri-urban areas and account for approximately 40 percent of service provision in these areas. Guidelines for malaria case management in the private sector mirror guidelines in the public sector, and the NMCP attempts to include private providers in malaria case management training.

**Figure 4. Maps of Service Delivery–Related Activities for Case Management, Therapeutic Efficacy Studies, Community Health and Malaria in Pregnancy in Madagascar**



**Figure 5. Elimination Districts (Antsiranana I, Antsirabe II, Faratsiho)**



#### 4.2. Recent Progress (CY 2021)

From March 2021 to March 2022, PMI supported 60 health districts in 11 regions, encompassing 18,500 CHWs and the staff of 867 clinics and 72 hospitals, with monitoring, equipment, and training on malaria case management.

#### Commodities

- Supported the procurement and distribution of 6,500,550 malaria RDTs, accounting for approximately 57 percent of needs.

- Supported the procurement and distribution of 3,275,600 ACTs, accounting for approximately 53 percent of needs.
- Supported the procurement and distribution of 411,000 vials of parenteral artesunate, accounting for approximately 46 percent of needs.

### **Care-seeking and Case Management Outcomes (January 2021 to December 2021)**

- At the community level, in the 11 regions supported by PMI, 507,045 children sought treatment at community sites. Of these, 369,466 (73 percent) had fever; 297,639 (81 percent) of these were tested using an RDT; and 169,632 (57 percent) of these tested positive. Of the positive cases, 134,368 (79 percent) received treatment with an ACT. The number of severe malaria cases was 7,753 (4.6 percent). Of these, 4,179 (54 percent) received pre-referral rectal artesunate. Although national guidelines require referral of severe cases from the community level whether or not they are first treated with rectal artesunate, data on the disposition of the remaining 46 percent of severe cases are not available.
- At the facility level, among patients presenting to facilities in the 11 regions supported by PMI, 2,304,659 had fever. Of these, 1,987,100 (86 percent) were tested using an RDT; 930,201 (47 percent) tested positive and 787,290 (85 percent) of these received an ACT. Among cases, 19,820 (2.1 percent) presented with severe malaria and received treatment at a basic health facility; 2,704 (14 percent) received a rectal artesunate suppository as pre-referral treatment.

### **TES 2020**

- Two sites were managed by the integrated pest management (RISE project) and two by NMCP. Each site tested ASAQ and AL, and enrolled approximately 90 patients per site and arm. During 2021, analysis and report writing continued. The corrected 28-day efficacy for both ASAQ and AL were extremely high (see Table 4). The 727 samples sequenced for *pfk13* showed no mutations linked to resistance to artemisinin; high prevalence of all three notable *pfdhfr* mutations (87–98 percent), which are linked to resistance to pyrimethamine; and none of the key mutations in *pfdhps* linked to resistance to sulfadoxine. Please note that additional information about recent progress with monitoring antimalarial efficacy and the TES approach is presented in the **Plans and Justification for FY 2023 Funding section** below.

**Table 4. A 28-Day Corrected Efficacy of ASAQ and AL, by Therapeutic Efficacy Study Site, 2020**

Arm	Site	28-Day Corrected Efficacy
ASAQ	Ankazomborona	100% (95% CI: 95.9-100)
ASAQ	Antsenavolo	100% (95% CI: 95.8-100)
ASAQ	Matanga	100% (95% CI: 96.0-100)
ASAQ	Vohitromby	100% (95% CI: 95.9-100)
AL	Ankazomborona	100% (95% CI: 95.9-100)
AL	Antsenavolo	98.9% (95% CI: 91.9-99.8)
AL	Matanga	100% (95% CI: 95.5-100)
AL	Vohitromby	97.6% (95% CI: 90.7-99.4)

### Community Health

- **Rectal Artesunate:** During CY 2021, 60 percent of CHWs in PMI regions received training on rectal artesunate and CHWs were able to treat and refer 4,179 children under five years of age with severe malaria during this period. When WHO issued the recommendation not to extend rectal artesunate programs (<https://www.who.int/publications/i/item/9789240042513>), based on lack of evidence of benefit and potential for harm during real-world implementation, the MOH decided not to expand the activities but to continue them where currently implemented.
- **mCCM:** Under an OR study, PMI piloted the extension of malaria treatment at community level to all age groups in Farafangana district and initiated field monitoring with the participation of all stakeholders, including the MOH directorates, local authorities, nongovernmental organizations, PMI, and the RISE project. The pilot ended in 2021 and preliminary results have been shared with local stakeholders and a final public report was under development at the time of this writing. NMCP plans to use the findings to inform plans to scale up this activity.
- **Service Quality Assurance (AQS):** AQS is a new tool to assess the performance of CHWs on reporting, knowledge, and practice, which provides data to monitor and guide efforts to reinforce their capacity. Because plans include gradual withdrawal of the new cadres of support staff for CHWs—ACs and ASCs—this approach is also used to identify the highest-performing CHWs and to train them to become peer CHW supervisors. In 2021, a total of 14,180 CHWs benefitted from AQS.
- **Additional Training at the Community Level:**
  - Conducted one round of on-site training and supportive supervision, which trained 68 health workers who in turn reached 584 CHWs.

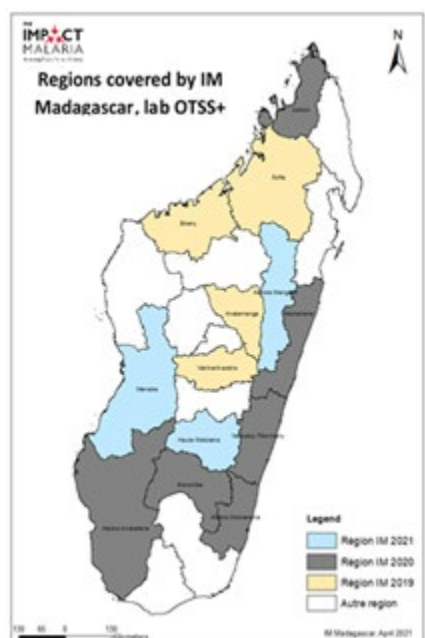


- Trained 76 supervisors in on-site training and supportive supervision for CHWs.
- **Compensation of CHWs:** Contributed to the discussion initiated by the directorate of basic health about CHW compensation; currently, the MOH does not officially offer compensation to CHWs. PMI is deeply involved in advancing this discussion.

## Laboratory

- **Training:** PMI trained 186 lab technicians; 76 percent of the technicians work in public facilities and 24 percent in private facilities. During a train-the-trainer session, three new trainers and four new co-trainers were selected to join the trainer pool. PMI also supported advanced training for 19 participants, from which nine proficient candidates will be selected to attend WHO's External Competency Assessment for Malaria Microscopists (ECAMM) training. PMI procured 411 microscopy training slides to complement the 364 slides procured in 2019. In total, PMI has procured 1,269 slides for training and for external quality control. Additionally, PMI trained 12 district staff, 4 regional staff, and 4 NMCP staff, who act as supervisors for on-site training and supportive supervision
- **Supportive Supervision:** PMI also supported the staff of 13 regions to perform OTSS+ in 165 health facilities and convened a workshop to share lab lessons learned in lab supervision in these regions. The Health Network Quality Improvement System (HNQIS) tools used during the supportive supervision will be integrated in the national DHIS2 system. Finally, 262 on-site training and supportive supervision lab visits were conducted over three rounds for 66 public health facilities and 30 private health facilities in six districts.

Figure 6. PMI-supported Regions Receiving Laboratory OTSS+



- **Elimination:** PMI continues to support malaria elimination activities in three pilot health districts (Antsirabe II, Faratsiho in Vakinankaratra region, and Antsiranana I in Diana region) and expand in two new districts. The package includes the training of CHW and health facility providers in malaria diagnostics using RDTs via OTSS+, case management, reporting of individual cases, investigation of foci/index cases, and focused entomological monitoring. To reduce the burden of imported cases in three pilot elimination districts, PMI provided training and two rounds of OTSS+ to health workers from 18 health facilities in three bordering control districts in Vakinankaratra region and four health facilities from one bordering health district in the Diana region.
- ***P. vivax*:** PMI initiated a national discussion on transitioning from *P. falciparum* / Pan RDTs to *P. falciparum* / *P. vivax* RDTs and strengthening implementation of radical treatment of *P. vivax* infections; local and international epidemiologists, infectious diseases specialists, NMCP, and WHO and regional authorities participated. The identified challenges include: a lack of data on *P. vivax* prevalence and G6PD deficiency; clinicians' hesitancy to administer 14 days of primaquine for radical treatment because they lack data on the local rates of *P. vivax* relapse; and primaquine stockouts. NMCP developed a roadmap which includes collecting more data on *P. vivax* and G6PD deficiency, training and sensitization of clinicians, and ensuring availability of primaquine (and/or tafenoquine) supply chain.

### **4.3. Plans and Justification for FY 2023 Funding**

The FY 2023 funding tables contain a full list of case management activities that PMI proposes to support in Madagascar with FY 2023 funding. Please visit [www.pmi.gov/resources/malaria-operational-plans-mops](http://www.pmi.gov/resources/malaria-operational-plans-mops) for these FY 2023 funding tables.

#### **National-level Case Management Activities**

Madagascar will review the malaria treatment guidance and PMI will contribute to its dissemination.

#### **Commodities**

PMI plans to procure the following commodities, which will also help supply CHWs:

- ACT: 2,000,000
- RDT: 2,500,000
- Injectable artesunate: 189,000 vials
- Microscopy slides and other labs supplies

#### **Facility-level Case Management Activities**

PMI will support the activities described in the **Recent Progress section**, including the scale-up of AQS. PMI will also ensure the training of 1,250 health workers, including at the public and private facilities. Furthermore, 12 high-performing lab technicians will participate in WHO microscopy ECAMM accreditation.

#### **Community-level Case Management Activities**

PMI will continue to support training, supervision, and quality improvement activities as described in the **Recent Progress section**. Additionally, to improve access to case management at community level, PMI will leverage lessons from the OR project in Farafangana district to expand mCCM to all age groups in 19 districts and expand malaria elimination activities from three to five districts (two new districts to be confirmed with NMCP). As described in previous MOPs, a plan to initiate pro-active mCCM in two to three districts was delayed due to stock shortages and the COVID-19 pandemic. However, PMI plans to support expansion of ProCCM to 12 communes with the highest incidence with MOP 2023. PMI will continue to support the use of rectal artesunate in the districts currently implementing it, while working to ensure appropriate referrals to health facilities; this activity will not be extended to other districts in FY 2023 MOP.

PMI will also support the implementation of SBC outreach activities to increase care-seeking at the health facilities and knowledge of ACT as treatment for positive RDT results.

Although CHWs are currently unpaid, PMI will continue to participate in discussions about CHW remuneration at the country level.

## Monitoring Antimalarial Efficacy

**Table 5. Ongoing and Planned Therapeutic Efficacy Studies**

Ongoing Therapeutic Efficacy Studies			
Year	Site Name	Treatment Arm(s)	Plan for Laboratory Testing of Samples
2022	Vatovavy Fitovinany	ASAQ AL	<ul style="list-style-type: none"> <li>• In-country at Institut Pasteur-Madagascar</li> <li>• CDC Atlanta</li> </ul>
2022	Boeny	ASAQ AL	<ul style="list-style-type: none"> <li>• In-country at NMCP</li> <li>• CDC Atlanta</li> </ul>
2022	Sud-Est	ASAQ	<ul style="list-style-type: none"> <li>• In-country at NMCP</li> <li>• CDC Atlanta</li> </ul>
2022	Betsiboka	ASAQ	<ul style="list-style-type: none"> <li>• In-country at Institut Pasteur-Madagascar</li> <li>• CDC Atlanta</li> </ul>
Planned Therapeutic Efficacy Studies (Funded with Previous or Current MOP)			
Year	Site Name	Treatment Arm(s)	Plan for Laboratory Testing of Samples
2024	TBD	ASAQ, AL, DHP	<ul style="list-style-type: none"> <li>• In-country at NMCP</li> <li>• CDC Atlanta</li> </ul>
2024	TBD	ASAQ, AL, DHP	<ul style="list-style-type: none"> <li>• In-country at Institut Pasteur-Madagascar</li> <li>• CDC Atlanta</li> </ul>

AL=artemether-lumefantrine; ASAQ=artesunate-amodiaquine; DHP=dihydroartemisinin-piperazine

## Case Management Elimination Activities

PMI will provide technical and financial support for the review of the Elimination Plan 2019–2022 and development of the Elimination Plan 2023–2026. PMI will continue to support a range of communications activities including radio spots, interpersonal communications, home visits, and short message service (SMS) messaging to promote prompt care-seeking and continue to bolster appropriate social norms around self-medication. In addition, PMI is supporting efforts to improve the quality of care at health facilities, including training of CSB staff and CHWs, OTSS+, and discussion on *P. vivax*. To improve the reporting performance of the CSB in the five supported elimination districts (including two new districts to be confirmed with NMCP), PMI will provide tablets and continue integrating the HNQIS reporting tool into the national DHIS2.

Please see the **SBC section** below for details on challenges and opportunities to improve intervention uptake or maintenance.

## 5. Health Supply Chain and Pharmaceutical Management

### 5.1. PMI Goal and Strategic Approach

PMI efforts aim to ensure continuous availability of life-saving and quality malaria commodities across all sectors and segments of the Malagasy population (NMSP 2018–2022). The NMCP objective is for 95 percent of facilities to report no stockouts of

malaria commodities by 2022. In coordination with the Global Fund, PMI continues to support the NMCP to improve the supply chain at national, regional, and district levels. This includes procurement of antimalarial commodities as well as providing relevant TA. While all commodities are distributed across the 114 districts by the central medical store “SALAMA,” PMI supports TA in 10 regions (Atsinanana, Atsimo-Andrefana, Vatovavy-Fitovinany, Analanjirifo, Boeny, Diana, Melaky, Menabe, Sava, and Sofia), reaching approximately 12.4 million individuals. PMI efforts aim to implement the PMI Stockout Reduction strategy (target: <10 percent stocked out) and leverage supply chain TA from the MOH through the Project Coordination Unit as the Global Fund/Government of Madagascar Principal Recipients to ensure national coverage.

## **5.2. Recent Progress (October 2020 to April 2022)**

PMI’s principal supply chain investment(s) aimed at improving malaria commodity availability at service delivery sites (health facilities and CHWs’ sites), including forecasting and supply planning, management information systems, TA for warehousing and distribution, direct warehousing, and delivery of commodities to health sites.

Progress included:

- Trained 32 MOH technical staff and USAID partners Accessible Continuum of Care and Essential Services (ACCESS) including 14 malaria *gestion des achats et stock* (GAS; supply chain management) committee core members who lead the quantification using Pipeline and Quantimed software in July 2021 and a mid-year review of the quantification in December 2021. Madagascar submitted four supply plans and five Procurement Planning and Monitoring Report for malaria reports to GHSC-PSM to inform global procurement of malaria commodities. The current FY 2023 MOP gap analysis used the national approved/validated December 2021 quantification review. Based on this quantification, more than 80 percent of commodities needed in CY 2021 were covered with direct contributions from PMI, Global Fund, United Nations Children’s Fund (UNICEF), and MOH.
- Supported partnerships with SALAMA for storage and transportation of the commodities to *Pharmacie de Gestion des Districts* (Pha-G-Dis) during routine distribution based on quarterly distribution plans and emergency distribution when required.
- Supported the central malaria GAS committee at NMCP to collect and analyze quarterly requisitions and Logistics Management Information System (LMIS) data from the 114 districts to generate accurate, efficient, and timely distribution plans and organize virtual validation meetings. These meetings increased the abilities of district GAS teams to understand their data and

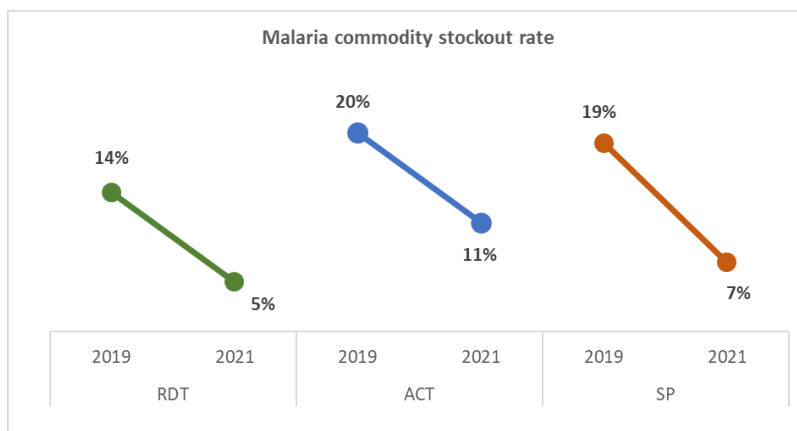
make informed decisions about the supply of commodities. In all 114 districts (comprising 115 Pha-G-Dis), the supply chain committees are functional.

- Continued to leverage Global Fund and other USAID health community platforms for the implementation of the last-mile distribution strategy using cash incentives provided by Global Fund for transporting malaria commodities from Pha-G-Dis to CSB/Pha-Ge-Com in all 78 PMI-supported districts.
- Leveraged other USAID programs to scale up drone delivery of commodities, including for malaria, family planning, maternal and child health and nutrition, and vaccines (routine vaccines and COVID-19 vaccines) to ensure coverage of hard-to-reach communities (reach the unreached). The April 2021 [drone evaluation](#) revealed that drones were a safe, reliable, and potentially scalable tool that could help reduce stockouts in Madagascar, and it recommended a scale phase with an emphasis on increasing MoPH ownership, diversifying donors' products being transported and donors and increasing number of flights to improve cost effectiveness for USAID and PMI investments.
- Continued to implement the Supervision, Performance Assessment and Recognition Strategy (SPARS), a quality improvement approach for the management of stocks at all 78 Pha-G-Dis already using it. Among the 78 Pha-G-Dis, the proportion classified as "performing" (score of 90 percent or higher) increased from 5 percent to 27 percent (4 to 21 Pha-G-Dis), and the proportion classified as "weak" (score of 75 percent or less) decreased from 29 percent (23 Pha-G-Dis) to 5 percent (4 Pha-G-Dis) from 2020 to 2021.
- Supported health management teams from regions and districts to conduct on-the-job supportive supervision and training of 993 Pha-G-Dis and Pha-Ge-Com personnel to build their capacities to follow proper stock management standard operating procedures, use LMIS tools (CHANNEL, paper-based LMIS tools), update the average monthly consumption to correctly estimate needs and use the report/order forms for resupply.
- Implemented the malaria market assessment action plan through the total market approach, which resulted in a local pharmaceutical wholesaler registering and procuring 20,000 units of injectable artesunate for the private sector.
- Completed two End-Use Verification (EUV) surveys and shared data with RBM and USAID ACCESS project for corrective action.
- Supported the National Drug Quality Control Laboratory (division under the National Medicines Regulatory Agency of Madagascar directorate) to initiate the Post-Marketing Surveillance System including a risk-based assessment protocol for malaria, products related to family planning and maternal and child health and nutrition, and to develop the post-marketing surveillance standard operating procedure.

- Supported the implementation of the new DHIS2-compatible LMIS tool, including the selection of the new LMIS tool to be procured by Global Fund.

In concert with these previous years' efforts, improvement of stockout is noticeable (though still high): RDT stockouts decreased from 14 percent in 2019 to 5 percent in 2021, ACTs from 20 percent to 11 percent, and SP from 19 percent to 7 percent (see Figure 7). The EUV survey showed similar improvements; for example, the percentage of health facilities with a formulation of ACT for children under five years of age increased from 64 percent in January 2020 to 86 percent in October 2020 and 96 percent in October 2021.

**Figure 7. Trends in Stockouts of Key Malaria Commodities, 2019–2021**



Source: DHIS 2

### 5.3. Plans and Justification with FY 2023 Funding

The FY 2023 funding tables contain a full list of health supply chain and pharmaceutical management systems strengthening that PMI proposes to support in Madagascar with FY 2023 funding. Please visit [www.pmi.gov/resources/malaria-operational-plans-mops](http://www.pmi.gov/resources/malaria-operational-plans-mops) for these FY 2023 funding tables.

Madagascar will continue to support core supply chain activities as described in the **Recent Progress section**. This support will mainly include quantification, information systems, warehousing and distribution, implementation of SPARS, training/refresher training of supply chain actors at all levels, regulatory support such as digitization of the registration of medications, engaging the private sector to increase their share of the malaria health product market, technical support for the supply chain for Pha-G-Dis and Pha-Ge-Com as well as two EUV surveys. The national supply chain assessment was planned to be implemented around July 2022 with financial and technical contributions from USAID/PMI, UNICEF, United Nations Population Fund, and Global Fund. Its results will be disseminated in early 2023 and will inform the new supply chain strategic plan (2023–2027) for Madagascar and mobilization of resources. Private sector

engagement will continue through use of the findings from the malaria market assessment, delivery of commodities by drones in remote areas, and sustaining full implementation of the new LMIS tool across the 114 districts. PMI (through Impact Malaria and Global Health Supply Chain-Procurement and Supply Management partners) will support QAT training in the first quarter of FY 2023 and its roll-out.

Demand and uptake of malaria drugs will improve with the SBC activities to accompany comprehensive malaria clinical services. Please see the SBC section for details on challenges and opportunities to improve intervention uptake or maintenance.

## **6. SBC**

### **6.1. PMI Goal and Strategic Approach**

PMI supports the NMCP's efforts in the implementation of the national communication strategy to expand mass media and community-level interpersonal communication activities to help increase consistent ITN use and care, prompt care-seeking for fever, uptake of RDT tests and provider adherence to diagnostic results for treatment with ACTs, and early attendance for ANC for pregnant women, with a goal of reaching >90 percent of the target populations with such SBC. At the central level, PMI supports activities designed to strengthen capacity, including coordination of stakeholders and development of materials and relevant guidelines. PMI is supporting ongoing efforts to revise the communication strategy that aligns with the NMSP. By cascading from the region and district levels, PMI continues to support the adaptation of the SBC strategy to local contexts as guided by the BEM'Ray approach — which focuses on increasing knowledge and adoption of preventive behaviors and use of malaria commodities for prevention and appropriate treatment by CHWs in close collaboration with local health providers — and support partner coordination efforts. Finally, PMI supports the generation, analysis, and translation of malaria SBC evidence from representative surveys (e.g., MIS, DHS) to easily digestible formats, including developing SBC materials in local languages, tailoring messages to different audiences, and informing adaptations to ongoing malaria SBC program implementation.

### **6.2. Recent Progress (CY 2021)**

PMI supported the revision of SBC materials for all intervention strategies, which helped strengthen the implementation of elimination activities and the ITN mass distribution campaign. PMI and the NMCP coordinated with maternal and child health agencies to improve SBC efforts during ANC visits in support of consistent ITN use among pregnant women and to ensure ITN availability at the community level.

During the 2021 ITN mass distribution campaign, PMI supported SBC activities through community mobilization, including interpersonal communication, posters, and increased



sensitization through radio spots in collaboration with local radio stations that ensured greater media coverage. In addition, at the regional and district levels, partners engaged MoPH officials in the dissemination of messages before and during the mass campaign.

At the community level, PMI supported partners to: update SBC training materials for use by the CHWs; use mass media approaches such as radio spots, mobile video with local actors, and print materials for sensitization; and train approximately 4,700 CHWs on malaria messages to improve interpersonal communication and promote care-seeking and prevention behaviors in 10 regions. These activities were associated with gains in knowledge among households; the number attaining a pre-set knowledge threshold and therefore awarded “household champion” status increased from 878 households in 2020 to 6,933 in 2021 Source: Partner Annual Report 2021).

PMI also supported the training of youth 13 to 24 years of age in three regions as promoters of malaria and other health messages to their community to help reach other youth in collaboration with private sector partners engaged in malaria prevention (Orange, Telma, and others) as well as the Red Cross. Finally, we provided TA to journalists for production and airing of messages to promote prompt care-seeking for malaria.

Efforts to prevent MIP included dissemination of 6,000 posters on IPTp to the basic health centers in 11 regions. The results of the DHS 2021 revealed progress in behaviors to prevent malaria during pregnancy: 51 percent of pregnant women received at least one dose of SP during pregnancy, and 41 percent received two doses. This is an improvement compared to the results from Multiple Indicator Cluster Survey 2018, in which IPTp1+ was 43 percent and IPTp2+ was 29 percent. Finally, PMI conducted SBC activities around appropriate timing for ANC and taking SP for IPTp.

In preparation for the community-based ITN continuous distribution campaign in summer 2022, PMI also supported the development of sensitization materials to be used by CHWs in the context of COVID-19. Social and community mobilization helped emphasize and disseminate malaria prevention messages to a broader community as part of the celebration of World Malaria Day 2021.

Progress in SBC activities in elimination zones included social and community mobilization to prevent malaria upsurges in the post-cyclonic season and health education campaigns involving local leaders. Note that the meetings and field visits supported the activities carried out in the three elimination districts (Antsirabe II, Faratsiho, and Antsiranana I). In addition, progress to reinforce the SBC in those districts included:

- Formative supervision of 97 health worker staff and 654 CHWs about SBC for the elimination of malaria. They were provided with job aids and awareness materials.
- Involvement of the local authorities to mobilize the population, which included use of audio-visual materials to support awareness-raising activities and cleaning of stagnant waters, which was done in 30 communes of the intervention districts. The population was receptive and accepted active case detection as part of the response activities.

Finally, in collaboration with Global Fund, PMI:

- Supported the broadcast of more than 29,000 spots through local radio stations with national reach that were tested to accommodate local language and culture and designed to increase knowledge and adoption of preventive behaviors and use of malaria commodities for prevention and appropriate treatment.
- Supported the community sensitization during the ITN routine distribution.

In addition to progress made, new findings showed significant challenges that will require greater SBC investment to improve the uptake and/or maintenance of behaviors.

### **ITNs**

The DHS 2021 showed that at least 69 percent of the households owned at least one ITN, with an average of 1.2 ITNs per household, and 30.1 percent of respondents slept under an ITN the night before the survey. Furthermore, in the households with at least one ITN, 76 percent of children under five years of age and nearly 76 percent of pregnant women were reported to sleep under an ITN the night before the survey. In addition, there was low awareness among pregnant women that they could receive a free ITN during ANC.

According to post-campaign site monitoring visits, additional factors contributing to non-utilization of ITNs included use of old ITNs versus recently distributed ITNs. In some of the zones not supported by PMI, SBC activities were not implemented due to the heavy administrative processes required for disbursement of Global Fund resources.

### **MIP**

In DHS 2021 with the MIS module, the proportion of pregnant women who received IPTp3+ was 31 percent, approximately half the NMCP's goal of 60 percent coverage with IPTp3. In addition, A cross-sectional household survey was conducted in March 2021 to identify factors associated with IPTp uptake and the results showed that women of higher socioeconomic status, those who understand how to take IPTp, and those receiving IPTp under direct observation of the health providers were more likely to

receive the three doses than those who did not adhere to these categories. These findings will help in the revision and development of adaptive SBC messages and approaches targeting women of lower socioeconomic status.

### **Case Management**

Habits and ease of access to traditional medicine and self-medication are among the challenges for care-seeking at the community level; the population tends to seek care at the health centers primarily when their condition becomes serious. Further, there are challenges related to lack of confidence in the basic health centers because of their poor quality of service. (Site visit, HCD report 2020, ACCESS program). In addition, heads of basic health centers have been prioritizing Covid-19 over routine services, making them less available to provide other services.

DHS 2021 with the MIS module also revealed gaps in care-seeking for fever and fever management among children under five years of age: 45 percent with fever sought care/advice and received treatment. Among those with fever and who were treated, 55 percent were treated with an ACT.

### **Service Delivery**

At the health facility and CHW levels, there is still limited awareness that malaria services provided are free of charge. In addition, disrespectful treatment at the health facility, discrimination, demands for payments when seeking care, and the inability to benefit from a paid facility system push pregnant women to go to matrons or traditional healers, or both. Initial training in communication techniques has not been sufficient and needs to be supplemented with more specific training to change the behavior of service providers.

Finally, home visits were also limited during 2021 because of COVID-19; several households refused to receive a visit at home according to partner reports. In addition, gathering for community dialogues was not possible, which may have impacted the maintenance of malaria-related behaviors.

### **Elimination**

Challenges in the implementation of elimination mobilization include: insufficient resource mobilization for elimination efforts; limited involvement of local health authorities in the implementation of the strategy (e.g., training, monitoring, reporting, etc.); and slow adoption and acceptance of the elimination strategy (e.g., active case detection etc.) in the 10 additional potential elimination districts not yet intensively supported by PMI for elimination activities.

### **6.3. Plans and Justification with FY 2023 Funding**

Based on the inputs from the in-country's SBC working group, recent studies (i.e., DHS 2021, IPTp study) and site monitoring visits, PMI will continue to support the implementation of more efficient SBC approaches such as interpersonal communication, home visits, and use of mass and mid-media to address the community behaviors where behavioral gaps have been identified, like the low use of ITNs despite the 2021 ITN campaign, or the low use of IPTp which will contribute to the improvement of behaviors and be part of the outbreak response. PMI will continue to provide technical support to the NMCP in the implementation of community-based SBC malaria prevention and treatment messages. In addition, PMI supports NMCP to ensure that the national SBC working group continues to conduct regular activity follow-up meetings. Specific focus will be given to the dissemination of the strategic plan for malaria SBC. PMI will also continue its support to Peace Corps volunteers to improve their engagement in malaria sensitization activities.

### **6.4. Proposed activities with FY 2023 funds include:**

- Support community mobilization activities at all levels. At the national level, PMI will continue to support the SBC working group led by the NMCP as they represent a variety of partners, and this body is responsible for reviewing key malaria messages and harmonizing SBC activities, such as materials for the ITN mass distribution campaign. Furthermore, the SBC working group advocates at different levels of the MoPH to ensure continuous engagement and to extend the collaboration with other government ministries such as the Ministry of Education and the Ministry of Youth and Sports for dissemination of SBC messages. Regional- and district-level health staff will coordinate SBC activities with the national SBC working group.

At the community level, various SBC approaches will be implemented, including community dialogues to involve traditional leaders and key members of the community. There will also be radio and TV spots to raise awareness and promote the use and care of ITNs, including SBC for the selected regions who will use PBO ITNs, acceptance of IRS, early and regular ANC to ensure uptake of IPTp, and prompt diagnosis and treatment of malaria for the general population. PMI will also support refresher training of CHWs on SBC.

- Continue to support key messages via the integrated BEM'Ray SBC campaign, which focuses on increasing knowledge and adoption of preventive behaviors and use of malaria commodities for prevention and appropriate treatment by CHWs in close collaboration with local health providers.

SBC materials will be revised, updated, and tailored according to the specific epidemiological zones to address communication challenges, and SBC activities will be intensified during the peak transmission season.

- Support elimination SBC activities. PMI will support the existing three elimination districts and additional potential elimination districts to disseminate malaria-related messages through existing community networks.
- Collaborate with Peace Corps Volunteers. PMI will support Peace Corps volunteers to assist with 2024 the ITN mass campaign and the development of key malaria messages through their community development activities.
- Conduct SBC activities to promote community acceptance of IRS.

While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, three behaviors will be prioritized with FY 2023 funds (see Table 6).

**Table 6. Priority Behaviors to Address**

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Prompt care-seeking within 24 hours of signs and symptoms	Household members; parents and caretakers of children (under five years of age, school-aged); pregnant women; CHWs and new health care providers	10 regions and elimination districts	<ul style="list-style-type: none"> <li>• Conducting community- and household-level interpersonal communication through continuous engagement with nongovernmental organizations and CHWs</li> <li>• Training and refresher training for existing and new health care providers and CHWs on SBC to improve competence to manage fever and malaria</li> <li>• Reinforcing the confidence in malaria diagnostics and encourage use of ACTs following positive RDT results</li> </ul>
Early ANC attendance and IPTp acceptance	Pregnant women; health care workers who provide ANC	10 regions	<ul style="list-style-type: none"> <li>• Spreading specific messages through radio spots, interpersonal communication, home visits to address health care provider behavior</li> <li>• Updating the messages to emphasize ANC4 and encourage pregnant women to not fear COVID at the CSBs</li> <li>• Integrating IPTp in the action plan for community health</li> <li>• Collaborating with the midwives' association and association of paramedics (capacity-strengthening, providing job aids, and IPTp guidance)</li> <li>• Strengthening capacity to encourage respectful treatment by health providers (BERCER approach: welcoming, interviewing, information/discussing, choice, explanation, follow-up)</li> </ul>

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
			<ul style="list-style-type: none"> <li>Collaborating with private sector on capacity-strengthening around IPTp</li> </ul>
Consistent ITN use and maintenance	All household members; pregnant women	10 regions and elimination districts	<ul style="list-style-type: none"> <li>Engaging in interpersonal communication with CHWs to focus on increasing use and improving understanding on how best to maintain them to their maximum durability and effectiveness</li> <li>Delivering messages about ITN use through mid-media channels such as radio</li> </ul>

**Additional Support Activities**

There is a need to collect more data on the specific behavioral factors related to prompt care-seeking and factors associated with provider behaviors surrounding diagnosis and treatment of malaria.

Through the recent assessment of community delivery of IPTp and an assessment of SBC activities for community case management planned in CY 2022, specific determinants for the community and provider will be determined.

There is a need for continued SBC capacity-building at the national, regional, and district levels. To bolster NMCP capacity for the planning, design, implementation, and evaluation of SBC activities, PMI will continue to support:

- Coordination at the national level to improve the effectiveness of the SBC TWG.
- Capacity-building for NMCP staff on the use of data from survey and study results (e.g., MIS, behavioral surveys, etc.) to inform SBC program priorities and strategies. PMI will also support participation in RBM SBC conferences and training.

**7. SM&E**

**7.1. PMI Goal and Strategic Approach**

PMI supports the NMCP to implement a strong surveillance system to allow early detection of malaria epidemics and reduce delays in outbreak response. In addition, PMI prioritizes the effective use of quality data to inform programming and to expand data use to the community level of the health system.

In support of the NMCP strategy and needs, PMI and the NMCP have prioritized the integration of data to establish a comprehensive system based on the DHIS2 platform and the training of SM&E personnel to support HMIS and to analyze and interpret the surveillance data for situational awareness in anticipations to epidemics or outbreaks.

In addition, PMI supported the NMCP to implement malaria surveillance involving health providers and community health volunteers in three elimination districts by digitalizing the notification system, conducting case investigation within seven days from the notification and drug administration strategies within 15 days of index case detected.

## 7.2. Recent Progress (January 2021 to May 2022)

At the national level, PMI supported NMCP to:

- Convened quarterly SM&E working group data review meetings to analyze and use data and to inform program on strategies in response to the increase in malaria cases in high-burden districts.
- Developed their data use plan to improve the effective use of data from national to community levels.
- Adopted a standard malaria routine data quality assessment (RDQA) tool and assessed regional health information system data quality through data quality assessment in 30 health facilities in two districts.
- Improved analysis and dissemination of health statistics, including weekly malaria epidemiology updates during RBM meetings, monthly bulletins with disease surveillance data, and quarterly bulletins summarizing malaria data.
- Improved monitoring of the 2021 ITN mass distribution campaign through an SMS-based reporting system to accelerate the reporting and an online dashboard to facilitate day-to-day monitoring.
- Began planning for a national health facility survey to assess quality of and readiness to provide malaria-related care, and prevalence of *pfhrp2/3* gene deletions among *P. falciparum*. Areas believed to be more heavily affected by *P. vivax* will be oversampled to estimate prevalence of G6PD deficiency and *P. vivax* infection. This survey is anticipated in CY 2023.

At the regional level:

- Supported three regions (Atsimo Andrefana, Atsinanana and Vatovavy Fitovinany) to hold semiannual data quality review meetings.
- Improved the implementation of the coaching system to strengthen coordination between NMCP and the regional staff and to better respond to malaria emergencies.

At the district level:

- Trained 24 district staff and 86 health providers from two districts on the use of a malaria dashboard and scorecard and provided training to 55 district malaria focal points on malaria SM&E.

- Supported routine data analysis in DHIS2 including use of the data quality toolkit in 78 districts.

At the health facility/community level:

- Distributed monitoring tools for health facility and CHWs in 60 districts.
- Piloted the use of electronic reporting using tablet devices at 55 health facilities in 2 districts (Nosy Varika and Ikongo) to improve data promptness and to allow more time for data analysis at the district level.
- Trained 91 regional and district staff on supportive supervision and conducted 342 RDQAs among CHWs, 293 RDQAs at health facilities, and 6 RDQAs among district hospitals.
- Strengthened the health information system with the integration of 314 clinical aids at health facility level and 230 ASCs at the community level, which improved the overall reporting rate and the data quality.
- Trained 646 community health volunteers from the three pilot elimination districts in malaria elimination strategies.
- Distributed 48 tablet devices to health providers and district staff to improve malaria case notification in the three elimination districts.

### **7.3 Plans and Justification with FY 2023 Funding**

For FY 2023, PMI is planning to support MOH to:

- Strengthen data use by providing assistance to regions and districts in addition to the national level.
- Support and decentralize RDQAs and data review meetings.
- Improve data quality for use in decision-making.
- Support the selection and use of the upcoming electronic Logistics Management Information System (eLMIS) and ensure its interoperability with DHIS.
- Integrate private sector data into the health information system.
- Distribute monitoring tools at facility and community levels.
- Progressively digitize the health information system and ensure new adopted tools will be interoperable with existing platforms.
- Conduct national reference surveys (e.g., DHS, EUV).
- Extend PMI support to some of the highest-burden districts not currently covered by PMI.



**Table 7. Available Malaria Surveillance Sources**

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Household Surveys	Demographic and Health Survey		X				
Household Surveys	Malaria Indicator Survey		X			P	
Household Surveys	Multiple Indicator Cluster Survey				P		
Household Surveys	EPI survey		X				
Health Facility Surveys	Service Provision Assessment	X					
Health Facility Surveys	Service Availability Readiness Assessment survey	X		P		P	
Health Facility Surveys	Other Health Facility Survey	X			P	P	
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies	X		P		P	
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System						
Malaria Surveillance and Routine System Support	Support to Health Management Information System	X	X	P	P	P	P
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response	X	X	P	P	P	P
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System	X	X	P	P	P	P
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System						
Other	End-Use Verification	X	X	P	P	P	P
Other	School-based Malaria Survey				P		
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey	X	X	P	P	P	
Other	Malaria Impact Evaluation				*P		
Other	Entomologic Monitoring Surveys						
Other	Evaluation of proactive case management and the introduction of rectal artesunate pre-referential treatment among children under five years of age			P			
Other	Evaluation of the use of CommCare app at community level			P	P		

\*Asterisk denotes non-PMI funded activities; X denotes completed activities; P denotes planned activities

## 8. OR and Program Evaluation

### 8.1. PMI Goal and Strategic Approach

The NMCP objective for program evaluation (PE) and OR is to provide evidence-based information to guide decision-making and update policies. PMI support for program and policy-relevant OR and PE intends to:

- Test promising new tools and approaches for remote locations.
- Evaluate scale-up of malaria interventions in remote areas.
- Identify effective combinations of interventions to reduce malaria transmission in remote areas and in those with highest incidence.
- Identify effective local solutions to vector control and case management challenges.
- Help Madagascar advance toward malaria elimination.

### 8.2. Recent Progress (April 2021 to April 2022)

PMI supported the NMCP and the Institut Pasteur de Madagascar to complete an OR study in Farafangana District to test the feasibility and effectiveness of expanding mCCM to all ages. A manuscript summarizing the baseline prevalence of malaria in this district was published in October 2021.<sup>1</sup> Data collection was completed for this study in December 2021, preliminary results were presented to PMI and NMCP in April 2022, and final reports were under development at the time of this writing. This study was funded with FY 2018 country funds and FY 2018 PMI core funds. Pending the results of the OR study, donors, including PMI, may adjust community activities to expand the community case management to all ages in non-study areas.

A study of the feasibility and entomological and human health impacts of using drones to map habitats and apply larvicide (*Bacillus thuringiensis israelensis*) bi-weekly throughout the rainy season to rice paddies within 1 kilometer of human settlements in Ankazobe and Morombe districts began in January 2022. The intervention is planned to continue through June 2022; health outcome data will be collected through mid-2023. Additional information can be found in the **Vector Control section** above.

Madagascar was selected to participate in a PMI core-funded OR priority to understand factors and processes associated with successful supervision of CHWs. A concept note was under development as of April 2022 with field work anticipated to begin by fall 2022.

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<sup>1</sup> Sayre, D., L.C. Steinhardt, J. Irinantenaina et al., Baseline malaria prevalence and care-seeking behaviours in rural Madagascar prior to a trial to expand mCCM to all ages, *Malaria Journal* 20, no. 1 (Oct. 26, 2021): 422, doi: 10.1186/s12936-021-03956-z.

A pilot of SMC implementation in the high-burden southern regions of Madagascar was in the early planning phase at the time of this writing. The costs of commodities and implementation are to be covered by the Global Fund; PMI allocated support for TA to assess this pilot in MOP 2022.

A multi-day stakeholder’s meeting convened in December 2021 to explore interest in and feasibility of advancing toward diagnosis and management of *P. vivax* infections in Madagascar. Currently Madagascar uses *P. falciparum* / Pan RDTs for malaria diagnosis, with cases presenting with severe signs and symptoms also undergoing microscopic diagnosis. Although national case management guidance recommends testing for G6PD deficiency and treating *P. vivax* infections with an ACT plus 14 days of primaquine, testing for G6PD deficiency is not available outside of research settings and cases determined to be caused by parasites other than *P. falciparum* are currently treated with ACTs only. Stakeholders generally desired more information about the burden of G6PD deficiency and *P. vivax* infections, rate of relapse of *P. vivax* infections in Madagascar, and feasibility of testing for G6PD deficiency and *P. vivax* before making changes to the program or policy.

**Table 8. PMI-funded Operational Research/Program Evaluation Studies in Madagascar**

Recently Completed OR/PE Studies	Status of Dissemination	Start Date	End Date
Age extension of community-based management of malaria in Farafangana	Preliminary results shared with PMI/NMCP Apr. 2022; manuscript reporting baseline results published*; manuscripts detailing primary endline results under development	Oct. 2019	Nov. 2021
Ongoing or Planned OR/PE Studies	Status	Start Date	End Date
Feasibility and impact of drone-delivered larvicide to rice paddies in 2 districts	Data collection in progress	Jan. 2022	Jun. 2023
Evaluation of seasonal malaria chemoprevention pilot	Concept note under development	NA	NA
Evaluation of CHW supervision (core-funded)	Concept note under development	NA	NA

\*Sayre D., L.C. Steinhardt, J. Irinantenaina et al., Baseline malaria prevalence and care-seeking behaviours in rural Madagascar prior to a trial to expand malaria community case management to all ages, *Malaria Journal* 20, no. 1 (Oct. 26, 2021:422, doi: 10.1186/s12936-021-03956-z.

### 8.3. Plans and Justification with FY 2023 Funding

No OR/PE activities are planned with MOP 2023 funding. In lieu of a separate OR project, PMI/Madagascar plans to integrate assessments of the prevalence of G6PD deficiency and *P. vivax* infections into the health facility assessment planned in CY 2023

(funded in MOP 2021). These findings may be leveraged to make program changes or to inform a future OR/PE project.

## **9. Capacity Strengthening**

### **9.1. PMI Goal and Strategic Approach**

The NMCP health systems strengthening objective is to build capacity to effectively implement the national malaria strategy and meet its goal of progressive elimination of malaria in Madagascar. PMI/Madagascar's approach to health systems strengthening includes: facilitating increased collaboration with other MOH directorates and government ministries, donors, and the private sector to strengthen the public health system across the country; supporting efforts to improve NMCP leadership, technical and organizational capacity; supporting in-country coordination through functional RBM and TWGs platforms; and coordinating investment in surveillance and OR with NMCP and the Global Fund to inform policy and strategy decisions. Historically, PMI/Madagascar together with implementing partners, have supported the U.S. Peace Corps to strengthen Madagascar's health systems; such support will resume when U.S. Peace Corps volunteers return to Madagascar.

### **9.2. Recent Progress (CY 2021)**

- Continued implementation of LDP+ for six NMCP division heads. LDP+ promotes team-based health planning by: 1) identifying the challenges to achieving defined objectives; and 2) finding and implementing local solutions (within the regulatory framework and according to national protocols) to overcome them.
- Supported the functioning of malaria TWGs including: elimination; national ITN campaign coordination committee; malaria supply chain management committee at national, regional and district levels; surveillance and malaria total market approach subgroup.
- Supported the NMCP to analyze and report data from the two TES sites they led in 2020 and to plan for a G2G collaboration with USAID and PMI for the TES in 2022.
- Supported MOH and CDC to plan the implementation of a Field Epidemiology Training Program (FETP; frontline) for district-level officials in Madagascar, anticipated to begin late spring 2022. This program will complement a similar program funded by the Indian Ocean Commission that began in April 2022 and targets regional-level officials.
- Supported NMCP staff with writing scientific abstracts and papers.
- Began processes required to establish G2G mechanism.
- Due to the COVID19 pandemic, U.S. Peace Corps volunteers were not placed in Madagascar during 2021 or as of this writing in 2022.

### **9.3. Plans and Justification with FY 2023 Funding**

PMI/Madagascar will continue to support capacity-strengthening activities as described in the **Recent Progress section**, as well as activities that were delayed due to the COVID-19 pandemic, such as the implementation of training workshops. Additionally, PMI/Madagascar is working to establish a G2G funding mechanism to facilitate increased investments in local expertise. PMI/Madagascar will also support approximately 10 frontline FETP fellows to bolster epidemiologic capacity at the district level.

The FY 2023 funding tables contain a full list of capacity strengthening activities that PMI proposes to support in Madagascar with FY 2023 funding. Please visit [www.pmi.gov/resources/malaria-operational-plans-mops](http://www.pmi.gov/resources/malaria-operational-plans-mops) for these FY 2023 funding tables.

### **10. Staffing and Administration**

A minimum of three health professionals oversee PMI in Madagascar. The single interagency team led by the USAID mission director or their designee consists of a resident advisor representing USAID, a resident advisor representing CDC, and one or more locally hired experts known as foreign service nationals. The PMI interagency team works 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.

**ANNEX: GAP ANALYSIS TABLES**

**Table A-1. ITN Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
Total country population	28,983,596	29,856,002	30,754,668
Total population at risk for malaria	28,983,596	29,856,002	30,754,668
PMI-targeted at-risk population	28,983,596	29,856,002	30,754,668
Population targeted for ITNs	26,241,748	23,735,522	24,449,961
<b>Continuous Distribution Needs</b>			
Channel 1: ANC	727,729	768,063	810,632
Channel 1: ANC Type of ITN	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO and Single Pyrethroid
Channel 2: EPI	737,343	759,537	782,399
Channel 2: EPI Type of ITN	Single Pyrethroid	PBO and Single Pyrethroid	PBO and Single Pyrethroid
Channel 3: School	N/A	N/A	N/A
Channel 3: School Type of ITN			
Channel 4: Community	841,354	866,678	0
Channel 4: Community Type of ITN	PBO and Single Pyrethroid	PBO and Single Pyrethroid	
Channel 5: Social Marketing	541,876	568,969	597,418
Channel 5: Type of ITN	Single Pyrethroid	Single Pyrethroid	Single Pyrethroid
Channel 5: ITN for emergency and response	302,574	302,574	302,574
Channel 5: Type of ITN	Single Pyrethroid	Single Pyrethroid	Single Pyrethroid
Estimated Total Need for Continuous Channels	3,150,876	3,265,821	2,493,022
<b>Mass Campaign Distribution Needs</b>			
Mass distribution campaigns	1,955,427	0	14,941,643
Mass distribution ITN type	Single Pyrethroid		Dual AI and Single Pyrethroid
Estimated Total Need for Campaigns	1,955,427	0	14,941,643
<b>Total ITN Need: Continuous and Campaign</b>	<b>5,106,302</b>	<b>3,265,821</b>	<b>17,434,665</b>
<b>Partner Contributions</b>			
ITNs carried over from previous year	506,219	0	410,329
ITNs from Government	0	0	0
Type of ITNs from Government			
ITNs from Global Fund	3,095,150	1,956,150	934,500
Type of ITNs from Global Fund	Single Pyrethroid	Single Pyrethroid	Single Pyrethroid
ITNs from other donors	31,000		
Type of ITNs from other donors	Single Pyrethroid		
ITNs planned with PMI funding	1,300,000	1,720,000	1,200,000

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
Type of ITNs with PMI funding	PBO and Single Pyrethroid	PBO and Single Pyrethroid	Dual AI
<b>Total ITNs Contribution Per Calendar Year</b>	<b>4,932,369</b>	<b>3,676,150</b>	<b>2,544,829</b>
<b>Total ITN Surplus (Gap)</b>	<b>(173,933)</b>	<b>410,329</b>	<b>(14,889,836)</b>



**Table A-2. RDT Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
Total country population	28,983,596	29,856,002	30,754,668
Population at risk for malaria	28,983,596	29,856,002	30,754,668
PMI-targeted at-risk population	28,983,596	29,856,002	30,754,668
<b>RDT Needs</b>			
Total number of projected suspected malaria cases	8,885,680	11,055,260	11,940,383
Percent of suspected malaria cases tested with an RDT	100%	100%	100%
<b>RDT Needs (tests)</b>	<b>9,677,526</b>	<b>12,059,646</b>	<b>13,028,505</b>
Needs Estimated based on HMIS Data			
<b>Partner Contributions (tests)</b>			
RDTs from Government	0	0	0
RDTs from Global Fund	7,221,250	3,362,500	
RDTs from other donors	162,500		
RDTs planned with PMI funding	3,375,475	2,500,000	2,500,000
<b>Total RDT Contributions per Calendar Year</b>	<b>10,759,225</b>	<b>5,862,500</b>	<b>2,500,000</b>
<b>Stock Balance (tests)</b>			
Beginning Balance	8,905,865	9,987,564	3,790,418
- Product Need	9,677,526	12,059,646	13,028,505
+ Total Contributions (received/expected)	10,759,225	5,862,500	2,500,000
<b>Ending Balance</b>	<b>9,987,564</b>	<b>3,790,418</b>	<b>(6,738,087)</b>
Desired End of Year Stock (months of stock)	7	7	7
Desired End of Year Stock (quantities)	5,645,223	7,034,794	7,599,961
<b>Total Surplus (Gap)</b>	<b>4,342,341</b>	<b>(3,244,376)</b>	<b>(14,338,048)</b>

**Table A-3. ACT Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
Total country population	28,983,596	29,856,002	30,754,668
Population at risk for malaria	28,983,596	29,856,002	30,754,668
PMI-targeted at-risk population	28,983,596	29,856,002	30,754,668
<b>ACT Needs</b>			
Total projected number of malaria cases	3,708,347	5,321,936	5,779,227
<b>Total ACT Needs (treatments)</b>	<b>3,879,957</b>	<b>5,572,921</b>	<b>6,053,076</b>
Select Data Source			
<b>Partner Contributions (treatments)</b>			
ACTs from Government	275,400	275,400	
ACTs from Global Fund	2,099,375	1,204,062	
ACTs from other donors	67,500		
ACTs planned with PMI funding	3,261,000	1,500,000	2,000,000
<b>Total ACTs Contributions per Calendar Year</b>	<b>5,703,275</b>	<b>2,979,462</b>	<b>2,000,000</b>
<b>Stock Balance (treatments)</b>			
Beginning Balance	2,289,565	4,112,883	1,519,424
- Product Need	3,879,957	5,572,921	6,053,076
+ Total Contributions (received/expected)	5,703,275	2,979,462	2,000,000
<b>Ending Balance</b>	<b>4,112,883</b>	<b>1,519,424</b>	<b>(2,533,652)</b>
Desired End of Year Stock (months of stock)	7	7	7
Desired End of Year Stock (quantities)	2,263,308	3,250,870	3,530,961
<b>Total Surplus (Gap)</b>	<b>1,849,575</b>	<b>(1,731,446)</b>	<b>(6,064,613)</b>

**Table A-4. Inj. Artesunate Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
<b>Injectable Artesunate Needs</b>			
Projected number of severe cases	89,542	121,771	134,946
Projected number of severe cases among children	66,172	89,988	99,725
Average number of vials required for severe cases among children	263,792	358,736	397,550
Projected number of severe cases among adults	23,371	31,782	35,221
Average number of vials required for severe cases among adults	210,335	286,039	316,988
<b>Total Injectable Artesunate Needs (vials)</b>	<b>478,868</b>	<b>651,223</b>	<b>721,683</b>
Needs Estimated based on HMIS Data			
<b>Partner Contributions (vials)</b>			
Injectable artesunate from Government	0	0	0
Injectable artesunate from Global Fund	991,390	314,355	
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding	100,000	200,000	189,000
<b>Total Injectable Artesunate Contributions per Calendar Year</b>	<b>1,091,390</b>	<b>514,355</b>	<b>189,000</b>
<b>Stock Balance (vials)</b>			
Beginning Balance	477,746	1,090,268	953,400
- Product Need	478,868	651,223	721,683
+ Total Contributions (received/expected)	1,091,390	514,355	189,000
<b>Ending Balance</b>	<b>1,090,268</b>	<b>953,400</b>	<b>420,717</b>
Desired End of Year Stock (months of stock)	7	7	7
Desired End of Year Stock (quantities)	279,340	379,880	420,982
<b>Total Surplus (Gap)</b>	<b>810,928</b>	<b>573,520</b>	<b>(266)</b>

**Table A-5. RAS Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
<b>Artesunate Suppository Needs</b>			
Number of severe cases expected to require pre-referral dose (or expected to require pre-referral dose based on number of providers for the service)	24,071	32,734	36,276
<b>Total Artesunate Suppository Needs (suppositories)</b>	<b>46,589</b>	<b>63,357</b>	<b>70,212</b>
Needs Estimated based on HMIS Data			
<b>Partner Contributions (suppositories)</b>			
Artesunate suppositories from Government	0	0	0
Artesunate suppositories from Global Fund	22,800	28,900	
Artesunate suppositories from other donors	0	0	
Artesunate suppositories planned with PMI funding	34,540	90,000	
<b>Total Artesunate Suppositories Available</b>	<b>57,340</b>	<b>118,900</b>	<b>0</b>
<b>Stock Balance (suppositories)</b>			
Beginning Balance	8,494	19,245	74,788
- Product Need	46,589	63,357	70,212
+ Total Contributions (received/expected)	57,340	118,900	0
<b>Ending Balance</b>	<b>19,245</b>	<b>74,788</b>	<b>4,576</b>
Desired End of Year Stock (months of stock)	7	7	7
Desired End of Year Stock (quantities)	27,177	36,958	40,957
<b>Total Surplus (Gap)</b>	<b>(7,931)</b>	<b>37,830</b>	<b>(36,381)</b>

**Table A-6. SP Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
Total Country Population	28,983,596	29,856,002	30,754,668
Total Population at Risk for Malaria	28,983,596	29,856,002	30,754,668
PMI Targeted at Risk Population	28,983,596	29,856,002	30,754,668
<b>SP Needs</b>			
Total Number of Pregnant Women	1,036,888	1,068,098	1,100,248
Percent of pregnant women expected to receive IPTp1	56%	60%	64%
Percent of pregnant women expected to receive IPTp2	45%	49%	53%
Percent of pregnant women expected to receive IPTp3	33%	37%	41%
Percent of pregnant women expected to receive IPTp4			
<b>Total SP Needs (doses)</b>	<b>1,408,298</b>	<b>1,574,809</b>	<b>1,755,458</b>
Needs Estimated based on Other (specify in comments)			
<b>Partner Contributions (doses)</b>			
SP from Government	0	0	
SP from Global Fund	536,650	440,000	
SP from other donors	0	0	0
SP planned with PMI funding	2,150,000	0	1,650,000
<b>Total SP Contributions per Calendar Year</b>	<b>2,686,650</b>	<b>440,000</b>	<b>1,650,000</b>
<b>Stock Balance (doses)</b>			
Beginning balance	957,700	2,236,052	1,101,243
- Product Need	1,408,298	1,574,809	1,755,458
+ Total Contributions (Received/expected)	2,686,650	440,000	1,650,000
<b>Ending Balance</b>	<b>2,236,052</b>	<b>1,101,243</b>	<b>995,785</b>
Desired End of Year Stock (months of stock)	7	7	7
Desired End of Year Stock (quantities)	821,507	918,639	1,024,017
<b>Total Surplus (Gap)</b>	<b>1,414,545</b>	<b>182,604</b>	<b>(28,232)</b>

**Table A-7. Primaquine Gap Analysis Table**

<b>Calendar Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>
Total Country Population	28,983,596	29,856,002	30,754,668
Total population at risk for malaria	28,983,596	29,856,002	30,754,668
PMI-targeted at-risk population	28,983,596	29,856,002	30,754,668
<b>Primaquine Needs</b>			
Total projected number of malaria cases	3,087,668	4,198,985	4,653,304
Total projected number of Pf cases			
Total projected number of Pv cases			
Total projected number of mixed cases (Pf + Pv)	18,844	53,855	58,149
<b>Total Primaquine Needs (tablets)</b>	<b>23,536</b>	<b>67,264</b>	<b>72,628</b>
Needs Estimated based on Other (specify in comments)	HMIS and demographic data		
<b>Partner Contributions (tablets)</b>			
Primaquine from Government	0	0	
Primaquine from Global Fund	9,000	7,000	
Primaquine from other donors	0	0	
Primaquine planned with PMI funding	0	0	
<b>Total Primaquine Contributions per Calendar Year</b>	<b>9,000</b>	<b>7,000</b>	<b>0</b>
<b>Stock Balance (tablets)</b>			
Beginning Balance	0	0	0
- Product Need	23,536	67,264	72,628
+ Total Contributions (received/expected)	9,000	7,000	0
<b>Ending Balance</b>	<b>(14,536)</b>	<b>(60,264)</b>	<b>(72,628)</b>
Desired End of Year Stock (months of stock)	7	7	7
Desired End of Year Stock (quantities)	13,730	39,238	42,366
<b>Total Surplus (Gap)</b>	<b>(28,266)</b>	<b>(99,502)</b>	<b>(114,994)</b>