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Mali

Malaria Operational Plan FY 2024

Suggested Citation: U.S. President's Malaria Initiative Mali Malaria Operational Plan FY 2024. Retrieved from www.pmi.gov

This FY 2024 Malaria Operational Plan has been approved by the 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 2024 appropriation from U.S. Congress. Any updates will be reflected in revised postings.

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ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AI	Active ingredient
AL	Artemether-lumefantrine
An.	*Anopheles*
ANC	Antenatal care
ASACO	Community Health Association
CDC	Centers for Disease Control and Prevention
CHW	Community health worker
CSCom	Community health center (*Centre de santé communautaire)*
CSRef	Referral health center (*Centre de santé de référence*)
CY	Calendar year
DHS	Demographic and Health Survey
DHIS2	District Health Information Software 2
DPM	Directorate of Pharmacy and Medicines
EIR	Entomological inoculation rate
EPI	Expanded Program on Immunization
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HRCD	Human resources capacity development
IPTp	Intermittent preventive treatment in pregnancy
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LMIS	Logistics management information system
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MOP	Malaria Operational Plan
NMCP	National Malaria Control Program
NMSP	National Malaria Strategic Plan
OR	Operational research
OTSS+	Outreach, training and supportive supervision plus
OSPSANTE	*Outil de Suivi des Produits de Santé*
PBO	Piperony butoxide
Pf	*Plasmodium falciparum*

PPM	*Pharmacie Populaire du Mali*
PMI	U.S. President's Malaria Initiative
Pv	*Plasmodium vivax*
RDT	Rapid diagnostic test
SBC	Social and behavior change
SMC	Seasonal malaria chemoprevention
SM&E	Surveillance, monitoring and evaluation
SP	Sulfadoxine-pyrimethamine
SPAQ	Sulfadoxine pyrimethamine-amodiaquine
TA	Technical assistance
TES	Therapeutic efficacy studies
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

To review specific country context for Mali, please refer to the country malaria profile located on PMI's country team landing page, which provides an overview of the country malaria situation, key indicators, the NMCP strategic plan, and the partner landscape.

U.S. President's Malaria Initiative

Launched in 2005, the 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 27 countries in Sub-Saharan Africa and three programs across the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Mali began implementation as a PMI partner country in FY 2007.

Rationale for PMI's Approach in Mali

Malaria remains a major public health concern and priority for Mali's Ministry of Health and Social Development because it is the leading cause of morbidity and mortality. Impressive gains in the past decade include significant decreases in malaria prevalence and all causes of child mortality, but challenges remain. In recent years, the country has suffered from political instability and insecurity, which hamper the provision of health services, patient access to care, and quality of care. Nevertheless, there are also positive factors that contribute to an enabling environment for malaria interventions, including a long tradition of insecticide-treated mosquito net (ITN) use, a strong research community, and government commitment to defeating malaria. PMI's support in Mali is well aligned with the national strategic plan, contributing to the implementation of the majority of key interventions. PMI's operational support is focused in the southern five regions with both the largest population and the highest malaria burden: Sikasso, Segou, Koulikoro, Mopti, and Kayes, as well as the capital of Bamako.

Overview of Planned Interventions

The proposed FY 2024 PMI funding for Mali is $24 million. PMI will support the following intervention areas with these funds:

1. Vector Monitoring and Control:

With FY 2024 funding, PMI will continue to procure and distribute ITNs through routine channels (antenatal care and expanded program on immunization), matching the type of net to those distributed during the 2023 mass campaign, as well as entomological monitoring activities at 13 sites, including sites with high risk of *Anopheles stephensi.*

2. Malaria in Pregnancy:

PMI will continue to procure sulfadoxine-pyramethamine (SP) for intermittent preventive treatment in pregnancy (IPTp) and artemisinin-based combination therapies (ACTs) and injectable artesunate needed to treat pregnant women with malaria. PMI will strengthen the capacity of health care providers on malaria prevention and case management through training and supportive supervision. PMI will also train and supervise community health workers on community IPTp.

3. Drug-Based Prevention:

With FY 2024 funding, PMI will procure seasonal malaria chemoprevention commodities and finance operational costs to cover children 3 to 59 months of age in 11 districts of the regions of Sikasso, Kayes, and Koulikoro, as well as all children 5 to 10 years of age in three districts of Sikasso.

4. Case Management:

PMI will continue to improve the quality of diagnostics and case management at health facilities and in the communities through training and supervision on all aspects of case management in PMI-supported regions. With FY 2024 funding, PMI will procure rapid diagnostic tests, artemisinin-based combination therapies, and injectable artesunate, to be distributed through the national supply chain.

5. Health Supply Chain and Pharmaceutical Management:

To ensure an uninterrupted supply of quality health commodities, PMI provides support for procurement and supply chain management and systems strengthening to the Ministry of Health and Social Development. With FY 2024 funds, PMI will continue to support health supply chain and pharmaceutical management activities. This includes planning, strategy and coordination, forecasting and supply planning, warehouse and inventory management, transport and distribution, monitoring and evaluation, human resource development and logistics. It also includes supporting the last mile delivery of products in two PMI supported districts and extending the functionalities of the electronic logistics management information system.

6. Malaria Vaccine:

The Malian government has informed Gavi they plan to apply for funding in July 2023 to support the procurement and deployment of the malaria vaccine. Once it is determined that Mali will receive the vaccine, PMI will consider activities to support vaccine introduction.

7. Social and Behavior Change:

The following two behaviors will be prioritized with FY 2024 funds: 1) prompt and appropriate care-seeking for fever for children under five years of age; 2) adherence to case management guidelines, particularly related to classifying severe malaria cases.

8. Surveillance, Monitoring, and Evaluation:

To support the malaria control strategic plan, PMI and the NMCP are focusing on the challenges of data underutilization and data quality in health facilities and communities. With FY 2024 funding, PMI will provide financial and technical support to the national health information system, including training, data quality assessments, producing monthly malaria bulletins, and using data for program improvement.

9. Operational Research and Program Evaluation:

PMI does not plan to fund operational research/program evaluation activities with FY 2024 funds.

10. Capacity Strengthening:

Capacity strengthening is integral to PMI's approach in Mali, as demonstrated in the sections above, and through support to improve management at the NMCP. With FY 2024 funds, PMI will continue these activities and will fund NMCP staff (national and field level) participation in international scientific and professional meetings. This will provide opportunities to learn best practices, share experiences, and develop networks.

11. Staffing and Administration:

FY 2024 funds will cover staffing and administration costs for two resident advisors and locally engaged experts.

I. CONTEXT & STRATEGY

1. Introduction

Mali began implementation as a PMI partner country in FY 2007. This FY 2024 Malaria Operational Plan (MOP) presents a detailed implementation plan for Mali, 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 Mali, describes progress to date, identifies challenges and relevant contextual factors, and provides a description of activities that are planned with FY 2024 funding. For more detailed information on the country context, please refer to the Country Malaria Profile located on PMI's country team landing page, 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)

The U.S. President's Malaria Initiative (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 of pregnant women (IPTp), and drug-based prevention–as well as cross-cutting interventions such as surveillance, monitoring and evaluation; social and behavior change; 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 27 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:

1. Reduce malaria mortality by 33 percent from 2015 levels in high-burden PMI partner countries, achieving a greater than 80 percent reduction from 2000.
2. Reduce malaria morbidity by 40 percent from 2015 levels in PMI partner countries with high and moderate malaria burden.

3. Bring at least ten 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 Mali

3.1. Malaria Overview for Mali

Malaria remains a major public health concern and priority for Mali's Ministry of Health and Social Development because it is the leading cause of morbidity and mortality, particularly for children less than five years of age and pregnant women. According to data from the routine health information system (housed on the District Health Information System 2 platform), 37 percent of outpatient consultations and 27 percent of deaths at health facilities were due to malaria in 2022.[1]

The Government of Mali, in partnership with funding partners, research institutions, and national and international organizations, has achieved impressive gains in malaria control over the past decade. Data from Demographic and Health Surveys (DHS) and Malaria Indicator Surveys (MIS)[2] show that malaria prevalence in children under five years of age declined from

[1] District Health Information Software 2, Extracted on 4/11/2023.

[2] Data sources include: Cellule de Planification et de Statistique du Ministère de la Santé - CPS/MS/Mali, Direction Nationale de la Statistique et de l'Informatique du Ministère de l'Économie, de l'Industrie et du Commerce - DNSI/MEIC/Mali and Macro International. Enquête Démographique et de Santé du Mali 2006. (Calverton, Maryland, USA: Bamako, Mali, 2007): https://dhsprogram.com/publications/publication-fr199-dhs-final-reports.cfm; Cellule de Planification et de Statistique - CPS/SSDSPF/Mali, Institut National de la Statistique - INSTAT/Mali, Centre d'Études et d'Information Statistiques - INFO-STAT/Mali and ICF International, 2014. Enquête Démographique et de Santé au Mali 2012-2013. Rockville, Maryland, USA, Bamako, Mali, 2014): https://dhsprogram.com/pubs/pdf/fr286/fr286.pdf; Programme National de Lutte contre le Paludisme - PNLP/Mali, Institut National de la Statistique - INSTAT/Mali, INFO-STAT, Institut National de la Recherche en Santé Publique - INRSP/Mali and ICF International, Enquête sur les Indicateurs du Paludisme au Mali (EIPM) 2015. (Rockville, Maryland, USA, Bamako, Mali, 2016): https://dhsprogram.com/pubs/pdf/mis24/mis24.pdf; Institut National de la Statistique - INSTAT, Cellule de Planification et de Statistique Secteur Santé-Développement Social et Promotion de la Famille. Enquête Démographique et de Santé au Mali 2018. (Bamako, Mali et Rockville, Maryland, 2019): https://dhsprogram.com/pubs/pdf/FR358/FR358.pdf; Institut National de la Statistique (INSTAT), Programme National de Lutte contre le Paludisme (PNLP) et ICF. Enquête sur les Indicateurs du Paludisme au Mali 2021. Bamako, Mali et Rockville, Maryland, USA, 2022): https://dhsprogram.com/pubs/pdf/MIS40/MIS40.pdf.

47 percent in 2012 to 19 percent in 2021, and all-cause child mortality decreased by 47 percent, between 2006 and 2018. Malaria prevalence varies across regions, from less than 2 percent in Bamako to 27 percent in Mopti region. However, between 2018 and 2022, Mali experienced an increase in malaria cases, from 133 per 1,000 population in 2018 (2,613,592 million cases) to 172 per 1,000 population in 2022 (3,771,426 malaria cases). For children under five years of age, malaria cases increased from 224 per 1,000 population to 250 per 1,000 population during the same period.[3]

Programmatic indicators have also shown improvement, according to recent surveys. The proportion of households with at least one ITN increased from 50 percent in 2006 to 91 percent in 2021. The proportion of pregnant women who received three or more doses of IPTp increased from 28 percent in 2018 to 35 percent in 2021. Care-seeking for children with fever has continued to improve from 56 percent in 2006 to 60 percent in 2021, as well as malaria testing, which increased from 14 percent in 2015 to 24 percent in 2021. However, among children with fever, the proportion receiving an ACT decreased from 31 percent in 2018 to 15 percent in 2021.

A new malaria stratification exercise was done in early 2023 using malaria incidence adjusted for health center attendance rate and climatic zones. Four transmission zones were defined:

- Very low transmission: adjusted incidence less than 100 cases per 1,000 person-years (10 districts),
- Low transmission: adjusted incidence between 100 and 250 cases per 1,000 person-years (12 districts),
- Moderate transmission: adjusted incidence between 250 and 450 cases per 1,000 person-years (34 districts), and
- High transmission: adjusted incidence above 450 cases per 1,000 person-years (19 districts).

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

3.2. Key Challenges and Contextual Factors

Mali faces a number of challenges to achieving its malaria control objectives. It ranks consistently among the poorest countries in the world, with nearly half the population living below the poverty line. In the latest Human Development Index report (2021-2022), Mali ranked 186 out of 191 countries, reflecting high levels of poverty and food insecurity, and low literacy rates, especially for women and rural populations. Mali is estimated to be among the most vulnerable countries to climate stress due to its socioeconomic status, geo-location, and

[3] DHIS2, Extracted on 4/11/2023.

climate-sensitive economy (pastoralism and farming systems provide livelihoods for 74 percent of the population).[4]

In recent years, political instability and insecurity have further complicated the situation. Violence in the northern and central regions of the country has increased over the past two years and often targets civilians, contributing to a significant increase in internally displaced populations and limiting the ability of health system personnel and partner organizations to access facilities/communities. Combined with weak governance structures, the provision of health services, patient access to care, and quality of care are less than optimal. Nevertheless, there are also positive factors that contribute to an enabling environment for malaria interventions. Mali has a long tradition of ITN use, with ownership and use indicators among the highest in Africa. In early 2022, the government formalized the role of community health workers (CHWs) in the health pyramid and as of early 2023, just over 3,000 CHWs were being paid by various organizations. Mali also boasts a strong scientific and research community, having contributed to research on malaria vaccines, mosquito genetics, and drug resistance. Finally, the Government of Mali has demonstrated its commitment to defeating malaria through the procurement of some malaria commodities, supporting some of the operational costs for seasonal malaria chemoprevention (SMC), and collaborating closely with local and international partners.

Some of the programmatic challenges the country faces include:

- Non-adherence to case management guidelines related to severe malaria cases, which has implications for commodity procurement, drug resistance, and patient out-of-pocket costs.
- Inconsistent data quality and poor visibility into commodity consumption data.
- Uncertainty around government follow through on commitments for funding commodities and activities.

3.3. PMI's Approach for Mali

PMI's support in Mali is well aligned with the national strategic plan, contributing to the implementation of the majority of key interventions. A few activities delineated in the National Malaria Strategic Plan that PMI does not currently contribute to include: sampling and quality control testing of ITNs upon arrival in the country, indoor residual spraying, larval source management, mass drug administration, procurement of rectal artesunate for pre-referral treatment, pharmacovigilance, epidemic preparedness and response in the northern regions, and malaria sentinel surveillance sites. Case management, vector control, and SMC make up the largest share of PMI's FY 2024 budget (26 percent, 26 percent, and 20 percent, respectively). Overall, 49 percent of the budget is dedicated to commodity procurement, with the remaining 51 percent supporting implementation costs and technical assistance.

[4] USAID/Mali Country Development Cooperation Strategy, 2022-2027: https://www.usaid.gov/sites/default/files/2023-08/CDCS-Mali-September-2027_1.pdf.

PMI seeks to ensure the availability of key prevention and case management products and services, in close collaboration with the Global Fund and the Government of Mali. Commodities procured by different partners are put into a common stock and distributed through the national system. PMI's operational support is focused in the southern five regions with both the largest population and the highest malaria burden: Sikasso, Segou, Koulikoro, Mopti, and Kayes, as well as the capital of Bamako.

PMI/Mali uses data to address the programmatic challenges listed above. This includes end-use verification surveys and the web-based dashboard for managing essential health commodities logistics and patient information (*Outil de Suivi des Produits de Santé*, or OSPSANTE), and health management information data to identify districts with the highest proportion of severe malaria cases. An exercise conducted in 2022 that included a data review, register review, and provider interviews furnished useful insights into the reasons for the overclassification of severe malaria cases, which PMI and the NMCP are working together to address. Data quality is monitored and improved through regular data review meetings with the NMCP and the publication of epidemiological bulletins at both the national and regional levels in PMI partner regions.

Encouraging the Government of Mali to increase and follow through on its funding commitments for malaria is critical, so, PMI contributes to the efforts of the USAID Health Office and the national donor coordination group that reviews government and external commitments for malaria and develops advocacy strategies for increasing and following through on government funding.

PMI/Mali supports CHWs and other volunteers to reach remote and underserved populations through door-to-door activities like SMC, outreach strategies for antenatal care (ANC) and IPTp, and active detection of malaria cases in children. PMI also supports training and supervision of CHWs, and last mile commodity distribution. Two local research institutions, the Malaria Research and Training Center and the Applied Molecular Biology Laboratory, both at the University of Bamako, have prominent roles in PMI's programming, working on therapeutic efficacy studies, operations research, entomological monitoring, and ITN durability monitoring. Community-based entomological surveillance also provides a way to allow data collection to continue when implementing partners may not be able to reach areas due to insecurity or other factors.

3.4 Key Changes in this MOP

PMI is not proposing any major changes in strategies, activities, or budget levels compared to the FY 2023 MOP. This plan includes resources for an MIS in 2025.

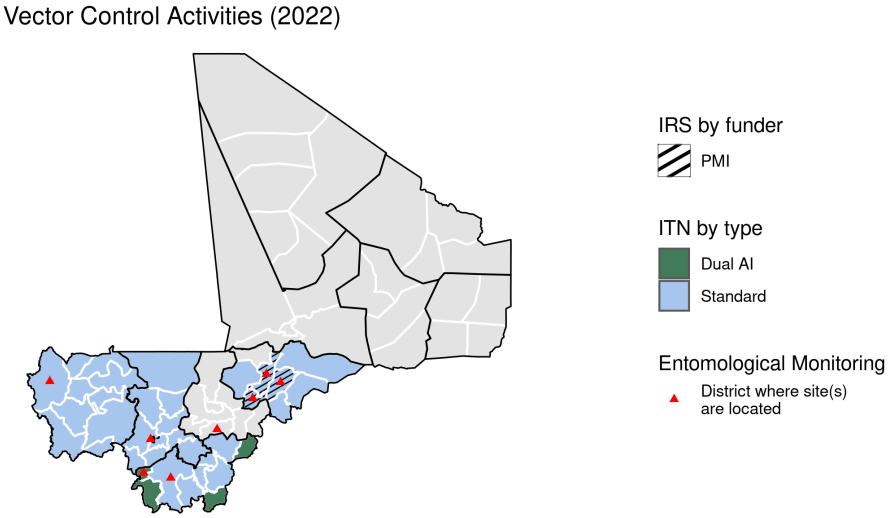
II. OPERATIONAL PLAN FOR FY 2024

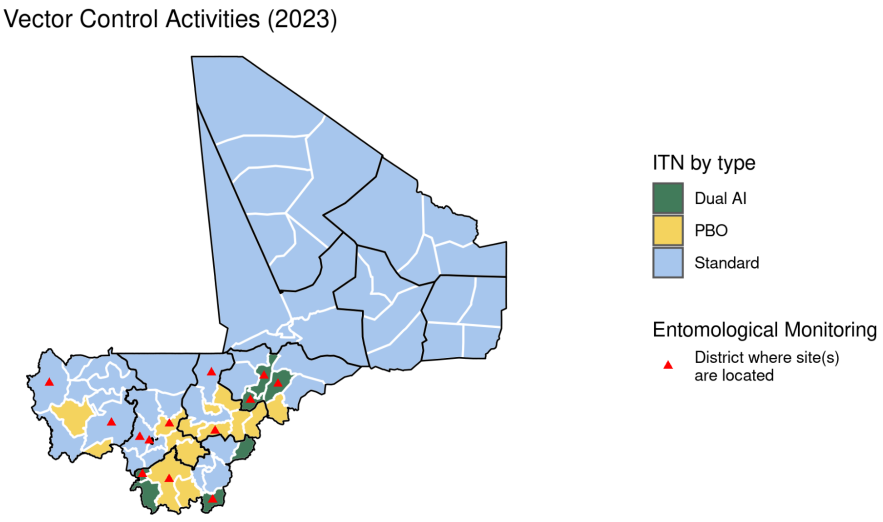
1. Vector Monitoring and Control

1.1. PMI Goal and Strategic Approach

Mali's 2023-2027 National Malaria Strategic Plan (NMSP) recommends vector control interventions including continuous and mass distributions of ITNs, IRS, larval source management, management of insecticide resistance, and strengthening entomological surveillance capacities. Currently, PMI supports the use of these interventions, with the exception of larval source management and IRS. PMI stopped implementing IRS after the 2022 spray campaign, but continues to support entomological monitoring to assess the impact of IRS withdrawal on vector bionomics in the previous IRS districts of Mopti Region (Bandiagara, Djenne and Mopti districts) and Sikasso Region (Selingue and Bougouni districts) where dual AI nets have been distributed. PMI supports continuous distribution of ITNs through antenatal care (ANC) and an expanded program on immunization (EPI) channels, while the Global Fund supports mass distribution of ITNs every three years. Figure 1 below shows the geographic coverage of vector control activities supported by PMI in 2022 and 2023. The type of ITN distributed refers to the 2020 mass campaign for the map on the top and the 2023 mass campaign for the map on the bottom.

Figure 1. Maps of Vector Control Activities in Mali (2022 and 2023)





1.2. Recent Progress (between May 2022 and April 2023)

During the referenced timeframe, PMI:

- Funded the planning, implementation, and evaluation of IRS in three districts (Bandigara, Djenne, and Mopti) covering 72,106 structures and protecting 273,831 people, including 20,728 pregnant women and 49,996 children under five years of age. For more information about IRS, please refer to the most recent End of Spray Report.
- Trained and engaged community members in three districts to support IRS mobilization, supervision and spray activities.
- Funded longitudinal entomological monitoring in six sentinel sites (one sprayed and one unsprayed site) in each of the three IRS districts in Mopti Region in partnership with the NMCP. Monitoring activities included vector bionomics in three districts (Bandiagara, Djene and Mopti), insecticide resistance monitoring in eight districts (Kayes, Bla, Bamako, Bandiagara, Djenné, Mopti, Selingué, and Bougouni) across the country and residual efficacy monitoring in three IRS sites (Djenné, Mopti, and Bandiagara). For more information about entomological monitoring, please refer to the 2022 Entomological Report.
- Continued to finance community-based entomology activities, piloted in 2021 in the six longitudinal entomology surveillance sentinel sites (Somadougou, Sarema, Bendieli, Dandoly, Madiama and Soala) for the three IRS districts, using CDC light traps and pyrethrum spray catches.
- Funded entomological monitoring of two sites in two ITN districts (Selingué received dual active ingredient (AI) nets and Bougouni pyrethroid-only ITNs), using human landing catches and pyrethrum spray catches.
- Procured and distributed more than 1.8 million ITNs through antenatal consultations and the child immunization visits (dual AI nets in the districts where IRS was withdrawn and district with high malaria prevalence, PBO nets for districts with high malaria prevalence and districts where insecticide to pyrethroids has been reported, and single pyrethroid for district with low to moderate malaria prevalence) .

- In collaboration with the NCMP and local authorities, supported community-level social and behavior change (SBC) activities to increase acceptance of vector control interventions (demand for ITNs, appropriate use and care, and acceptance of IRS). For more information, please refer to the SBC section.

1.3 Plans and Justification for FY 2024 Funding

The FY 2024 funding tables contain a full list of vector monitoring and control activities that PMI proposes to support.

1.3.1. Entomological Monitoring

PMI will continue to support entomological monitoring activities in Mali, which will include insecticide resistance monitoring and vector bionomics. Although PMI no longer supports IRS, longitudinal monitoring will continue in areas where IRS has been withdrawn and in areas with dual AI, piperonyl butoxide (PBO) and single pyrethroid ITNs. PMI will work with partners to continue to strengthen community-based entomological surveillance, which has been key to the continuation of this work in areas of insecurity. PMI will continue to support longitudinal surveillance of *Anopheles (An.) stephensi* in selected areas connected to main transport routes in Bamako. Its recent emergence in the Horn of Africa, Kenya, Ghana and Nigeria attest this mosquito's ability to spread to new West Africa countries and poses a significant threat to Mali's malaria control efforts.

Summary of Distribution and Bionomics of Malaria Vectors in Mali

An. stephensi is a mosquito species which can transmit both *Plasmodium falciparum* and *P. vivax* malaria parasites. Unlike the other types of mosquitoes which carry malaria, it thrives in urban areas.[5] *An. gambiae* s.l. continues to be the primary vector in Mali, representing 99.3 percent of *An.* collected at the six entomological monitoring sites in Mopti region between January 2022 and February 2023. Other species recorded include *An. pharoensis* and *An. rufipes. An. funestus* s.l was found in only one IRS site in Mopti region. The indoor resting densities were lower (ranging from 2.2 female *An. Gambia* s.l. per room (*f/r*) to 12.9 (*f/r*) in the IRS sites compared with the unsprayed sites (ranging from 4.4 *f/r* to 47.2 *f/r)* with the peak of indoor resting densities in August/September. Human biting rates, measured by proxy using CDC light traps were higher in unsprayed sites except in Mopti district where the IRS and unsprayed sites had similar biting rates. The entomological inoculation rate (EIR) was low in all six sites monitored in Mopti region with the EIR of one unsprayed site (Bandiagara) at 0.0006 infective bites per person over the 14 months of monitoring and 0.04 infective bites per person in two of the sprayed sites (Mopti and Djenné).

In Sikasso sites with dual-AI and pyrethroid-only ITNs, mosquito collections between July and November 2022 showed a similar vector species composition with *An. gambiae* s.l. being the

[5] World Health Organization. WHO initiative to stop the spread of *Anopheles stephensi* in Africa, 2023 update. Policy brief. Geneva, Switzerland, June, 2023): https://www.who.int/publications/i/item/WHO-UCN-GMP-2022.06.

predominant vector, followed by *An. pharoensis.* Indoor resting density in Bougouni (pyrethroid-only ITN) peaked in August, while in Selingué (dual AI ITN), the peak was in October. Higher indoor resting densities and biting rates were also observed in Bougouni. Biting trends at both sites increased from 1:00 am to 5:00 am and overall more biting was observed indoors than outdoors, with the highest EIR of 68.8 infective bites per person compared to Selingué at 35.2 infective bites per person.

Molecular species identification of the mosquito specimens from longitudinal monitoring indicates that *An. coluzzii* (97 percent) was the predominant vector species, followed by *An. gambiae* s.s. (1.2 percent). In Sikasso entomological monitoring sites that received ITNs however, *An. coluzzii* represented 55 percent and *An. gambiae* s.s. 41 percent of the mosquitoes collected.

Status of Insecticide Resistance in Mali

In 2022, insecticide resistance was tested in eight sites (Kayes, Bla, Bamako, Bandiagara, Djenné, Mopti, Selingué, and Bougouni). *An. gambiae* s.l. was resistant to permethrin, deltamethrin and alpha-cypermethrin in all sites. There was a significant increase in mortality when the synergist PBO was used, however the PBO did not fully restore susceptibility of *An. gambiae* s.l. to the three pyrethroids at all the sites tested. In Bamako, however, PBO had no significant difference on the mortality of *An. gambiae* s.l.. There was full susceptibility to pirimiphos-methyl, clothianidin and chlorfenapyr in all eight sites.

1.3.2. Insecticide-Treated Nets (ITNs)

PMI will continue to fund the procurement and distribution of ITNs for pregnant women and children less than one year of age through routine distribution (ANC visits and vaccination programs). With FY 2024 funds, PMI will procure enough ITNs to maintain 10 months of stock availability to avoid stockouts. PMI will purchase PBO nets for the 14 targeted districts with high malaria prevalence and where resistance to pyrethroids has been reported; dual active ingredient nets for three districts where IRS has been withdrawn (Mopti, Djenne, and Bandiagara) and that will receive these nets during 2023 mass campaign, and four additional health districts in Sikasso with high malaria prevalence that received them during the 2020 and 2023 mass campaigns (Kadiolo, Selingue, Yanfolila, and Yorosso). PMI will procure single-pyrethroid ITNs for the regions with low to moderate malaria prevalence and where resistance to pyrethroids had not yet been observed.

PMI will maintain support for ITN SBC interventions in targeted districts to increase demand for ITN ownership, increase appropriate use, and mitigate against misuse. Please see the SBC section for details on challenges and opportunities to improve intervention uptake or maintenance.

ITN Distribution in Mali

In Mali, ITNs are distributed via mass distribution campaigns every three years and through ANC and the child vaccination continuous distribution channels. Though Mali currently does not use community outlets for ITN distribution, CHWs play an important role to increase the demand and appropriate use of ITNs in the community. PMI will procure the majority of ITNs required for routine distribution in calendar year 2025, with the Government of Mali also planning to procure some nets. Please refer to the ITN Gap Table in annex for more detail on planned quantities and distribution channels.

Table 1. Streamlined Durability Monitoring

Campaign Date	Site	Brand	Baseline	12-month	24-month	36-month
Dec. 2017	Kenieba	Yorkool	March–May 2018	December 2018	Nov.–Dec. 2019	Nov.-Dec. 2020
Dec. 2017	Kita	PemaNet 2.0	March–May 2018	December 2018	Nov.–Dec. 2019	Nov.-Dec. 2020
June 2023	TBD	Dual AI nets PBO nets	Planned	Planned	Planned	Planned

PMI completed a three-year full durability monitoring study in 2021. It compared two ITN brands (Yorkool and PermaNet 2.0) in two locations from the Kayes region with similar malaria epidemiology, climatic, and socio-ecological profiles. At the 36-month follow-up period, the proportion of Yorkool nets surviving in serviceable condition was lower than PermaNet 2.0 nets, mostly because of high attrition due to wear and tear and lower physical integrity. With FY 2024 funds, PMI plans to conduct streamlined durability monitoring for dual active ingredient and PBO-based ITNs that will be distributed in the 2023 mass campaign in Sikasso region.

1.3.3. Indoor Residual Spraying (IRS)

PMI will no longer support IRS in Mali from 2023.

IRS Insecticide Residual Efficacy in Mali

Mali conducted its last spray campaign in 2022 in three districts with Actellic 300CS in Bandigara district, SumiShield 50WG in Mopti district and Fludora Fusion WP-SB in Djenné district. Spray quality testing conducted one-week post-IRS indicated good spray quality with 100 percent mortality on all wall types tested with the three insecticides. All three insecticides showed residual efficacy of eight months for all wall types.

2. Malaria in Pregnancy

2.1. PMI Goal and Strategic Approach

Mali's 2023–2027 NMSP goal is to achieve a minimum of 80 percent coverage of three doses of intermittent preventive treatment for pregnant women (IPTp) and use of ITNs, 100 percent prompt case management of malaria infection in pregnancy, improve the availability of sulfadoxine-pyrimethamine (SP) for IPTp, and strengthen capacities for malaria case management at the facility level. Currently oral quinine is the first line treatment for uncomplicated malaria during the first trimester of pregnancy. With the new WHO recommendation to use AL, the NMCP is planning to update the treatment policy of MIP and recommends the use of AL in the first trimesters. Mali also has been implementing the WHO guidelines on IPTp since 2020, which recommends administering IPTp starting as early as the 13th week of gestation, and subsequent doses are given at monthly intervals until delivery.

Results from the 2021 MIS show that coverage for at least one ANC visit is at 84 percent. However, coverage of at least four ANC visits remains around 45 percent. In addition, only 35 percent of women start their ANC during the first trimester of pregnancy. The proportion of women receiving at least one dose of IPTp increased from 16 percent in 2006 to 78 percent in 2021, while the proportion of women receiving at least three doses of IPTp increased from 6 percent in 2006 to 37 percent in 2021. In order to increase ANC attendance and IPTp, the NMCP is planning a pilot of a mobile strategy in two health districts as a complementary approach to fixed ANC clinics. This strategy consists of administration of SP by CHWs in the community starting from the second dose. Results will help to determine if any changes to the implementation plan are necessary before the national roll out. In addition, the NMCP is planning to extend the offer of free IPTp services to private health facilities. Particular attention is being paid to stock monitoring to ensure the availability of the SP at all levels and limit the risks of stockouts.

PMI funds national-level coordination and malaria in pregnancy (MIP) technical working groups, which include representation from the NMCP, the sub-directorate of reproductive health, the sub-directorate of health facilities and regulations, research institutions, midwives associations and pharmacists). PMI also supports effective delivery of malaria prevention services to pregnant women at sub-national levels. Specific activities include the training and supervision of health workers to provide ANC services, malaria prevention and case management during pregnancy in PMI-supported regions; distribution of an ITN at the first ANC visit; communication to women of childbearing age through women's associations with mass media, CHW platforms and modern communication technologies; and development of policies. PMI also meets SP procurement needs for all of Mali.

Malaria case management for pregnant women is an NMCP priority intervention. Treatment of uncomplicated malaria in pregnancy follows World Health Organization (WHO) recommendations with regard to testing of fevers and prompt treatment. In order to improve

adherence to guidelines, MIP is a component of integrated supervision and outreach, training and supportive supervision plus (OTSS+).

Please see the ITN section (1.3.2) for further details on how PMI supports routine distribution through ANC channels.

2.2. Recent Progress (between May 2022 and April 2023)

During the referenced period, PMI:

- In collaboration with NMCP and the Sub-Directorate of Reproductive Health, trained 101 health providers from private clinics in the regions Kayes and Koulikoro, and the capital district of Bamako in prevention and treatment of MIP and provision of ANC services. A pre- and post-test evaluation showed that the average competency of participants in malaria case management improved from 68 percent to 87 percent.
- Funded MIP technical working groups for effective implementation of MIP activities that include IPTp data review to monitor SP uptake; and review and monitor MIP implementation strategies. PMI also funded the revision of national supportive supervision guidelines, disseminated 1,773 copies and developed MIP training modules for maternity care providers.
- Conducted two rounds of OTSS+ with ANC healthcare providers in Kayes, Koulikoro and Bamako. Healthcare providers in the health facilities visited significantly improved their skills after the second round: the proportion of service providers demonstrating competency in the prevention of MIP increased from 59 percent to 68 percent, and provider competency in the treatment of MIP increased from 48 percent to 66 percent.
- Completed an operations research (OR) study on increasing intermittent preventive treatment uptake through enhanced antenatal clinic service delivery to improve maternal and child health. For more information, please refer to the OR section.
- Procured and distributed 3,109,480 doses of SP, procured about 1.8 million ITNs and distributed about 734,179 to pregnant women during their ANC visits.
- Implemented SBC interventions targeting pregnant women to generate awareness and uptake of ANC services and IPTp. For more information, please refer to the SBC section.

Key barriers that affect delivery of MIP services include knowledge gaps of prevention, case management, and IPTp guidelines among health care providers; limited IPTp content during ANC on-site training and supervision; delayed ANC attendance coupled with the fact that most women do not return for follow-up visits; long distance to health facilities; lack or limited knowledge of usefulness of SP with pregnant women; and stock-outs of malaria commodities.

2.3. Plans and Justification for FY2024 Funding

The FY 2024 funding tables contain a full list of malaria in pregnancy activities that PMI proposes to support.

PMI will:

- Collaborate and coordinate with USAID health programs that support broader maternal health activities.
- Finance MIP technical working groups; the revisions/development of MIP tools (guidelines, standard operating procedures, strategies) especially for community IPTp if needed; and the monitoring the implementation of MIP activities.
- Finance training and supervision of district, health facility, ANC and private clinic workers on IPTp implementation guidelines, quality assurance through continued use of an MIP module in OTSS+, and supportive supervision.
- Based on the findings from the pilot study in two districts, support the NMCP to begin to scale up community IPTp in some PMI supported regions/districts, including training and supervision of CHWs to deliver SP in the community starting from the second dose.
- Continue to procure the full quantity of SP needed for the country and ITNs for routine distribution through ANC. Please refer to the SP and ITN Gap Analysis Tables in the annex for more detail on planned quantities and distribution channels.
- To increase ANC attendance, use of ITNs, increase malaria care-seeking for pregnant women in supported districts, PMI will continue to support national and community-level SBC activities. Please see the SBC section for details on challenges and opportunities to improve intervention uptake or maintenance.

3. Drug-Based Prevention

3.1. Seasonal Malaria Chemoprevention

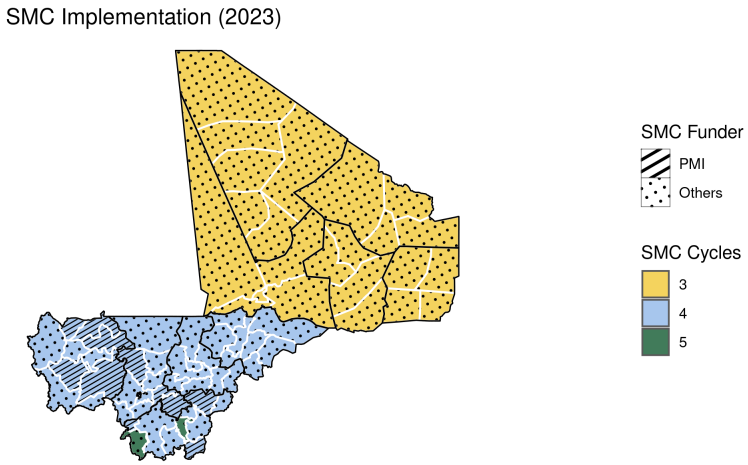
3.1.1. PMI Goal and Strategic Approach

The National Malaria Program's objective is to provide SMC in districts with high seasonal malaria transmission and reach 90 percent of children in eligible age groups during each cycle (three cycles in the district where the rainy season lasts three months to five cycles in the districts where the rainy season lasts five months and more). SMC is implemented nationwide, except in the capital district of Bamako. The NMSP 2023-2027 recommends including children from 3 months to 10 years, and suggests that SMC can be extended up to 15 years depending on the availability of funds. Currently, the intervention only covers children 3 to 59 months in most of the country.

PMI provides financial support and technical assistance to all aspects of the implementation of SMC in 11 districts of Sikasso, Kayes and Koulikoro regions (see Figure 2 below). This includes commodity procurement; planning; training of health providers; training, supervision and paying of CHWs; and SBC activities. Children 3 to 59 months of age are covered in all eleven districts, and children 5 to 10 years of age are included in three of these districts, initially selected based on malaria prevalence (30% or higher).

Mali's approach to SMC includes screening all children targeted for SMC for fever, and malnutrition screening for all children under five years of age. Children with fever are tested for malaria, and those who are positive are treated with an ACT. Children severely malnourished are referred to health facilities for proper management. In addition, pregnant women are screened for fever during SMC campaigns and those who are febrile are referred for care.

Figure 2. Map of SMC Implementation in Mali in 2023



3.1.2. Recent Progress (between May 2022 and April 2023)

PMI supported SMC implementation in 11 districts between July and October, 2022, including the following activities:

- Supported the NMCP to hold planning and post-implementation validation meetings.
- Regional micro-planning workshops and training of trainers for Kayes, Koulikoro and Sikasso regions.
- Procurement and distribution of about 6 million SPAQ blister-packs to meet the need in PMI supported districts.
- Supervision during the four SMC cycles.
- Independent monitoring of the SMC campaign after the first and fourth cycles.
- Financed the study for molecular characterization of *P. falciparum* dhfr and dhps genes in three districts among children and pregnant women. These two genes are associated with sulphadoxine and pyrimethamine resistance.
- Development and production of communication materials for the 2022 SMC campaign. For more information, please refer to the SBC section.

The campaign reached 1,035,879 children in the 11 PMI districts, including 224,540 children aged 5 to 10 years in the three districts of Sikasso region, achieving a coverage rate of 101 percent.

SMC also provided an opportunity to couple other low-cost interventions and contribute to reducing cases of anemia, hospitalizations and deaths among children. In PMI-supported districts, 16,643 children aged 3 to 59 months with fever were tested for malaria and 9,479 were confirmed malaria positive and treated. In addition, 488,682 children were screened for malnutrition, with 6,586 found to be malnourished and referred to care.

3.1.3. Plans and Justification for FY 2024 Funding

The FY 2024 funding tables contain a full list of SMC activities that PMI proposes to support.

With FY 2024 funds, PMI will continue to support the implementation of SMC in 11 districts of Sikasso, Kayes and Koulikoro regions as described in the recent progress section. All districts will receive at least four SMC cycles.

Please refer to the SPAQ Gap Table in annex for more detail on the planned quantities and distribution channels.

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

3.2. Other Drug-Based Prevention (as applicable)

PMI is not planning to support any other drug-based prevention activities with FY 2024 funding.

4. Case Management

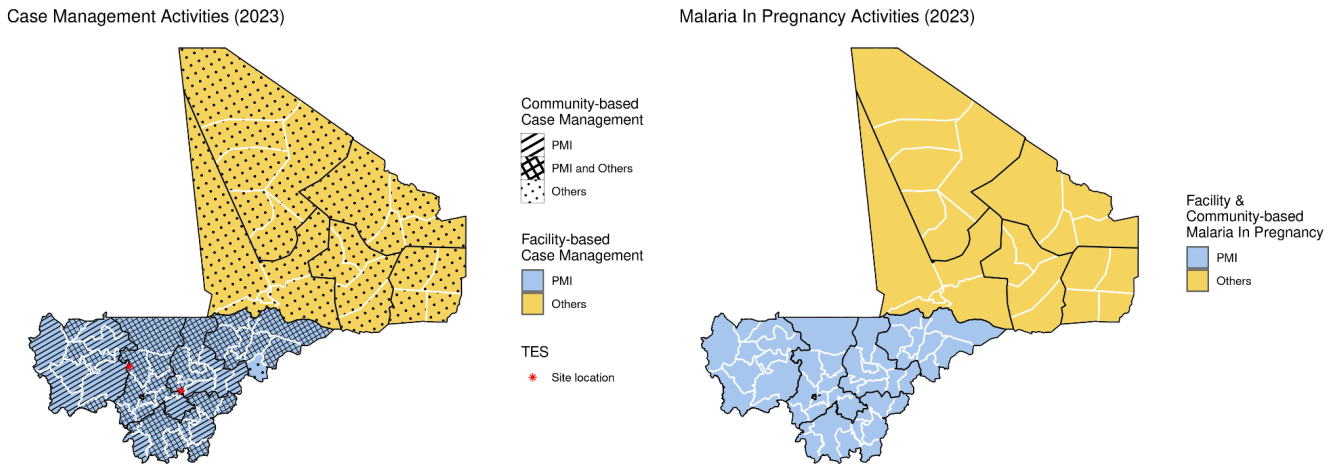
4.1. PMI Goal and Strategic Approach

The NMSP 2023- 2027 aims to provide appropriate parasitological testing (by microscopy or rapid diagnostic test [RDT]) to 100 percent of suspected malaria cases encountered in all health facilities (public and private), or seen by CHWs in the community, and to ensure proper management of all confirmed cases. Malaria diagnosis and treatment are free for children under five years of age and pregnant women, while older children and adults pay for both services and medications. In light of malaria outbreaks in the districts with low malaria prevalence in the northern regions of the country, the NMCP plans to enhance epidemiologic surveillance, strengthening capacity of CHWs for fever screening at community level, and digitalization of community data. The country is focusing on expanding iCCM to improve access and promote early care-seeking behavior and treatment of uncomplicated malaria at community level, particularly in rural populations. The iCCM algorithms direct CHWs to identify children with danger signs of severe illness (including those indicative of severe malaria), administering a rectal artesunate suppository and then immediately refer the patient to the nearest health facility.

PMI support for case management aligns with the NMCP strategy and includes central-level policy and operational activities at district and community levels in five regions of the country, commodity procurement and distribution nationwide, and improvement of facility- and community- level worker performance through the OTSS+ approach in PMI partner regions. The OTSS+ encompasses malaria laboratory diagnosis, uncomplicated and severe malaria case management, and MIP services. The Global Fund and the Government of Mali support similar activities in the rest of the country.

In 1999, the Government of Mali adopted the Community Health Program Policy to expand health access at the community level through trained CHWs offering integrated community case management in areas with difficult access to case management at health facilities. The government's goal is to enroll about 2,000 CHWs each year and have approximately 14,000 CHWs operational by the end of 2025. PMI supports, through equipment, training, and supervision, approximately 2,200 CHWs in five regions of the country. Salaries for these CHWs and the rest of the country are paid by the Global Fund, Gavi, the Vaccine Alliance and other partners covering a total of 3,200 CHWs in the country. PMI currently does not provide salary payments to CHWs, but is involved in advocating for the Government of Mali to take over salary payments for CHWs from Global Fund and Gavi.

Figure 3. Map of Case Management, Community Health and Malaria in Pregnancy Service Delivery Activities in Mali in 2023



4.2. Recent Progress (between May 2022 and April 2023)

PMI provided technical and financial assistance to the NMCP for the implementation of malaria case management policy in the southern and central regions of the country where more than 90 percent of the population live, as detailed below.

National Case Management Activities

- Trained 26 national and regional supervisors on the OTSS+ approach using the Health Network Quality Improvement System tool.
- Provided funding to conduct a mid-term review of the 2022-2025 NMSP and develop the 2023-2027 NMSP.
- Supported the development of key guidelines and reference documents, including the national quality assurance and quality control manual for the biological diagnosis of malaria; standard operating procedures; checklists for biological diagnosis of malaria including biomedical waste management; and national malaria prevention and case management guides for private facilities.
- Funded the harmonization of training modules in biological diagnosis of malaria at the National Institute for Training in Health Sciences.

Mali continues to report a high proportion of severe malaria cases compared to neighboring countries (more than 30 percent of malaria cases reported), resulting in significant overuse of injectable drugs. In 2022, PMI and the NMCP started work to identify the root causes of this problem and identify appropriate ways to address it. This included an analysis of health system data, register reviews, and interviews with health facility staff. Key takeaways include:

- **Health management information system data:** From 2019 to 2021, the proportion of malaria cases classified as severe nationwide ranged from 29 percent to 32 percent. Across demographics it was 31 percent for all age groups but 42 percent for pregnant women. Geographically, it ranged from a low of 9 percent in Kidal region to a high of 38 percent in Koulikoro, with the four central regions reporting rates above 30 percent. Some districts report more than 50 percent.
- **Register reviews:** Testing of suspected cases was 97 percent. A positive test result and at least one sign/symptom of severity was recorded for only 24 percent of patients classified as severe cases. For the six regions reviewed, this ranges from a low of 8 percent in Bamako to 41 percent in Mopti. The most common signs of severity recorded were convulsions, prostration, severe anemia and hyperparasitemia. Nearly all of the patients were treated with injectable medications (artemether, artesunate or quinine).
- **Provider interviews (254):** Analyses by sign/symptom showed that the vast majority of providers knew the characteristic signs and symptoms of severe malaria (more than 90 percent). Paradoxically, these results also indicate that the tendency to consider other (non-specific) signs as signs of severe malaria is high. As a result of including non-severe symptoms in the definition, only 38 percent of providers were considered to have good or very good knowledge of severe malaria. The main reasons stated by providers for treating a case of uncomplicated malaria with injectables were repeated vomiting (51 percent), ACT stockouts (24 percent), and patient request (5 percent). A small proportion (13 percent) of providers would refrain from doing so for any reason.

There is widespread suspicion that cost recovery is a significant factor guiding provider decisions to classify cases as severe malaria (as facilities generate more resources through the sale of the more expensive drugs and ancillary services for severe malaria), but this has not been explored. Classifying patients with vomiting and pregnant women as severe malaria is based on previous case management guidelines (2012). Despite the revision of these guidelines in 2016 and 2020, some providers continue to apply this outdated recommendation.

Commodities

- Procured 2.5 million malaria RDTs for nationwide distribution.
- Procured and distributed over 2 million ACTs.
- Procured over 340,000 vials of injectable artesunate.

Facility Level:

- PMI funds supported the NMCP and the National Institute of Public Health to implement a refresher training on basic malaria diagnosis for 110 laboratory technicians from regional hospitals, reference health centers (*Centres de santé de référence, CSRef*), and community health centers (*Centres de santé communautaires, CSComs*) in PMI focused regions. Pre- and post-training tests showed that parasite detection and identification scores increased from 66 percent to 90 percent and from 37 percent to 65 percent, respectively, but parasite counting did not improve.
- Trained 12 laboratory technicians from the regions of Kayes, Koulikoro, Sikasso, Segou, and Mopti and the capital district of Bamako on advanced biological diagnostics.
- Trained 114 trainers (from the central, regional levels and district levels) to train service providers from public and private facilities on the prevention and management of malaria with focus on severe malaria.
- Trained 476 service providers from public and private health facilities in the regions of Kayes, Koulikoro and the capital district of Bamako on malaria prevention and management.
- Funded two rounds of OTSS+, covering laboratory diagnostics and malaria case management in 521 health facilities representing 44 percent of all health facilities in PMI regions. The performance in slide reading of the facilities visited improved from 35 percent to 40 percent in external quality assurance. In addition, the proportion of service providers from Kayes, Koulikoro, and Bamako who demonstrated good performance in the management of uncomplicated malaria cases improved from 49 percent to 66 percent. The average competency of participants in malaria case management improved from 50 percent to 78 percent in Sikasso and from 45 percent to 90 percent in Segou.
- Supported the NMCP to hold lessons learned workshops after two rounds of OTSS+ on malaria prevention and case management in the health facilities of the regions of Kayes, Koulikoro, and the capital district of Bamako.

Community Level

- Funded on-site training and supportive supervision at 1,347 CHW sites in the regions of Koulikoro, Kayes, Mopti, Sikasso and Segou. These supervisory visits consisted of observing CHWs at work, reviewing consultation records, reports, data collection sheets, and drug inventories including RDTs, ACTs for non-severe malaria cases and artesunate suppositories for pre-referral management for complicated cases.
- Supported home visits through community platforms in Mopti, Segou and Sikasso regions that identified 17,460 children under five years of age with fever, who were referred to the nearest CHW.

Please note that recent progress with monitoring antimalarial efficacy and the TES approach is presented in the Plans and Justification for FY 2024 Funding section below.

4.3. Plans and Justification for FY 2024 Funding

The FY 2024 funding tables contain a full list of case management activities that PMI proposes to support.

National Level Case Management Activities

With FY 2024 funding, PMI will provide financial and technical support to the NMCP for the revision of case management guidelines and tools, if needed, and support the coordination and convening of the case management technical working groups (quarterly). PMI will support data collection and laboratory work for therapeutic efficacy studies.

PMI will continue to explore the severe malaria issue with the NMCP, Ministry of Health Officials, and other malaria stakeholders and continue to implement actions being initiated with MOP 2022 funds, which include a forum for reflection that meets on a regular basis; enhancing training and supervision of health care providers; analyzing and discussing severe malaria data regularly in various forums; conducting additional research on root causes; and enhancing SBC activities for the community and health care providers.

Commodities

PMI will collaborate with the NMCP and Global Fund to coordinate procurement and delivery of malaria commodities to ensure appropriate stock levels. Please refer to the ACT, RDT, injectable artesunate, and artesunate suppository Gap Tables in the annex for more detail on planned quantities and distribution channels. These quantities reflect enough stock to stay between the recommended minimum and maximum months of stock, except for injectable artesunate which is excessively used for non-severe malaria cases leading to insufficient stock of the product.

Facility Level

PMI aims to maintain the gains achieved through prior investments. With FY 2024 funding, PMI will finance refresher training, on-site training and supportive supervision for management of malaria cases including severe cases, and laboratory testing.

PMI will also continue to fund OTSS+ in all supported regions, including private facilities in the respective regions. Funds will facilitate at least one visit per year for each facility in PMI supported areas, and the frequency will vary based on performance (i.e., lower performing facilities will receive more frequent on-the-job training).

Community Level

In recognition of the country's ambitious goal for CHW expansion, PMI will coordinate with the Global Fund, other partners, and the NMCP to support the recruitment process (equipment and installation), training and supervision needs of additional 1,699 CHWs in PMI focus regions as they come on board.

PMI will continue to support on-site training and supportive supervision of about 1,400 established CHWs on managing uncomplicated malaria cases in older age groups, and the use of rectal artesunate as pre-referral treatment for children with severe malaria. PMI currently does not provide salary payments to CHWs, but is advocating for the Government of Mali to take over salary payments.

Monitoring Antimalarial Efficacy

Table 2. Ongoing and Planned Therapeutic Efficacy Studies

Ongoing Therapeutic Efficacy Studies			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
N/A	N/A	N/A	N/A
Planned TESs (funded with previous or current MOP)			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
2023	Selingue, Dioro, Missira	AL, DP	In-country

AL: Artemether-lumefantrine ; DP: dihydroartemisinin-piperaquine

Please see the SBC section 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's objective is to ensure an uninterrupted supply of quality health commodities (see description of Mali's supply chain system and strategy in the Mali Country Malaria Profile). This includes procurement and supply chain management support to the Ministry of Health to improve the availability and quality of malaria commodities and providing related systems strengthening technical assistance for comprehensive supply chain management. PMI's Stockout Reduction Strategy for Mali includes a stockout target of less than ten percent.

5.2. Recent Progress (between April 2022 and March 2023)

PMI's principal supply chain investments aimed at improving malaria commodity availability at service delivery sites included planning, strategy and coordination, forecasting and supply planning, warehouse and inventory management, transport and distribution, logistics management information system (LMIS), monitoring and evaluation, human resources capacity development and in-country logistics. In conjunction with these interventions, the availability of key commodities increased overall.

In March 2023, the availability of malaria commodities was 100 percent at the central and regional warehouses of the *Pharmacie Populaire du Mali* (PPM). At the service delivery points (CSCom, reference health centers and hospitals), the availability of AL6 and AL12 was at 97 percent and 95 percent, respectively, in the six PMI-supported southern and central regions (Bamako, Kayes, Koulikoro, Mopti, Ségou and Sikasso), above the target of 91 percent set in the PMI investment plan for 2023. Availability of SP and RDT were 97.8 and 94.3 percent, respectively, during the same time period, above the target of 92 percent.

Specific activities included:

- *Planning, strategy and coordination technical assistance (TA)*
    - Support to the Directorate of Pharmacy and Medicines (DPM) for the organization of quarterly meetings of the technical committee for the coordination and monitoring of the management of essential drugs and to the PPM for bi-monthly meetings with its partners.
    - Support to DPM and NMCP to monitor the PMI investment plan for the stock out reduction strategy.
    - Support to PPM for the development of a monitoring and evaluation plan and indicator guide for the five-year strategic plan (2021-2025).
    - Support to the National Laboratory of Health to develop its five-year strategic plan and its accreditation process for quality control of medicines.
    - Support for the coordination of supply chain management at regional and district levels.
- *Forecasting and supply planning*

    - Technical assistance to the DPM to organize an annual quantification exercise and quarterly review of the supply plan of malaria commodities.
    - Developed a long-term (2022-2025) forecast and funding gap analysis to facilitate resource mobilization. As a result, four supply plans were submitted on time.
- *Warehouse and inventory management TA*
    - Support to PPM for weekly monitoring of the maintenance of the Bamako prefabricated warehouse and weekly stock evaluation at central and regional warehouses to facilitate redistribution of malaria commodities.
- *Transport and distribution TA*
    - Mapping for road network optimization in Kayes and Koulikoro
    - Support to develop and implement distribution plans.
    - Support to develop redistribution plans among district warehouses and facilities.
- *Logistics management information system (LMIS)*
    - Support to the health structures to enter logistics data into the DHIS2 platform, transfer to OSPSANTE and use reports for decision-making.
    - Support to the NMCP to implement call centers in target CSComs in Kayes, Koulikoro and Mopti to increase the availability of malaria products.
- *Monitoring and evaluation*
    - Support to the NMCP to conduct the end-use verification surveys in the low and high transmission season. The stock out rate identified in the last survey was 0 percent for AL6, 8 percent for AL12, 4 percent for SP, 6 percent for RDT and 2 percent for ITNs in the facilities sampled.
    - Support to DPM to conduct a data quality assessment at selected warehouses and health facilities.
    - Support to produce monthly Procurement Planning and Monitoring Reports for Malaria and quarterly LMIS reports.
- *Human resources capacity development (HRCD)*
    - Support to regions to conduct targeted coaching and supportive supervision at the under-performing CSComs.
    - Support to the DPM and regions to conduct training of stock managers and health information officers on LMIS standard operating procedures.
- *TA for regulation*
    - Continued to support the DPM to improve its regulatory functions and improve the quality of circulating malaria products. According to the 2022 post-marketing risk-based surveillance results, 5.5 percent of registered antimalarial drugs were substandard (absence of active ingredients and a non conformance with pH specification) versus10 percent in 2014.
    - In 2022, the *Laboratoire National de la Santé* (National Health Laboratory) received initial accreditation to the ISO/IEC-17025 standard for activities in Pharmaceutical Products (Certificate N°ES21007 version.00/SOAC) by the West African Accreditation System.

5.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of health supply chain and pharmaceutical management systems strengthening that PMI proposes to support.

With FY 2024 funds, PMI will continue to support the health supply chain and pharmaceutical management activities as described in the Recent Progress. Additional activities include:

- Support the implementation of last mile delivery of malaria products in the regions of Kayes and Koulikoro.
- Extend the call center to additional districts of Kayes, Koulikoro, and Mopti regions, and to Gao and Tomboctou regions.
- Extend the functionalities of the OSPSANTE to add an inventory management and dispensing module to make it a full electronic logistics management information system-(eLMIS), in collaboration with other donors.

6. Malaria Vaccine

6.1. PMI Goal and Strategic Approach

The PMI/Mali goal for the malaria vaccine is to support the Ministry of Health to strategically deploy this intervention as a complementary tool to the existing core interventions. Vaccine introduction will be led by the national EPI, thus PMI will work with the NMCP and national immunization colleagues to provide complementary support, as needed, in the planning, delivery and monitoring of vaccine deployment. This includes support to maximize uptake of the vaccine without adversely affecting coverage of other malaria interventions. Given that the country has not yet received confirmation on timing of malaria vaccine introduction, PMI will not allocate funding to introduction until the deployment timeline and specific resource requirements have been determined. In the near term, PMI plans to support the development and submission of Mali's application package to Gavi.

6.2. Recent Progress (between May 2022 and April 2023)

In December 2022, the Mali government submitted a letter of intent to Gavi declaring that they would apply for introduction of the malaria vaccine once it became available. They are planning to apply for funding in July 2023 to support the procurement and deployment of the malaria vaccine. Per the WHO allocation framework for limited vaccine supply, more than 640,000 Malian children could be eligible for the malaria vaccine. This includes 171,000 children in Category 1 zones where the initial vaccine roll-out is prioritized, defined as areas with *Plasmodium falciparum* parasite prevalence of more than 40 percent and all-cause under five mortality between 7.5 percent and 9.5 percent as Category 1. The country has subsequently established a national technical working group to coordinate the vaccine introduction. The government is currently working to amend its national malaria control strategy to incorporate the use of the vaccine.

6.3. Plans and Justification for FY 2024 Funding

PMI has not planned for any FY 2024 funding to support vaccine introduction. Once it is determined that Mali will receive the vaccine, PMI will reconsider activities to support vaccine introduction.

7. Social and Behavior Change

7.1. PMI Goal and Strategic Approach

PMI/Mali supports the NMCP's Malaria Control Communication and Advocacy Plan, which includes the promotion of:

- Correct and consistent net use;
- Early and frequent ANC attendance;
- Acceptance of IPTp;
- Messaging and communications for SMC focusing on completion of each course of medication and attendance at all cycles;
- Prompt care seeking for fever; and
- Adherence to national guidelines by health workers.

SBC activities to promote the attainment of these objectives are being implemented nationally and at the sub-national level with support from donors including PMI and the Global Fund. Activities include the use of interpersonal communication, advocacy, social mobilization, mass media, and new technologies. PMI contributed significantly to the writing of the revised 2018-2024 Malaria Control Communication and Advocacy Plan and to the establishment of the SBC Technical Working Group headed by the NMCP.

7.2. Recent Progress (between May 2022 and April 2023)

The following activities were implemented with PMI funds:

- Four communication technical working group meetings were held at the national level.
- Development and production of communication materials for the 2022 SMC and World Malaria Day campaigns.
- Development of SBC training modules on malaria for social mobilization and for CHWs.
- Supported SBC activities focused on demand generation at the community level through social behavior change outreach during the SMC campaign through various channels including radio and TV broadcasting (in French and four local languages), town criers, and banners.
- Training and supervision of established CHWs focusing on the promotion of ANC attendance and IPTp implementation at facility-level.
- To ensure high IRS coverage rates, PMI supported the use of various information, education and communication strategies before and during the spray campaign to increase community IRS awareness and acceptance. These strategies included:

- Working with seven local radio stations 4,410 radio spots and jingles were broadcasted in local languages (in Bambara, Fulfulde, and Dogonon).
- Training of radio operators.
- Developing specific SBC messages for the community to accept insecticide rotation to prevent malaria vectors from becoming resistant to an insecticide.
- Household visits by community mobilizers to remind beneficiaries of their pre-spray responsibilities.
- Coordination with local authorities (village chiefs and their assistants) to ensure effective and successful community awareness.

Challenges

ITNs: According to the 2021 Malaria Indicator Survey (MIS), only 72 percent of the household population had access to an ITN, and 68 percent of the household population used an ITN the night before the interview. Reasons for not using it include ITNs not available in households, lack of interest, too hot, and physical conditions of the nets. Given that ITN use is highly seasonal, peaking during transmission season and declining in the hot dry season, investment in SBC should be emphasizing constant use of ITN, and the benefit of using ITNs.

SMC: Overall community buy-in for SMC is adequate. However, compliance with the last two doses of medication has been challenging. Weak communication between parents/guardians and administrators, lack of understanding on the part of parents/caregivers, parents being absent, child refusal, limited number of community members involved in mobilization, inadequate community supervision, and insufficient media coverage have been identified as key barriers.

Case Management: Prompt care seeking for malaria is still challenging. The 2021 MIS demonstrated that advice or treatment was sought for only 60 percent of children with recent fever, and for only 27 percent of children was sought the same day or the following day. Self-medication is a common phenomenon. For instance, the 2021 MIS reported that 5.6 percent of caregivers first went to a shop or market to seek treatment for malaria. High consultation fees, a perception that providers in health facilities will prescribe multiple unnecessary medicines, and preference for traditional medicines among the general population are the common barriers.

MIP: Challenges related to the adoption and maintenance of early and repeat ANC visits and IPTp uptake include late ANC visits by pregnant women, pregnant women lacking education regarding ANC and IPTp services, and poor communication between health providers and pregnant women during prenatal consultations.

Service Delivery: Behaviors that impact service delivery (both MIP and case management) include insufficient communication by providers regarding health promotion and

non-compliance with case management guidelines leading to the misclassification of severe malaria

7.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of SBC activities that PMI proposes to support.

With FY 2024 funding, PMI intends to support SBC activities at the facility and community levels in selected regions of Mali to address key population and service provider behaviors, including the use and proper care of nets; early and consistent ANC visits, uptake of IPTp, and seeking care for malaria in pregnancy; early care-seeking for fever; and adherence to case management guidelines. Particular emphasis will be given to the acceptability of oral medications for uncomplicated malaria in lieu of injectables. Various media and communications activities will be utilized. Other activities will include support for the monitoring and supervision of communication activities; regular convening of the Communication Technical Working Group on malaria; engagement and involvement of all relevant communication stakeholders in SBC activities; support for messages and communications for seasonal malaria chemoprevention, with a focus on completion of each course of medication and attendance at all rounds; and supporting SBC activities at the facility and community levels to address beneficiaries and service provider behaviors, including the use and care of nets.

Priorities

While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, the following behaviors outlined in Table 3 will be prioritized with FY 2024 funds:

Table 3. Priority Behaviors to Address

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Prompt and appropriate care-seeking for fever for children under five years of age	Caregivers of children under 5 years of age	PMI partner regions	● SBC messages will be disseminated through radio, TV spots, and town criers to sensitize communities on the importance of prompt care-seeking for early diagnosis to avoid severe malaria. ● Discouraging self-medication and use of substandard, counterfeit or fake medicines sold in the streets through radio and TV spots, and during visits at health centers.
Adherence to case management guidelines, particularly related to the classification of	Patients / Health workers	PMI partner regions	● Train, supervise, and coach health workers (OTSS) at all levels to increase their knowledge of differential diagnosis of uncomplicated and severe malaria. Use of supervision visits to encourage service providers to adhere to treatment protocols despite patient pressure. ● Messaging to patients and healthcare providers on the use of oral medications for uncomplicated

severe malaria cases			malaria cases, and injectables only for severe malaria cases. ● Media campaigns on local radios.
ANC attendance and IPTp uptake	Pregnant women	PMI partner regions	● Raising awareness of pregnant women on the benefits of early and regular ANC visits to increase the uptake of SP (reaching at least three doses).

Additional Support Activities:

There is a need for continued SBC capacity building at both the national and subnational levels. Therefore, in addition to the above priorities, part of the FY 2024 funding will also be used to help the NMCP to address the optimization of the administration of SMC drugs. Data from independent monitoring have suggested low levels of adherence to the three-day course required by SMC, supported by national routine data which show a constant increase of cases although the SMC coverage seems to be high in Mali. The NMCP in collaboration with research institutions plans to implement pilot studies to optimize the administration of the SMC drugs, particularly the second and third doses. This will involve community mobilizers who will visit households to make sure that appropriate doses are taken. The results of these studies will help to improve children's adherence to SP-AQ.

8. Surveillance, Monitoring, and Evaluation

8.1. PMI Goal and Strategic Approach

The National Malaria Control Monitoring and Evaluation Plan 2022- 2025 aims to strengthen malaria surveillance systems to ensure that high-quality and relevant data are available to inform interventions and track the progress of implementation and impact. The goal is to ensure 100 percent promptness and completeness of data reporting at all levels; to provide timely information for decision making; and to use the data collected to improve health systems in Mali. PMI contributes to the NMCP surveillance, monitoring and evaluation (SM&E) strategy, collaborates with the NMCP, the Global Fund, and other partners in providing technical assistance and resources for these activities.

In support of the malaria control strategic plan, PMI and the NMCP have prioritized interventions that address the challenges of underutilization of data and data quality at health facility and community levels. This support includes:

- Improving supportive supervision and training at health facility levels to ensure proper data collection, reporting, and interpretation.
- Continuing to support regional malaria data review workshops/meetings to discuss routine data use and programmatic implications to improve malaria quality assurance systems at all levels in supported regions.
- Providing support for surveys, including the MIS, to inform program strategy.

- Work with the NMCP to have more data from private clinics in the malaria surveillance system.

8.2. Recent Progress (between May 2022 and April 2023)

During the reference period, at the central level, PMI supported the NMCP to:

- Conduct four quarterly meetings for malaria-related data management and analysis, routine data review and monitoring of data reported in the DHIS2 platform to address any anomalies.
- Develop and produce malaria monthly bulletins.
- Revise data collection tools for external review of the malaria programme performance.
- Revise and distribute 1,800 copies of the malaria surveillance guide.
- Develop standard operating procedures for data collection, transmission and archiving by health facilities.
- Develop a malaria indicators reference document.
- Conduct a micro stratification of malaria indicators that contributed to the development of the new 2023-2027 national strategic plan.
- Collect, analyze data, write and disseminate a report on the overdiagnosis of severe malaria in Mali.
- Support Field Epidemiology Training Program Frontline training of 13 providers in Mali and advanced training for two students in Burkina-Faso.
- Support the NMCP to develop a guide and performance indicators for remote technical assistance to data managers.

At the regional level, PMI supported:

- The annual review of malaria performance indicators in the regions of Sikasso, Koulikoro, Segou, Mopti and Bamako.
- Training of 61 health information system data managers and malaria focal points in the region of Segou, Kayes and the capital district of Bamako on the use of the Malaria Routine Data Quality Assessment tool for data quality audit.
- The implementation of Malaria Routine Data Quality Assessment in 347 health facilities in the regions of Kayes, Koulikoro, Sikasso, Mopti and the capital district of Bamako.
- Capacity building of staff from 52 health districts in six regions (Kayes, Sikasso, Koulikoro, Segou, Mopti, and the capital district of Bamako) on the use of the DHIS2 data consistency check tools to perform a monthly assessment of routine malaria data quality and send feedback to the health facilities.
- Development and dissemination of quarterly malaria bulletins (four bulletins per region) in six regions.
- The review of malaria program indicators and discussing challenges, lessons learned, and identification of SM&E priorities; verification and validation meetings of the routine malaria data in five regions (Sikasso, Koulikoro, Segou, Bamako, and Mopti).
- Technical assistance to the NMCP to conduct online meetings for remote technical support to data managers in Sikasso and Kayes regions.

8.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of surveillance, monitoring, and evaluation activities that PMI proposes to support.

In coordination with other partners supporting routine surveillance in Mali, PMI FY 2024 funds will continue to support improving data quality in the health management information system and support the NMCP and the regions to hold regular meetings to review and analyze data, data quality assurance activities, and production of monthly malaria bulletins. PMI funds will also be used to support integrated supervision visits to health facility data managers to validate and audit data collection, analysis, and reporting to improve data quality. Support will be provided for semi-annual data review meetings at district level in selected health districts. PMI will also provide technical assistance through Technical Working Groups and support monitoring and evaluation training of NMCP staff at both national and subnational levels. In addition, support will be provided for an MIS in 2025, co-funded with other partners.

Table 4. Available Malaria Surveillance Sources

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Household Surveys	Demographic Health Survey				P		
Household Surveys	Malaria Indicator Survey		X				P
Household Surveys	Multiple Indicator Cluster Survey						P
Household Surveys	EPI survey						
Health Facility Surveys	Service Provision Assessment						
Health Facility Surveys	Service Availability Readiness Assessment survey						
Health Facility Surveys	Other Health Facility Survey			X			
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies		X		P		P
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System						

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Malaria Surveillance and Routine System Support	Support to health management information system	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response	*	*	*	*		
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System	X	X	X	P	P	
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System						
Other	End-Use Verification survey	X	X	X	P	P	P
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey						
Other	Malaria Impact Evaluation				*		
Other	Entomologic Monitoring Surveys	X	X	X	P	P	P

*Asterisk denotes non-PMI funded activities, X denotes completed activities and P denotes planned activities.

9. Operational Research and Program Evaluation

9.1. PMI Goal and Strategic Approach

9.2. Recent Progress (between May 2022 and April 2023)

PMI funded three operational research studies:

- **Increasing intermittent preventive treatment uptake through enhanced antenatal clinic service delivery to improve maternal and child health:** The study was completed and a report is under development. The interventions that were tested included training and supervision of CHWs, and strengthening communication on outreach ANC service delivery in communities (community mobilization) greater than five kilometers from a health facility. Focus group interviews with community leaders were organized in both control and intervention arms.

A total of 30 community health centers were assessed in three study arms (two interventional and one control cohorts), and data from 2,195 interviewed women were analyzed. The coverage of at least three doses of IPTp (IPTp3+) increased in both intervention arms (from 41.2 percent to 51.8 percent in the group where community mobilization was implemented, from 36.9 to 50 percent in the group where an enhanced MiP focused training and supervision for CHWs was implemented). IPTp3+ coverage decreased between baseline and endline in the control arm group from 42.4 percent to 41.8 percent.

The main finding of this first study is that the CHW interventions can contribute to increase the IPTp uptake through enhanced ANC service delivery.

- **Increasing intermittent preventive treatment uptake through enhanced antenatal clinic service delivery to improve maternal and child health & assessing ANC data for routine monitoring in Mali:** The study is ongoing and the fieldwork is expected to be completed in 2024.
- **Assessing the resistance and efficacy of SP:** The study aims to monitor the change of resistance profile (dhfr and dhps genes, which are markers of parasite resistance to SP) in the districts of Sélingué, Missira, and Dioro. The prevalence of SP-resistance markers is around 35.4 percent for single mutations and 6.2 percent for quadruple mutations. No key mutation was detected for dhps 540 gene, which was reported in different studies to be associated with a high risk of treatment failure. For dhps 613S gene, which is known to also decrease SP sensitivity, two mutations were detected out of 45 samples processed. Analysis for this study is ongoing.

Table 5. PMI-funded Operational Research/Program Evaluation Studies in Mali

Ongoing or Planned OR/PE Studies	Status of Dissemination	Start date	End date
MIP study 1: Increasing Intermittent Preventive Treatment uptake through enhanced antenatal clinic service delivery to improve maternal and child health	Final report review	2020	2023
MIP study 2: Increasing Intermittent Preventive Treatment uptake through enhanced antenatal clinic service delivery to improve maternal and child health & assessing ANC data for routine monitoring in Mali	Field data collection	2020	2024
2022 SP-resistance study: Assessment of SP resistance associated with use of SP for IPT and during SMC.	Progress report	2022	2023

ANC: antenatal care; IPT: intermittent preventive treatment; MIP: malaria in pregnancy; SMC: seasonal malaria chemoprevention; SP: sulfadoxine-pyrimethamine.

Table 6. Non-PMI funded Operational Research/Program Evaluation Studies Planned/Ongoing in Mali

Source of Funding	Implementing institution	Research Question/Topic	Current status/ timeline
The European and Developing Countries Clinical Trials Partnership	Malaria Research & Training Center	Increasing IPTp with SP through SMC channel delivery	Study started in 2022 and will end in 2024
Bill & Melinda Gates Foundation	Muso	iCCM trial to focus on the impact of passive versus active malaria cases detection by CHWs	Pilot will end in May 2023
KOICA	Medicines for Malaria Venture	Piloting 5th cycle of SMC in children 3-59 months (Niena, Dioila and Yanfolila health districts)	2021-2024

CHW: community health worker; iCCM: integrated community case management; IPTp: intermittent preventive treatment during pregnancy; SMC: seasonal malaria chemoprevention.

10. Capacity Strengthening

10.1. PMI Goal and Strategic Approach

The new Mali National Malaria Strategic Plan includes an objective to strengthen NMCP capacity for management and coordination at all levels, highlighting the following interventions: revising the NMCP organizational framework; strengthening management, leadership and planning capacity; holding regular meetings of thematic working groups and the NMCP orientation committee; developing an annual action plan; and routine supervision. The evaluation of the 2018-2022 strategic plan identified some weaknesses related to program management, including irregular coordination meetings and limited competencies in leadership and governance of the NMCP leadership team.

Capacity strengthening is integral to PMI's approach in Mali, as demonstrated in the technical sections above, and through support to improve management at the NMCP.

10.2. Recent Progress (between May 2022 and April 2023)

PMI supported the following activities to strengthen capacity and improve functionality of the NMCP during the past year:

- Supported the NMCP Director to attend the annual meeting of the American Society for Tropical Medicine and Hygiene and a side meeting with all National Malaria Program directors from PMI partner countries; at this meeting the Director presented on Mali's approach to insecticide resistance management.
- Procured printers and ink, two photocopiers, and office furniture.
- Repaired four vehicles and provided fuel coupons to facilitate supervision visits.

10.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of capacity strengthening activities that PMI proposes to support.

PMI/Mali will continue to support capacity strengthening activities as described in the Recent Progress section. In particular, PMI will fund the participation of NMCP staff (national and field level) in international scientific and professional meetings to provide opportunities to learn best practices, share experiences, and develop networks. Potential meetings include the American Society of Tropical Medicine and Hygiene and the Pan African Malaria conferences.

11. Staffing and Administration

A minimum of three health professionals oversee PMI in Mali. The single interagency team led by the USAID Mission Director or their designee consists of resident advisors representing USAID and 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

Calendar Year	2023	2024	2025
Total country population	22,506,687	23,130,123	23,770,827
Total population at risk for malaria	22,506,687	23,130,123	23,770,827
PMI-targeted at-risk population	22,506,687	23,130,123	23,770,827
Population targeted for ITNs	22,506,687	23,130,123	23,770,827
Continuous distribution needs			
Channel 1: ANC	1,012,801	1,040,856	1,069,687
Channel 1: ANC Type of ITN	Dual AI and Single Pyrethroid	Dual AI and Single Pyrethroid	Dual AI and Single Pyrethroid
Channel 2: EPI	897,342	922,198	947,743
Channel 2: EPI Type of ITN	Dual AI and Single Pyrethroid	Dual AI and Single Pyrethroid	Dual AI and Single Pyrethroid
Channel 3: School	0	0	0
Channel 3: School Type of ITN			
Channel 4: Community	0	0	0
Channel 4: Community Type of ITN			
Channel 5:	0	0	0
Channel 5: Type of ITN			
Estimated total need for continuous channels	1,910,143	1,963,054	2,017,430
Mass campaign distribution needs			
Mass distribution campaigns	12,054,723	0	0
Mass distribution ITN type	All three (Dual AI, PBO and Single Pyrethroid)		
Estimated total need for campaigns	12,054,723	0	0
Total ITN Need: Continuous and campaign	**13,964,866**	**1,963,054**	**2,017,430**
Partner contributions			
ITNs carried over from previous year	2,038,450	1,958,307	1,858,926
ITNs from Government	0	273,672	322,600
Type of ITNs from Government		Single Pyrethroid	Single Pyrethroid
ITNs from Global Fund	12,054,723	0	0
Type of ITNs from Global Fund	All three (Dual AI, PBO and Single Pyrethroid)		
ITNs from other donors	0	0	0
Type of ITNs from other donors			
ITNs planned with PMI funding	1,830,000	1,590,000	1,517,096
Type of ITNs with PMI funding	All three (Dual AI,	All three (Dual AI,	All three (Dual AI,

	PBO and Single Pyrethroid)	PBO and Single Pyrethroid)	PBO and Single Pyrethroid)
Total ITNs contribution per calendar year	**15,923,173**	**3,821,979**	**3,698,622**
Ending balance	**1,958,307**	**1,858,926**	**1,681,192**
Projected month of stock at end of the calendar year	12.3	11.4	10.0
Desired end of year stock (months of stock)	10	10	10
Desired end of year stock (quantities)	1,591,785	1,635,878	1,681,192
Total surplus (gap)	**366,522**	**223,048**	**0**

AI: active ingredient; ANC: antenatal care; EPI: expanded program on immunization; ITN: insecticide-treated mosquito net; PBO: Piperony butoxide.

Table A-2. SMC Gap Analysis Table

Calendar Year	2023	2024	2025
Total population in the SMC targeted age range	21,989,951	22,599,067	23,222,456
SMC drug (SP+AQ) needs			
National population 3-11 months targeted for SMC	628,043	645,439	663,318
National population 12-59 months targeted for SMC	2,601,890	2,673,963	2,748,032
Total national population targeted for SMC	**3,229,933**	**3,319,402**	**3,411,350**
PMI population 3-11 months targeted for SMC	138,326	142,158	145,996
PMI population 12-59 months targeted for SMC	652,111	670,174	688,269
PMI population 5-7 years targeted for SMC	117,951	121,218	124,491
PMI population 8-10 years targeted for SMC	117,951	121,218	124,491
Total PMI population targeted for SMC	**1,026,339**	**1,054,768**	**1,083,247**
Total SP+AQ needs (co-blisters) - Only at PMI supported districts	**6,072,845**	**6,241,057**	**6,409,565**
Total SP+AQ needs (co-blisters)	**16,806,627**	**17,272,166**	**17,748,738**
Partner contributions (co-blisters, national)			
SP+AQ carried over from previous year	6,808,887	**6,657,027**	3,098,374
SP+AQ from Government	3,109,467	0	768,348
SP+AQ from Global Fund	7,472,450	7,472,450	7,472,450
SP+AQ from other donors	0	0	0
SP+AQ planned with PMI funding	6,072,850	6,241,063	6,409,565
Total SP+AQ contributions per calendar year	23,463,654	20,370,540	17,748,737
Total SP+AQ surplus (gap)	**6,657,027**	**3,098,374**	**(0)**

AQ: amodiaquine; SMC: Seasonal malaria chemoprevention; SP: Sulfadoxine pyrimethamine.

Table A-3. SP Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	22,506,687	23,130,123	23,770,827
Total population at risk for malaria	22,506,687	23,130,123	23,770,827
PMI targeted at-risk population	22,506,687	23,130,123	23,770,827
SP needs			
Total number of pregnant women	1,125,334	1,156,506	1,188,541
% of pregnant women expected to receive IPTp1	80%	80%	80%
% of pregnant women expected to receive IPTp2	80%	80%	80%
% of pregnant women expected to receive IPTp3	80%	80%	80%
% of pregnant women expected to receive IPTp4	0.00%	0.00%	0.00%
Total SP needs (doses)	**2,700,802**	**2,775,615**	**2,852,499**
Needs Estimated based on HMIS Data			
Partner contributions (doses)			
SP from Government	0	0	0
SP from Global Fund	0	0	0
SP from other donors	0	0	0
SP planned with PMI funding	3,994,901	3,780,000	1,619,691
Total SP contributions per calendar year	**3,994,901**	**3,780,000**	**1,619,691**
Stock balance (doses)			
Beginning balance	1,311,407	2,605,506	3,609,891
- Product need	2,700,802	2,775,615	2,852,499
+ Total contributions (received/expected)	3,994,901	3,780,000	1,619,691
Ending balance	**2,605,506**	**3,609,891**	**2,377,083**
Projected month of stock at end of the calendar year	11.6	15.6	10.0
Desired end of year stock (months of stock)	10	10	10
Desired end of year stock (quantities)	2,250,669	2,313,012	2,377,083
Total surplus (gap)	**354,837**	**1,296,879**	**0**

HMIS: Health Management Information System; IPTp: intermittent preventive treatment during pregnancy; SP: Sulfadoxine pyrimethamine.

Table A-4. RDT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	22,506,687	23,130,123	23,770,827
Population at risk for malaria	22,506,687	23,130,123	23,770,827
PMI-targeted at-risk population	22,506,687	23,130,123	23,770,827
RDT needs			
Total # of projected suspected malaria cases	7,951,913	8,172,181	8,398,551
% of suspected malaria cases tested with an RDT	85%	85%	85%
RDT needs (tests)	**6,759,126**	**6,946,354**	**7,138,768**
Needs estimated based on other (specify in comments)			
Partner contributions (tests)			
RDTs from Government	1,181,800	0	1,300,000
RDTs from Global Fund	4,667,500	1,322,175	5,134,250
RDTs from other donors	0	0	0
RDTs planned with PMI funding	2,500,000	2,500,000	2,407,736
Total RDT contributions per calendar year	**8,349,300**	**3,822,175**	**8,841,986**
Stock balance (tests)			
Beginning Balance	5,779,760	7,369,934	4,245,755
- Product Need	6,759,126	6,946,354	7,138,768
+ Total contributions (received/expected)	8,349,300	3,822,175	8,841,986
Ending balance	**7,369,934**	**4,245,755**	**5,948,973**
Projected month of stock at end of the calendar year	13.1	7.3	10.0
Desired end of year stock (months of stock)	10	10	10
Desired end of year stock (quantities)	5,632,605	5,788,628	5,948,973
Total surplus (gap)	**1,737,329**	**(1,542,873)**	**0**

RDT: rapid diagnostic test.

Table A-5. ACT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	22,506,687	23,130,123	23,770,827
Population at risk for malaria	22,506,687	23,130,123	23,770,827
PMI-targeted at-risk population	22,506,687	23,130,123	23,770,827
ACT needs			
Total projected # of malaria cases	5,786,607	5,946,896	6,111,625
Total ACT needs (treatments)	**5,786,607**	**5,946,896**	**6,111,625**
Needs estimated based on HMIS Data			
Partner contributions (treatments)			
ACTs from Government	539,944	5,652,488	2,500,000
ACTs from Global Fund	1,195,500	810,870	1,195,500
ACTs from other donors	0	0	0
ACTs planned with PMI funding	2,076,150	2,500,000	2,553,399
Total ACTs contributions per calendar year	**3,811,594**	**8,963,358**	**6,248,899**
Stock balance (treatments)			
Beginning balance	3,914,298	1,939,285	4,955,747
- Product need	5,786,607	5,946,896	6,111,625
+ Total contributions (received/expected)	3,811,594	8,963,358	6,248,899
Ending balance	**1,939,285**	**4,955,747**	**5,093,021**
Projected month of stock at end of the year	4.0	10.0	10.0
Desired end of year stock (months of stock)	10	10	10
Desired end of year stock (quantities)	4,822,173	4,955,747	5,093,021
Total surplus (gap)	**(2,882,888)**	**0**	**(0)**

ACT: Artemisinin-based combination therapy.

Table A-5. Injectable Artesunate Gap Analysis Table

Calendar Year	2023	2024	2025
Injectable artesunate needs			
Projected # of severe cases	966,363	594,690	611,163
Projected # of severe cases among children	444,527	273,557	281,135
Average # of vials required for severe cases among children	6	6	6
Projected # of severe cases among adults	521,836	321,132	330,028
Average # of vials required for severe cases among adults	10	10	10
Total injectable artesunate needs (vials)	**7,885,525**	**4,852,667**	**4,987,086**
Needs estimated based on other			
Partner Contributions (vials)			
Injectable artesunate from Government	5,770,000	5,451,324	4,040,000
Injectable artesunate from Global Fund	398,796	657,188	657,188
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding	340,800	386,222	401,914
Total injectable artesunate contributions per calendar year	**6,509,596**	**6,494,734**	**5,099,102**
Stock balance (vials)			
Beginning balance	3,777,752	2,401,823	4,043,889
- Product need	7,885,525	4,852,667	4,987,086
+ Total contributions (received/expected)	6,509,596	6,494,734	5,099,102
Ending balance	**2,401,823**	**4,043,889**	**4,155,905**
Projected month of stock at end of the year	3.7	10.0	10.0
Desired end of year stock (months of stock)	10	10	10
Desired end of year stock (quantities)	6,571,271	4,043,889	4,155,905
Total surplus (gap)	**(4,169,448)**	**0**	**(0)**

Table A-6. RAS Gap Analysis Table

Calendar Year	2023	2024	2025
Artesunate suppository needs			
# of severe cases expected to require pre-referral dose (or expected to require pre-referral dose based on # of providers for the service)	106,300	65,416	67,228
Total artesunate suppository needs (suppositories)	**212,600**	**130,832**	**134,456**
Needs estimated based on HMIS Data			
Partner contributions (suppositories)			
Artesunate suppositories from Government	0	231,103	128,721
Artesunate suppositories from Global Fund	8,755	8,755	8,755
Artesunate suppositories from other donors	0	0	0
Artesunate suppositories planned with PMI funding	0	0	0
Total artesunate suppositories available	**8,755**	**239,858**	**137,476**
Stock balance (suppositories)			
Beginning balance	4,300	0	109,027
- Product need	212,600	130,832	134,456
+ Total contributions (received/expected)	8,755	239,858	137,476
Ending balance	**0**	**109,027**	**112,046**
Projected month of stock at end of the year	0.0	10.0	10.0
Desired end of year stock (months of stock)	10	10	10
Desired end of year stock (quantities)	177,167	109,027	112,046
Total surplus (gap)	**(177,167)**	**(0)**	**0**

HMIS: Health Management Information System.

Table A-7.Primaquine Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	22,506,687	23,130,123	23,770,827
Total population at risk for malaria	22,506,687	23,130,123	23,770,827
PMI-targeted at-risk population	22,506,687	23,130,123	23,770,827
Primaquine needs			
Total projected # of malaria cases	5,786,607	5,946,896	6,111,625
Total projected # of Pf cases			
Total projected # of Pv cases			
Total projected # of mixed cases (Pf + Pv)			
Total primaquine needs (tablets)			
Select Data Source			
Partner contributions (tablets)			
Primaquine from Government			
Primaquine from Global Fund			
Primaquine from other donors			
Primaquine planned with PMI funding			
Total primaquine contributions per calendar year	**0**	**0**	**0**
Stock balance (tablets)			
Beginning balance		0	0
- Product need			
+ Total contributions (received/expected)	0	0	0
Ending balance	**0**	**0**	**0**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	0	0	0
Total surplus (gap)	**0**	**0**	**0**

Pf: Plasmodium falciparum; Pv: Plasmodium vivax.