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Uganda

Malaria Operational Plan FY 2024

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This Fiscal Year (FY) 2024 Malaria Operational Plan (MOP) 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
AMF	Against Malaria Foundation
An.	*Anopheles*
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
CDC	U.S. Centers for Disease Control and Prevention
CHEW	Community Health Extension Worker
CHW	Community Health Worker
CY	Calendar Year
DHIS-2	District Health Information Software 2
DHMT	District Health Management Team
DHS	Demographic and Health Survey
DP	Dihydroartemisinin-piperaquine
DQA	Data Quality Assessment
eCHIS	electronic Community Information System
EOC	Emergency Operations Center
EPI	Expanded Program on Immunization
EUV	End Use Verification
FCDO	United Kingdom Foreign, Commonwealth, and Development Office
FETP	Field Epidemiology Training Program
FSN	Foreign Service National
FY	Fiscal Year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoU	Government of Uganda
HAAM	Household Action Against Malaria
HMIS	Health Management Information System
HMS	Housing Modification Study
iCCM	Integrated Community Case Management
IDRC	Infectious Diseases Research Collaboration
IPC	Interpersonal Communication
IPTp	Intermittent Preventive Treatment for Pregnant Women
IPTp-3	Three doses of Intermittent Preventive Treatment in Pregnancy

IMS	Incident Management System
IMT	Incident Management Team
IRS	Indoor residual spraying
ITN	Insecticide-treated Mosquito Net
JMS	Joint Medical Store
LLIN	Long-lasting Insecticide-treated Net
LQAS	Lot Quality Assurance Survey
MAAM	Mass Action Against Malaria
MaCRA	Malaria RDT Capture and Reporting Assessment
MEL	Monitoring, Evaluation, and Learning
MIP	Malaria in Pregnancy
MIS	Malaria Indicator Survey
MoH	Ministry of Health
MOP	Malaria Operational Plan
NIH	National Institutes of Health
NMCD	National Malaria Control Division
NMS	National Medical Stores
OR	Operational Research
PA	Pyronaridine-artesunate
PBO	Piperonyl Butoxide
PE	Program Evaluation
PMI	U.S. President's Malaria Initiative
PNFP	Private Not-for-Profit
RDT	Rapid Diagnostic Test
RA	Resident Advisor
SBC	Social and Behavior Change
SM&E	Surveillance, Monitoring, and Evaluation
SMC	Seasonal Malaria Chemoprevention
SP	Sulfadoxine-pyrimethamine
SPAQ	Sulfadoxine-pyrimethamine and Amodiaquine
TA	Technical Assistance
TBA	Traditional Birth Attendant
TBD	To Be Determined
TES	Therapeutic Efficacy Study
TPR	Test Positivity Rate
UCC	Universal Coverage Campaign

UCSF	University of California, San Francisco
UMRESP	Uganda Malaria Reduction and Elimination Strategic Plan
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VCD	Vector Control Division
VCO	Vector Control Officer
VHT	Village Health Team
WHO	World Health Organization

EXECUTIVE SUMMARY

To review specific country context for Uganda, please refer to the country malaria profile which provides an overview of the country malaria situation, key indicators, the National Malaria Control Division (NMCD) 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. Uganda began implementation as a PMI partner country in fiscal year (FY) 2006.

Rationale for PMI's Approach in Uganda

PMI's approach to malaria prevention and control is well-aligned with the Uganda Malaria Reduction and Elimination Strategic Plan 2021–2026, which aims to reduce malaria deaths by 75 percent and malaria cases by 50 percent of the levels reported in 2019. PMI's approach prioritizes evidence-based interventions in vector control, drug-based prevention, malaria case management, supply chain management, and social and behavior change (SBC) activities. PMI funding for these activities in targeted high malaria burden districts complements the intervention support received from the Government of Uganda and Global Fund to Fight AIDS, Tuberculosis and Malaria. In FY 2024, PMI will continue to reduce the scope of indoor residual spraying (IRS) activities and increase strategic investments in local partners. In response to emerging vector and insecticide resistance threats, PMI will also include additional funding for entomological monitoring of *Anopheles stephensi* and transition to procurement of dual active ingredient insecticide-treated mosquito nets (ITNs).

Overview of Planned Interventions

The proposed FY 2024 PMI funding for Uganda is $31 million. PMI will support the following intervention areas with these funds:

1. Vector Monitoring and Control

PMI will:

- Continue to support the continuous distribution of dual active ingredient ITNs at antenatal care and Expanded Program on Immunization clinics to mitigate resistance.
- Continue to conduct entomological monitoring in 20 districts to collect and use data on IRS insecticide residual efficacy, vector bionomics, and insecticide resistance for vector control decision-making.
- Continue the scale-down of the PMI-funded IRS program, spraying 5-6 districts. PMI will agree on the exact districts to be sprayed with NMCD/MOH leadership.

2. Malaria in Pregnancy

PMI will continue to support MIP interventions, including procurement of ITNs and promotion of equitable distribution of at least three doses of intermittent preventive treatment in pregnancy with sulfadoxine-pyrimethamine.

3. Drug-Based Prevention

PMI does not support seasonal malaria chemoprevention in Uganda. However, PMI is closely following the findings of the ongoing NMCD-led seasonal malaria chemoprevention implementation in the Karamoja region.

4. Case Management

PMI will continue to support malaria diagnostics and case management at health facilities in five high burden regions, as well as strengthening case management capacity in lower level facilities. PMI supports integrated community case management in 32 high burden districts, which includes training of village health workers and ensuring commodity availability. These activities complement the integrated community case management commodities available in public health facilities with Global Fund to Fight AIDS, Tuberculosis and Malaria support.

5. Health Supply Chain and Pharmaceutical Management

PMI provides technical assistance to the NMCD and district health management teams to improve the supply chain for malaria commodities and to improve the supply chain for malaria commodities, properly quantify needs, acquire accurate stocks, and minimize stockouts. With FY 2024 funds, PMI will continue to support:

- Forecasting and supply planning.
- Management information systems.
- Warehousing and distribution.
- Delivery of commodities to the last mile.
- End use verification surveys.

6. Malaria Vaccine

As a country with moderate to high malaria transmission, the Ugandan Ministry of Health applied to Gavi for consideration of malaria vaccine rollout support in the second application window. PMI provided technical assistance in the application process. PMI is not currently planning to support vaccine implementation with FY 2024 MOP resources.

7. Social and Behavior Change

PMI will continue to support social and behavior change activities that promote equitable access and uptake of all key malaria interventions. PMI's SBC interventions will focus on:

- Correct and consistent net use
- Prompt care-seeking for fever
- Early and frequent ANC attendance to prevent and treat malaria in pregnancy
- Strengthening coordination and alignment of national SBC messaging

PMI will further seek to collect more evidence on factors that affect these behaviors from the household, community, and service provider perspective. PMI will continue to bolster the capacity of the MoH (NMCD and the Health Promotion Education and Communication department) for the design, implementation, monitoring, and evaluation of SBC activities at all levels of the health system.

8. Surveillance, Monitoring, and Evaluation

In FY 2024, PMI will increase investments in strengthening surveillance at lower-level facilities and in the community, to ensure consistent reporting, data management and use. This will include the support of national and regional Data Quality Assessments, increasing the frequency of data review meetings from quarterly to monthly in PMI supported districts. PMI will also pilot the electronic Community Health Information System to improve the timeliness and accuracy of community data collection, reporting, and surveillance.

9. Operational Research and Program Evaluation

While no operational research or program evaluation activities are planned in the FY 2024 MOP, PMI will continue to support the national malaria operations research agenda and projects funded through other partners.

10. Capacity Strengthening

PMI's capacity strengthening strategy supports a whole-of-society, multi-sectoral approach to improve health service delivery. FY 2024 funds will support:

- Strengthening the organizational capacity of local partners through direct support or sub awards;
- Providing small grants to community service organizations with the goal of helping build leadership and accountability; and
- Continuing support to the Ugandan MoH Field Epidemiology Training Program, including through support for mini-grants

11. Staffing and Administration

An interagency team works together to oversee all technical and administrative aspects of PMI Uganda's program.

I. CONTEXT & STRATEGY

1. Introduction

Uganda began implementation as a U.S. President's Malaria Initiative (PMI) partner country in fiscal year (FY) 2006. The FY 2024 Malaria Operational Plan (MOP) presents a detailed implementation plan for Uganda, based on the strategies of PMI and the National Malaria Control Division (NMCD). It was developed in consultation with the NMCD 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 Uganda, 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, which provides an overview of the country's malaria situation, key indicators, the NMCD's strategic plan, and the partner landscape.

2. U.S. President's Malaria Initiative (PMI)

PMI is led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC). Launched in 2005, PMI supports implementation of malaria prevention and treatment measures—insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs), intermittent preventive treatment of pregnant women (IPTp), and drug-based prevention—as well as cross-cutting interventions such as surveillance, monitoring, and evaluation (SM&E); social and behavior change (SBC); and capacity strengthening. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 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 NMPs 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 and vulnerable 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 Uganda

3.1. Malaria Overview for Uganda

For more detailed information on malaria indicators, please refer to the Country Malaria Profile. Malaria remains a critical public health problem in Uganda, with the country's entire population of 45.5 million people at risk for malaria infection. In 2021, Uganda accounted for five percent of all malaria cases globally with an estimated 13 million malaria cases[1]. Transmission is heterogeneous with regional and sub-national variation among specific sub-populations. Pregnant women and children under five years of age remain among the most vulnerable populations. The highest malaria burden has been reported in northern Uganda (e.g., regions of Acholi, Karamoja, Lango, and West Nile) and Eastern Uganda (e.g., Busoga region). Uganda has made significant progress in malaria control in partnership with PMI, the NMCD, the Global Fund, the UK Foreign Commonwealth and Development Office, research institutions, and other stakeholders. Malaria control efforts in Uganda have included providing case management services at health facilities and in the community, malaria chemoprophylaxis in pregnancy, mass ITN distribution campaigns (most recently in 2020-2021), and IRS in eight Eastern districts in 2023. The Ugandan Ministry of Health (MoH) has made a strong commitment to ensuring ITN access, delivering ITNs through universal coverage campaigns (UCCs) in 2013–2014, 2017–2018, and 2020–2021, with one planned for 2023-2024. In 2018–2019, 83 percent of households reported owning at least one ITN, the

[1] World Health Organization. WHO. "World Malaria Report 2022," *WHO website,* (December 8, 2022): https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022.

highest coverage globally at the time[2]. In 2020-2021 a total of 28,805,800 nets were procured. As a result of these interventions, malaria prevalence in children under five years of age decreased from 45 percent in 2009 to 9 percent in 2019[2], and all-cause child mortality decreased from 128 to 64 deaths per 1,000 live births between 2006 and 2016[3].

However, despite these gains, routinely reported data from health facilities have shown an unexpected increase in confirmed malaria cases, test positivity rate (TPR), and percentage of outpatient diagnosed (OPD) malaria cases since 2019. These increases affected up to 75 districts, including IRS districts in the eastern region, with the highest case counts in Busoga, Karamoja, and West Nile regions. To respond to these upsurges in cases, the NMCD and partners conducted a rapid assessment of routine surveillance data and established a Malaria Scientific and Advisory Committee. These data reviews proposed potential explanations for the upsurge that included: suboptimal intervention coverage, commodity challenges impairing adequate integrated community case management (iCCM), programmatic challenges in implementing malaria control interventions, changes in vector species, and emerging biological threats (e.g., antimalarial and insecticide resistance). The root causes of the increased cases nationwide still remain unclear.

The Uganda Malaria Reduction and Elimination Strategic Plan (UMRESP) 2021–2026 midterm review, done in 2022, determined that a stratified approach and high political will was needed to achieve its malaria control goals. The proposed approach combined the implementation of Mass Action Against Malaria (MAAM) and High Burden, High Impact principles. The mass action against malaria (MAAM) is a multisector approach implemented by USAID PMI Uganda Malaria Reduction Activity (MRA) that aims to address gaps in malaria prevention and management by engaging various stakeholders at the different levels–from district, community and household The High Burden to High Impact was a strategy led by countries with the World Health organization and the Roll Back Malaria Partnership; it contains four elements: (i) Political will to reduce malaria deaths; (ii) Strategic information to drive impact, (iii) Better guidance, policies and strategies, and (iv) A coordinated national malaria response.The midterm review also confirmed the following needs: strategic information to drive impact; better guidance for policies and strategies; and deployment of a coordinated national malaria response. In February 2023, the MoH activated the Incident Management System (IMS) for malaria emergency response to improve the coordination of malaria outbreak detection and control efforts.

3.2. Key Challenges and Contextual Factors

The Uganda health system is recovering from the effects of two back-to-back epidemics, the global COVID-19 pandemic, and the 2022/2023 Sudan Ebola virus disease epidemic in two of

[2] Uganda National Malaria Control Division (NMCD), Uganda Bureau of Statistics (UBOS), and ICF. 2018-19 Uganda Malaria Indicator Survey Atlas of Key Indicators. (2019). Kampala, Uganda, and Rockville, Maryland, USA: https://dhsprogram.com/pubs/pdf/ATR21/ATR21.pdf

[3] Uganda Bureau of Statistics (UBOS) and ICF. Uganda Demographic and Health Survey 2016. (Kampala, Uganda and Rockville, Maryland, USA, 2018): https://dhsprogram.com/publications/publication-fr333-dhs-final-reports.cfm.

its districts. This has strengthened the national epidemic response structures that are now being used to coordinate malaria epidemic responses nationwide.

The key challenges the country is currently facing that could stall progress in achieving its malaria control objectives include:

- Weaknesses in implementing iCCM, ensuring funding and access for service delivery, and maintaining commodity availability at public and lower-level health facilities;
- The need to improve case management and chemoprevention in the private sector,
- Gaps in surveillance reporting and data quality, limiting rapid outbreak response,
- Shifting seasonality of malaria transmission with climate change;
- Misinformation and poor risk perception for malaria in some high burden communities;
- New biological threats, including increasing insecticide and artemisinin resistance; and
- The emergence of *An. stephensi* in neighboring countries.

3.3. PMI's Approach for Uganda

The long-term vision of the UMRESP 2021–2026 strategy is to achieve a malaria-free Uganda. Toward this goal, the near-term objective of the plan is to reduce malaria deaths by 75 percent and malaria cases by 50 percent of the levels reported in 2019. Investments from the Government of Uganda (GoU) and partners in vector control, case management, chemopreventive interventions, program management, and data monitoring and evaluation are outlined as core to the success of the national strategy.

PMI contributes to Uganda's malaria strategy by providing funding and support for the implementation of evidence-based interventions in vector control (ITNs, IRS, and entomological monitoring), drug-based prevention, malaria case management, commodity procurement and supply chain management, and promotion of targeted SBC activities. In FY 2024, PMI investments in vector control, case management, and IPTp continue to complement Global Fund-supported activities in these intervention areas.

3.4 Key Changes in this MOP

Most of the proposed activities in the Uganda FY 2024 MOP are unchanged from the prior year's strategies and budget activities. A few notable updates include:

1. Continuing to implement a gradual and comprehensive IRS exit strategy, with plans for reduction from eight districts in 2023 to five or six districts in calendar year 2025;
2. Additional funding for entomological monitoring given the emerging threat of *Anopheles (An.) stephensi*; and
3. Increased strategic investments in local partners to strengthen and use local capacity.

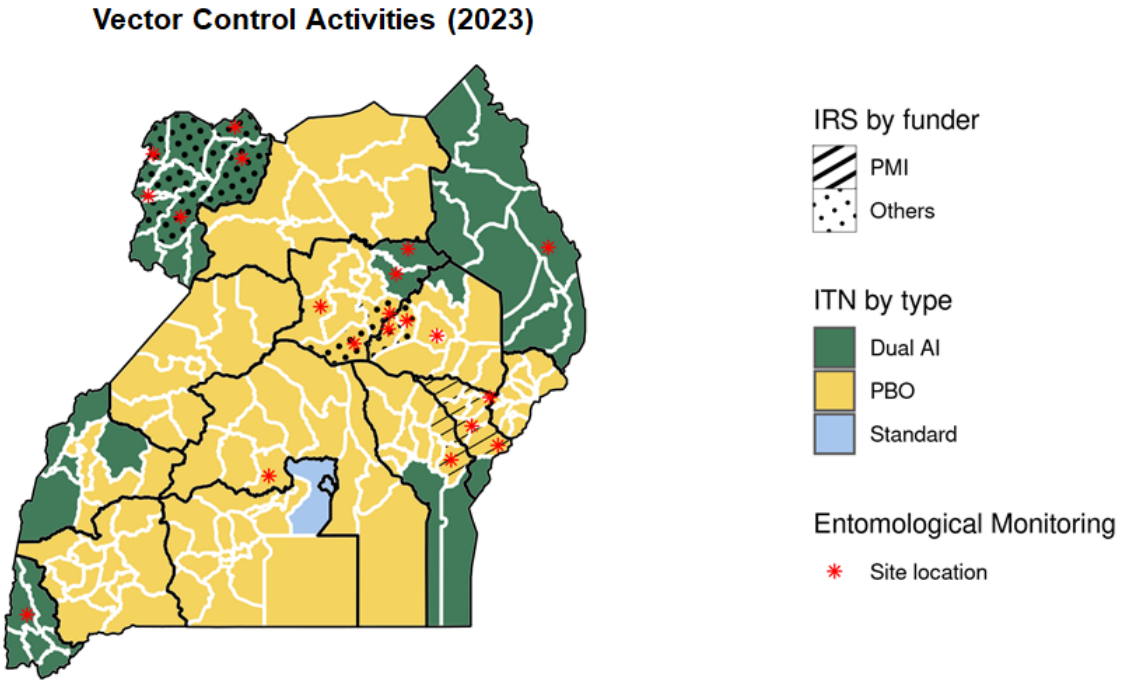
II. OPERATIONAL PLAN FOR FY 2024

1. Vector Monitoring and Control

1.1. PMI Goal and Strategic Approach

The NMCD's UMRESP promotes an integrated vector management strategy, including vector surveillance, insecticide resistance management, continuous and mass distribution of ITNs, geographically targeted IRS, and larval source management. PMI supports the use of all of these interventions, with the exception of larval source management. PMI supports entomological monitoring in 20 districts, including in Global Fund-supported IRS districts. The Global Fund and other partners support mass campaigns every three years while PMI supports continuous distribution of ITNs via antenatal care (ANC) and Expanded Program on Immunization (EPI) channels nationwide. PMI currently implements IRS in 8 districts and provides technical assistance to Global Fund-supported IRS in 13 districts.

Figure 1. Map of Vector Control Activities in Uganda



1.2. Recent Progress (between March 2022 and March 2023)

In the last implementation year, PMI supported the following activities:

- Entomological monitoring in 20 sentinel sites in 20 districts, in partnership with the Ministry of Health Vector Control Division (VCD) and NMCD. Monitoring activities included insecticide resistance monitoring in 11 sites in 11 districts (Tororo, Bugiri, Gulu, Hoima, Kamwenge, Nakaseke, Katakwi, Kitgum, Wakiso, Soroti, and Butebo); vector

bionomics monitoring in 18 sites in six districts; insecticide residual efficacy monitoring in four sites in four PMI-supported IRS districts and in five sites in five Global Fund-supported IRS districts; and community-based entomological surveillance in 36 sites in six former United Kingdom Foreign, Commonwealth, and Development Office-supported IRS districts. For more information about entomological monitoring, please refer to the 2021 Entomological Monitoring Report;

- Community-based entomology activities in seven districts (Alebtong, Amolatar, Dokolo, Kalaki, Kaberamaido, Otuke, and Serere). The District Vector Control Officer (VCO) together with the selected sub-county Health Inspectors/Health Assistants identified, trained, and supervised 12 Village Health Team (VHT) members (two per village). The VHTs conducted pyrethrum spray collections in ten houses per village in six selected villages (i.e., two villages in each of the three selected sub-counties in the six districts). Community-based entomology activities are intended to decentralize entomological monitoring activities and empower greater ownership of data collection and analysis by VCOs while increasing coverage to allow for more representative data to be collected in support of vector control decision-making. Collected data on human-vector behavior in six sites in the six bionomics monitoring districts;
- Provided technical assistance to the NMCD for entomological monitoring. PMI supported on-the-job mentoring and technical support to NMCD staff at the central and district levels in insecticide resistance testing, morphological mosquito species identification, and advanced entomological techniques; shared protocols with the NMCD and district VCOs on IRS quality assurance, species identification, mosquito dissection, and laboratory assays; recruited and trained one full-time lab technician on malaria vector molecular and biochemical assays; and established one insectary and maintained four insectaries in the last year;
- Provided additional entomological monitoring as part of a housing modification study where extra mosquito collections assessing the impact of mosquito proofing with window screens is being conducted;
- Strengthened the capacity of local research institutions, including the Infectious Diseases Research Collaboration (IDRC), Gulu University, and Muni University through the provision of critical equipment, supplies, and technical assistance.
- Supported the procurement and distribution of Piperonyl Butoxide (PBO) ITNs to pregnant women and children under five years of age through ANC and EPI clinics in public and private not-for-profit (PNFP) facilities;
- Supported prevention of malaria in pregnancy (MIP) by providing ITNs to women at their first ANC visit;
- Provided implementation support and technical assistance for planning for the 2023/2024 ITN mass distribution campaign, which will distribute standard, PBO, and dual active ingredient ITNs nationwide. The activity is in collaboration with Global Fund, Against Malaria Foundation (AMF), and the MoH/NMCD;

- Supported ITN durability monitoring, by implementing 24-month data collection, monitoring the Royal Guard and PermaNet 3.0 ITN brands in Apac and Mubende districts from the 2020 cohort;
- Supported national, facility, and community-level SBC activities to improve demand for ITNs, increase appropriate use, promote care, and mitigate against misuse. For more information, please refer to the SBC section;
- Supported the planning, implementation, and evaluation of the 2022 PMI-funded IRS campaign in ten districts, covering 1,104,083 structures and protecting 3,894,239 people during March 2022. For more information about the PMI-funded spray campaign, please refer to the most recent 2022 End of Spray Report;
- Provided technical assistance to the MoH/NMCD and the District Health Offices with the planning, training, supervision, and close-out of Global Fund-supported IRS operations in 13 districts; and;
- Trained and engaged community members in ten districts to support IRS mobilization and spray activities.

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.

1.3.1. Entomological Monitoring

PMI will continue to support entomological monitoring activities as described in the Recent Progress section. Activities include insecticide resistance, vector bionomics, and insecticide residual efficacy monitoring. PMI conducts wall bioassays to monitor residual efficacy in four IRS districts. PMI is also continuing to provide technical assistance to strengthen the capacity of local research institutions, including IDRC, Gulu University, and Muni University.

Summary of Distribution and Bionomics of Malaria Vectors in Uganda

Vector bionomics means studying mosquitoes that transmit malaria, including their relationship with their environment. As of 2022, the primary vectors are *An. gambiae* s.l. and *An. funestus* s.l. The peak malaria transmission season is from April to May with a second peak between September and October. The preferred biting location of the primary vector is indoors based on endophagic index. The majority of malaria vectors bite after 10:00 p.m. and the majority of mosquitoes, especially *An. funestus* s.l., rest indoors. The preferred hosts are humans. There is a higher abundance of *An. gambiae* s.l. over *An. funestus* s.l. throughout the country.

An. stephensi, an invasive urban vector mainly breeding in artificial containers, has been identified in four PMI countries as of 2023. Although it has not been detected in Uganda at the time this MOP was written, activities for enhanced surveillance of *An. stephensi* will be included in accordance with the PMI *An. stephensi* action plan guidance for at-risk countries.

Status of Insecticide Resistance in Uganda

An. gambiae s.l. was found to be susceptible to pirimiphos-methyl in 9 out of 11 districts where the test was completed, while *An. gambiae* s.l. was susceptible to insecticide bendiocarb in 4 districts (Gulu, Kitgum, Lira, and Tororo) out of 11 districts where the test was completed. *An. gambiae* s.l. was found susceptible to clothianidin and chlorfenapyr in all 11 study districts. *An. gambiae s.l.* was resistant to alpha-cypermethrin, deltamethrin, and permethrin in all the study districts where they were tested with mortality varying between 23 percent in Nakaseke and 83 percent in Tororo for deltamethrin, based on the WHO tube test results. *An. funestus* s.l. was susceptible to pirimiphos-methyl, clothianidin, chlorfenapyr, and bendiocarb in Soroti and Katakwi but resistant to deltamethrin (33 percent mortality), permethrin (23 percent mortality), and alpha-cypermethrin (28 percent mortality). Synergist assays using PBO fully or partially restored *An. gambiae* s.l. susceptibility to pyrethroids indicating that oxidases are the major resistance mechanisms in the study districts although other resistance mechanisms may also play a minor role in districts where PBO only partially restored susceptibility to pyrethroids.

1.3.2. Insecticide-Treated Nets (ITNs)

PMI will continue to support ITN-related activities as described in the Recent Progress section. Activities include the procurement and distribution of dual active ingredient ITNs through continuous distribution via ANC and EPI, a shift that began with FY 2022 MOP funds. PMI also plans to continue support and improve coordination for SBC to enhance the use and care of ITNs, particularly in areas where IRS has been withdrawn, and to mitigate against misuse. PMI does not plan to support additional durability monitoring for this MOP. PMI plans to warehouse and distribute ITNs through the Joint Medical Store (JMS), a private not-for-profit warehouse.

Please see the SBC section for details on challenges and opportunities to improve ITN use.

ITN Distribution in Uganda

In Uganda, ITNs are distributed via mass campaigns every three years. The 2020 mass campaign distributed about 28 million nets (UCC report, 2020), and the upcoming 2023/2024 mass campaign is planning to distribute 28.5 million nets. The Global Fund is prioritizing support for the ITN mass campaign planned for 2026, with a total of 29 million ITNs and a buffer of 2 million ITNs planned. With entomological monitoring data demonstrating increasing insecticide resistance to pyrethroids, PBO and new nets will be prioritized in the next Global Fund grant. The new nets will be distributed in 38 districts where sentinel site monitoring has shown that PBO did not restore the susceptibility of malaria vectors to pyrethroids, expanded to include contiguous districts in the ecological zone. The PBO nets will be distributed in 87 districts with widespread pyrethroid resistance and areas of moderate to high malaria transmission/burden where metabolic resistance is the main mechanism. The remaining areas (Wakiso & Kampala) will receive standard nets.

The mass campaign will be complemented by continuous distribution channels (ANC, EPI, and schools). PMI and the Global Fund support ITN distribution at ANC/EPI in a complementary manner with PMI supporting 86 districts with dual AI ITNs and the Global Fund supporting 50 districts with PBO ITNs. The Global Fund alone supports school-based distribution, which started in September 2022. The MoH/NMCD has adopted school-based distribution as a routine distribution channel.

The anticipated ITN net need for all distribution channels at the time of MOP FY 2024 implementation is 6,307,555 nets. The total number of nets anticipated to be procured at that time is 1,540,000. This leaves a gap of 3,378,210. Please refer to the ITN Gap Table in the annex for more details on planned quantities and distribution channels.

Table 1. Standard Durability Monitoring

Campaign Date	Site	Brand	Baseline	12-month	24-month	36-month
November 2020	Apac	PermaNet® 3.0 & ®Royal Guard	February 2021	December 2021–January 2022	November–December 2022	November–December 2023
November 2020	Mubende	Permanet® 3.0 & Royal Guard®	February 2021	December 2021–January 2022	February–March 2023	November–December 2023

Table 1 shows that durability monitoring is being conducted to understand how the PermaNet® 3.0 & Royal Guard® ITNs maintain their chemical and physical effectiveness starting in February 2021 and assessed for 12 months, 24 months and 36 months until December 2023. The standard durability monitoring will be conducted in two sites: Apac and Mubende.

1.3.3. Indoor Residual Spraying (IRS)

In calendar year (CY) 2025, PMI will support the planning, implementation, and evaluation of IRS in five to six districts using a long-lasting insecticide based on the latest resistance data. As of 2023, PMI has been spraying in the same area for nine years and is seeing decreased efficacy (both reduced impact on vector abundance and malaria cases despite spraying) and increasing community resistance. With the 2023 spray campaign concluded, PMI is currently in discussion with the NMCD and other stakeholders on whether or not IRS should be moved to higher priority areas. The exact number of districts, structures, and people PMI will cover is still under discussion with PMI's implementing partner, and the NMCD. PMI will execute a multi-pronged IRS exit strategy, inline with PMI guidance. A critical component of this plan will be to ensure the former spray areas are covered with an effective vector control measure. As such, PMI will work to ensure the districts where IRS is withdrawn will receive new nets in the 2023–2024 mass distribution campaign and will continue entomological monitoring in these districts to monitor for a potential increase in mosquito density. The IRS withdrawal districts will also be targeted for iCCM and enhanced commodity support to manage any potential rebound.

Lastly, PMI will support robust SBC in any withdrawal areas to ensure communities are receiving key malaria messages related to withdrawal. As PMI begins to scale back its IRS program, it will use lessons learned from its withdrawal over time, as well as lessons from the withdrawal of the United Kingdom Foreign, Commonwealth, and Development Office, completed in 2022, to inform future implementation. In addition to the PMI-funded spray campaign, PMI will also provide technical assistance to the NMCD and District Health Officers in 13 Global Fund-supported districts.

Table 2. PMI-Supported IRS Coverage

Calendar Year	District	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide
2022	Budaka, Bugiri, Butebo, Butaleja, Kibuku, Lira, Namutumba, Pallisa, Serere and Tororo	1,104,083	93	3,894,239	Neonicotinoid
2023*	Budaka, Bugiri, Butebo, Butaleja, Namutumba, Pallisa, and Tororo	768,664	93	3,206,978	Pirimiphos-methyl & Neonicotinoid
2024**	TBD 5-7 Eastern Uganda districts	650,000	90+	2.6M	Pirimiphos-methyl
2025**	TBD 5-6 districts	600,000	90+	2M	TBD, based on resistance data

*Spraying is ongoing, final numbers may change.
**Planned.

Table 2 shows IRS coverage supported by PMI and conducted or planned from CY 2022–2025. Various insecticides will be used and the population covered will strategically decrease from almost 4 million people in 2022 to 2 million people in 2025.

IRS Insecticide Residual Efficacy in Uganda

Wall bioassays conducted monthly following the 2022 IRS campaign in five sites showed a residual efficacy of SumiShield® and Fludora Fusion®. Residual efficacy varied depending on the surface type and location. SumiShield lasted seven months on all wall types while Fludora Fusion lasted seven months on painted surfaces and four months on mud wall surfaces.

1.3.4 Other Vector Control

The MoH/NMCD implemented larviciding in the four districts, Kabale, Rubanda, Kisoro, and Lira, in 2020 and 2021 using GoU funds. Larviciding refers to the regular application of chemical or microbial insecticides to water bodies or water containers to kill the aquatic immature forms of the mosquito (the larvae and pupae). In 2023, the MoH/NMCD is planning

to conduct larviciding in nine districts, Kabale, Rubanda, Kisoro, Alebtong, Lira, Otuke, Namutumba, Kibuku, and Pallisa, using GoU funds. PMI is not providing support for this activity.

2. Malaria in Pregnancy (MIP)

2.1. PMI Goal and Strategic Approach

In the UMRESP 2021–2026, the coverage goal for MIP is for at least 85 percent of all pregnant women to be protected against malaria. Recommended interventions include chemoprevention with sulfadoxine-pyrimethamine (SP), early diagnosis and prompt treatment of MIP, and consistent ITN use, with nets delivered through both routine distribution channels in antenatal clinics and universal campaigns. PMI ITN commodity procurement supports the NMCD in ITN distribution at both public and PNFP facilities.

PMI continues to support the NMCD in the goal of providing a minimum of three doses of IPTp. The Uganda national guidelines have been updated per the revised 2022 WHO recommendations[4] for IPTp-SP to be administered to all pregnant women (regardless of gravidity) as early as possible in the second trimester (after 13 weeks gestation), with at least three doses, each given at least one month apart. The revised WHO recommendations also support exploration of other delivery methods (e.g., community health workers) for ensuring IPTp access if there are challenges in care delivery at ANC; community IPTp has not been implemented in Uganda, but health workers conduct outreach drives that promote early ANC attendance. While at least three doses of intermittent preventive treatment in pregnancy (IPTp-3) uptake in Uganda has increased from 40 percent in 2019 to 62 percent in 2022, this remains below the national target of 67 percent. Barriers to IPTp-3 uptake include delayed and low ANC attendance, especially among young mothers; low ANC retention; SP stockouts and supply imbalances between facilities; limited staffing and clinic days allocated for ANC; poor attitudes of some healthcare workers towards expectant mothers or utility of IPTp; and in some health facilities, long wait times and lack of access to clean drinking water for SP directly observed therapy.

The national MIP guidelines are updated to reflect the revised 2022 WHO malaria treatment guidelines that recommend the use of artemether-lumefantrine (AL) for uncomplicated malaria in all trimesters of pregnancy, including the first trimester[5]. Parenteral artesunate continues to be the recommended first-line treatment for severe MIP. PMI continues to support the NMCD and district health management teams (DHMTs) to improve effective and timely case management of MIP, following WHO recommendations, including early referral and treatment of severe MIP cases.

[4] World Health Organization: WHO, “Making GRADE the Irresistible Choice - Guidelines and Evidence Summaries. *WHO website*. (Geneva, Switzerland, March 14, 2023): https://app.magicapp.org/#/guideline/7089.
[5] WHO. Ibid.

2.2. Recent Progress (between March 2022 and March 2023)

- PMI and NMCD advocated that SP should be considered a priority essential medication by the GoU. In 2023, the GoU funded 5,687,309 doses of SP for the public sector. More recent developments include ordering a one hundred package regimen of SP that can be conveniently re-distributed to lower health facilities. In addition, to promote health facilities' ordering of SP from the central level, the pharmacy department is providing technical assistance to facilities to review their essential drugs orders, to ensure SP is included;
- PMI provided technical guidance to partners on improving the performance of IPTp-3 and for the monitoring of four or more doses. In FY 2022, 59 percent of pregnant women attended at least four ANC visits during pregnancy. Overall, 58 percent of pregnant women attending ANC received IPTp-3;
- PMI supported IPTp training for 601 health workers; and
- PMI supported meetings of the MIP technical working group, convened with leadership from NMCD, malaria partners, the MoH Reproductive Health Division, the Community Health Department and Pharmacy Division, and Reproductive, Maternal, Newborn and Child Health, to coordinate quality MIP interventions at the national and district levels.

2.3. Plans and Justification for FY 2024 Funding

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

PMI will continue to support strengthening MIP interventions and improving IPTp uptake by:

- Supporting coordination of MIP services at the national and district level through monthly MIP technical working group meetings, in collaboration with NMCD and the MoH Reproductive Health Division;
- Providing technical guidance for the revision of MIP guidelines, training tools, and standard operating procedures in alignment with WHO recommendations;
- Supporting evidence-based training of VHTs and health care workers in ANC clinics to improve MIP implementation, including promoting IPTp administration, and timely diagnosis and treatment of MIP;
- Continuing to support community level activities that promote early attendance of ANC using the community pregnancy mapping approach, where community outreach targets pregnant mothers for facility-led comprehensive ANC drives;
- Using surveillance data to inform which poorly performing health facilities should be targeted for increased SBC interventions to improve IPTp coverage; and
- Funding commodity procurement for dual active ingredient (AI) ITN distribution at antenatal clinics.

Please refer to the SP Gap Table in annex for more detail on planned quantities and distribution channels. Please see the SBC section for details on challenges and opportunities to improve intervention uptake or maintenance.

3. Drug-Based Prevention

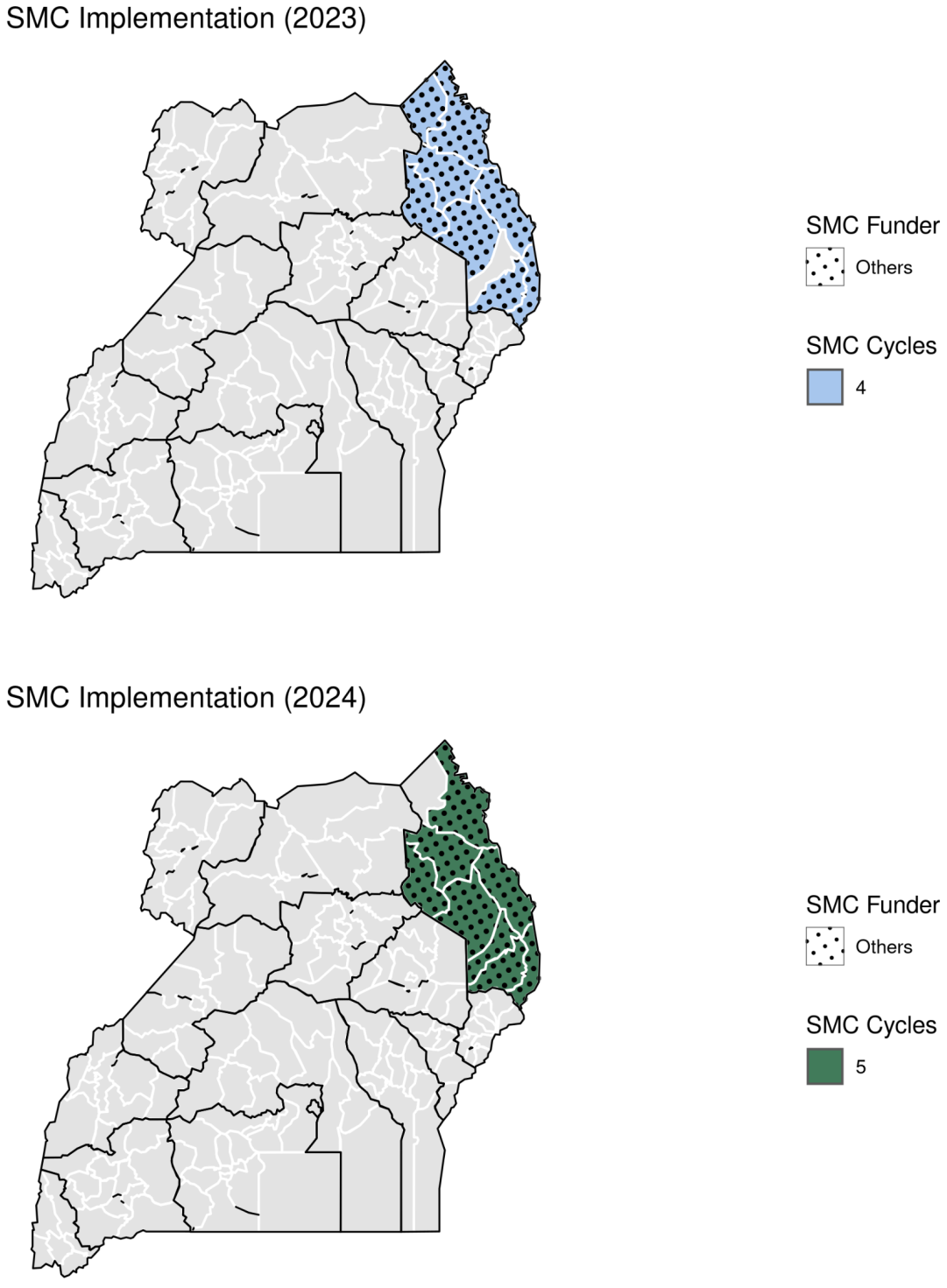
PMI does not currently support seasonal malaria chemoprevention (SMC) or drug-based prevention in Uganda other than IPTp. However, the NMCD, in collaboration with the Malaria Consortium and funded by the Bill & Melinda Gates Foundation, conducted a non-randomized control trial of SMC among children aged 3–59 months in the Karamoja region in May to September, 2021. This region was selected due to its high malaria prevalence and seasonal malaria transmission (i.e., with one rainy season from May to September).

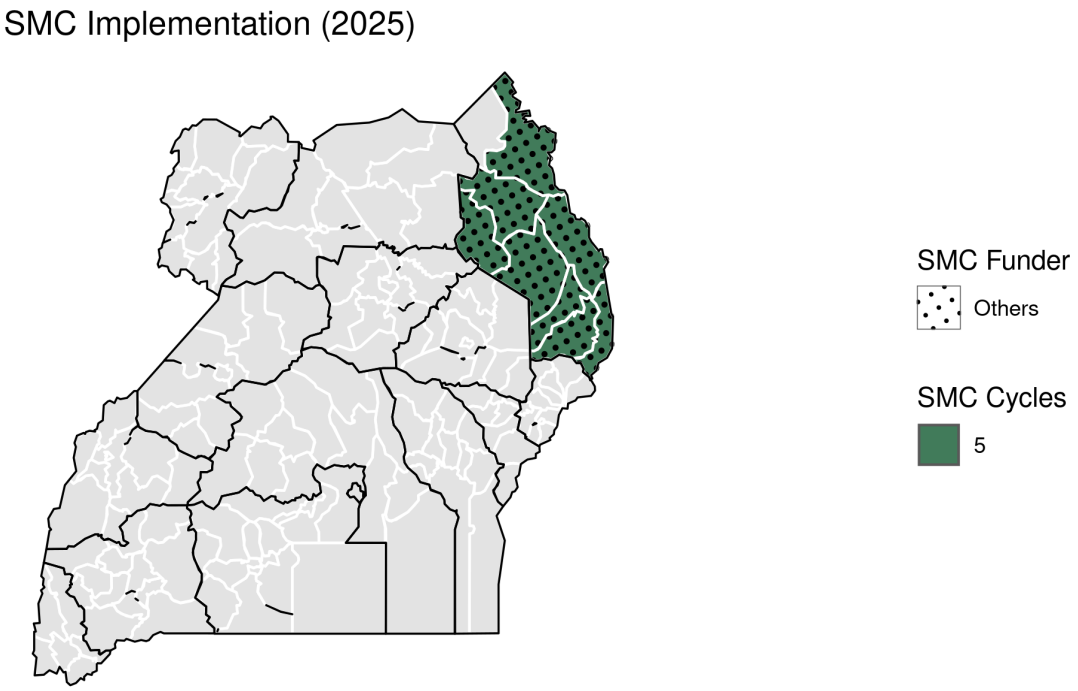
Preliminary results from this trial of SMC using monthly sulfadoxine-pyrimethamine and amodiaquine (SPAQ) during the peak transmission season showed protective effectiveness of 92 percent among children aged 3-59 months in the intervention group[6]. Notably, children in the intervention group had a lower malaria incidence rate per person (3.0) and number of malaria episodes (39/400) compared to children in the control group (38.8 and 171/200, respectively). The NMCD plans to scale up SMC implementation to all nine districts in Karamoja with Global Fund support, possibly including older children, if study results support this (per new WHO recommendations). In 2022, updated WHO chemoprevention recommendations[7] allowed for more flexibility in the geographic areas (i.e., removing restriction to the Sahel sub-region) considered for SMC and, in some areas, expansion of the possible age groups to include children older than six years of age. PMI is closely following the NMCD study's progress in Karamoja to see if the findings will lead to policy changes.

[6] Anthony Nuwa et al., "A Non-Randomized Controlled Trial to Assess the Protective Effect of SMC in the Context of High Parasite Resistance in Uganda," *Malaria Journal* 22, no. 1 (February 22, 2023): https://doi.org/10.1186/s12936-023-04488-4.

[7] World Health Organization: WHO, "Updated WHO Recommendations for Malaria Chemoprevention among Children and Pregnant Women," *WHO Website*, June 3, 2022, https://www.who.int/news/item/03-06-2022-Updated-WHO-recommendations-for-malaria-chemoprevention-among-children-and-pregnant-women.

Figure 2. Maps of Seasonal Malaria Chemoprevention Implementation in Uganda





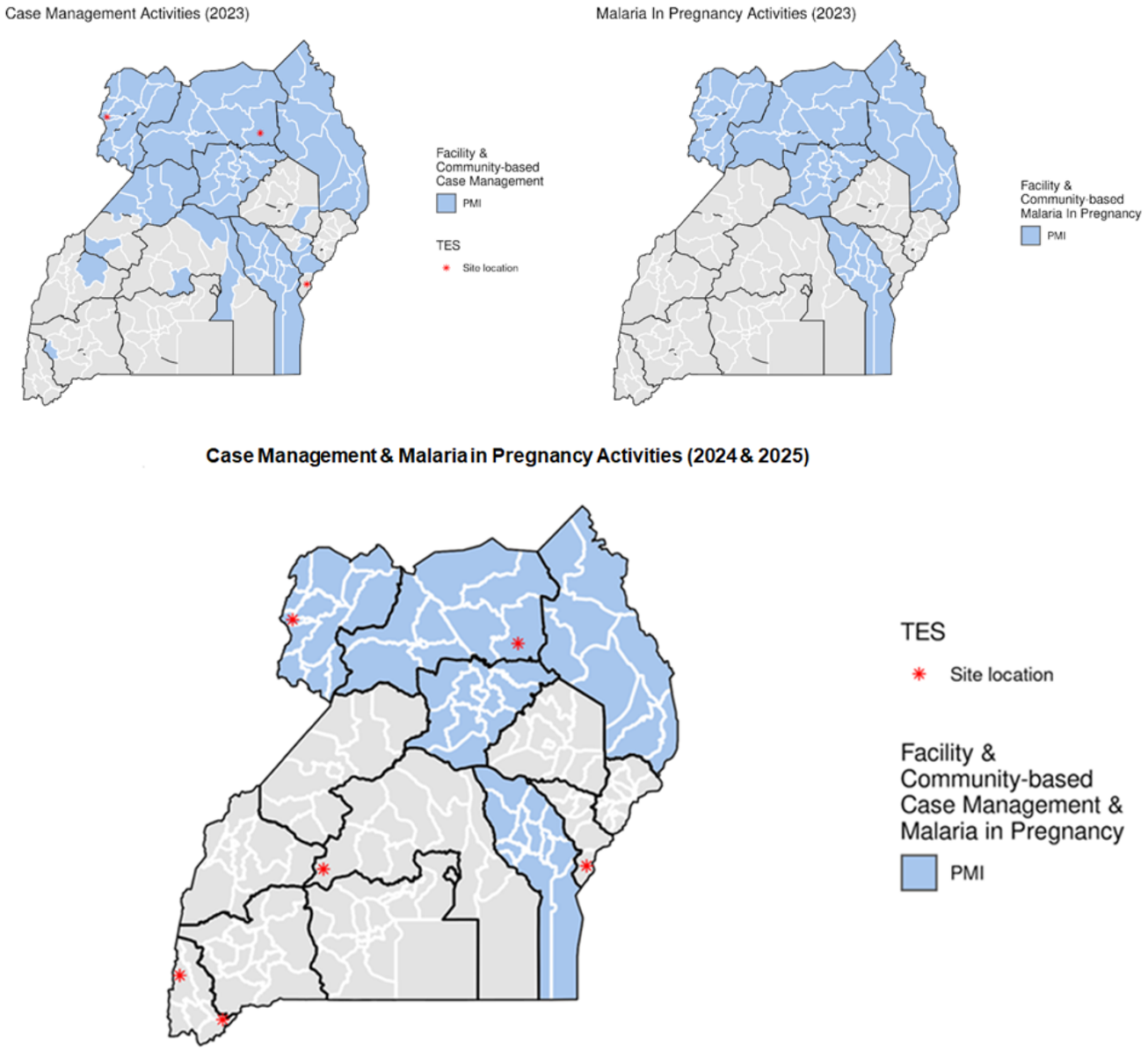
4. Case Management

4.1. PMI Goal and Strategic Approach

The UMRESP 2021–2026 stipulates that rural areas with hard to reach communities that lie beyond five kilometers of health facilities or malaria services should be covered with iCCM. In high transmission seasons or in areas with persistent high transmission areas, like Karamoja where populations are mobile, this approach is combined with community outreach services. Given the heterogeneity of transmission of the disease, the plan mandates deployment of interventions based on stratification for maximum impact. A widespread national increase in malaria cases led to the activation of the IMS in 2023 to respond to emerging malaria epidemics. The national case management strategic objective is to accelerate access to malaria curative services to achieve universal coverage in all eligible populations by 2025. Specifically, the NMCD aims for 90 percent of malaria cases to be appropriately managed in public and private facilities and at the community level.

PMI supports nationwide procurement of malaria rapid diagnostic tests (RDTs), ACTs, and injectable and rectal artesunate, through PNFP facilities, accounting for approximately 10 percent of the total national supply. Global Fund and GoU cover the rest. PMI also supports case management outreach services in high transmission settings, and training and supportive supervision activities in 68 high burden districts.

Figure 3. Maps of Case Management, Community Health, and Malaria in Pregnancy Service Delivery Activities in Uganda



4.2. Recent Progress (between March 2022 and March 2023)

PMI contributed to strengthening malaria quality diagnostics and case management at health facilities by providing training and supportive supervision in five high burden regions. PMI is building case management capacity in lower level private clinics and drug shops to address inappropriate malaria medication (dosing, quality and regimen choice), to increase early referral, and improve reporting and adherence to national guidelines. In districts identified as high malaria hotspots in the targeted high burden regions, PMI supported iCCM by training VHTs and equipping them for monthly reporting and bimonthly commodity stock replenishment. Global Fund supports 61 districts with iCCM by providing technical training and supplying community stocks through the National Medical Stores (NMS). At the health facility level where

iCCM is implemented, antimalarials are delivered in two packages, with the specific community allocation prepackaged for community case management. PMI supported 29 high burden districts to carry out iCCM. PMI has traditionally used Joint Medical Stores (JMS) to distribute commodities, however JMS's community reach is limited to PNFPs that only cover 10 percent of the population. NMS will provide better coverage and reach for community commodities. PMI is working with its partners in the supply chain to ensure accountability and visibility of malaria commodities throughout the process. Bridging the community stock gap will reduce the numbers and severity of community cases. PMI supported community reporting of iCCM by availing tools, training on data collection, and monitoring community stocks.

A preliminary health facility readiness assessment revealed gaps in health worker practices at lower level health facilities contributing to significant delays in referral, inadequate case management and deficiencies in case reporting into the national health management systems. PMI supported the roll out of the NMCD's post discharge malaria chemoprevention strategy, which administers a full course of malaria treatment to children who suffered severe malaria with anemia one month after discharge. Uncomplicated malaria cases that fail on the first line treatment regimen, that is Artemether Lumefantrine are treated with a dose of second line ACTs i.e. Dihydroartemisinin Piperaquine while all severe malaria cases are discharged with a dose of second line ACTs and given two follow up doses post discharge.

Below are specific activities implemented with PMI support over the past year:

National Level:

- Strengthened quality assurance of malaria diagnostics in private health facilities and laboratories through training and professional development and laboratory supervision;
- Collaborated and coordinated with the Maternal and Child Health and Community Health departments to revise community health tools and carry out community mortality audits to improve case management at all levels;
- Convened and led six national level coordination meetings and supported national level malaria technical working groups;
- Supported malaria case management pre-service training courses for nurses in boarding schools to manage malaria and refer students in order to prevent complicated malaria in school children;
- Convened a mid term national strategic policy review that examined the widespread malaria epidemic in the country with resultant formulation of a national malaria epidemic response under the incident management team (IMT); and
- Conducted malaria case management continuous medical education in teaching hospitals and pre-service institutions.

Commodities:

- Supported the procurement and distribution of 2,527,850 malaria RDTs for PNFP health facilities nationwide, accounting for approximately 10 percent of the national needs;
- Supported the procurement and distribution of 1,418,370 ACT for PNFP facilities, accounting for approximately 10 percent of national needs;
- Supported the procurement and distribution of 246,195 vials of parenteral artesunate for PNFPs health facilities nationwide, accounting for approximately 10 percent of needs.

Facility Level:

- Trained 16 supervisors in on-site training and supportive supervision;
- Conducted 1,117 supportive supervision visits in 1,117 health facilities; and
- Conducted 273 on-site training and supportive supervision visits in 273 private facilities/drug shops through collaboration between private sector associations and district health teams.

Community Level:

- Conducted four on-site training and supportive supervision or mentorship visit sessions reaching 336 VHTs and CHEWs;
- Collected key case management quality of service indicators at the community level during round four of supportive supervision (children under five years of age tested, children under five years of age treated, number of household members using mosquito nets, ACT and RDT availability), including diagnostic testing prior to treatment and adherence to diagnostic test results;
- Trained 184 supervisors in on-site training and supportive supervision for CHEWs and supported training of trainers to strengthen the CHEW supervision system;
- Supported the MoH to develop a National Digital Community Health Implementation Roadmap in alignment with their National Digital Health Strategy;
- PMI, with the larger USAID/Uganda health office and the Ministry of Health, supported the Community Health Extension Workers (CHEWs) training, from which 322 CHEWs graduated in October 2022. The CHEWs will deliver malaria literacy, community literacy, community diagnosis and treatment in the community. GOU has already shown its commitment to the CHEWs by dispersing the first monthly payment in Lira district, with a planned disbursement for Mayuge district expected in April 2023;
- Conducted training of 334 VHTs in iCCM and community supply chain management in 15 high malaria burden districts in Uganda. These VHTs continue to work on a voluntary basis and are provided non-monetary rewards; and
- Supported the development of the National Community Health Strategy for the improved coordination of comprehensive and integrated community health service

delivery for sustainability of malaria prevention and referral services within the communities.

Other case management / chemoprevention activities included a mass drug administration during the 2022/2023 Ebola virus disease epidemic in Mubende and Kassanda districts supported by WHO. The MoH has adapted the WHO recommendation to provide post discharge malaria chemoprevention for cases of severe malaria. As part of the epidemic response under the IMS, selected high burden districts experiencing malaria epidemics will receive targeted drug administration.

4.3. Plans and Justification for FY 2024 Funding

PMI the MoH/NMCD will pilot and implement electronic Community Health Information System (eCHIS) across PMI's iCCM supported districts to improve the timeliness and accuracy of community data collection, reporting and surveillance. Thus, aiding VHTs and CHEWs in the delivery of integrated health services at the community level. This is in line with MoH's processes of digitizing health service delivery in line with the Health Information and Digital Health Strategic Plan 2020/21–2024/25, the National Community Health Strategy, and the MoH strategic plan 2020/21.

National Level

PMI will continue to support the NMCD to implement the UMRESP 2021-2026, with an emphasis on strategic objective one, which aims to accelerate access to malaria preventive and curative services to achieve universal coverage in all eligible populations by 2025. PMI will target high burden regions and hard-to-reach populations with enhanced community malaria prevention approaches, and early community diagnosis and treatment through MAAM. PMI will deliver targeted community case management interventions in areas identified as high malaria burden, or malaria hotspots at the sub-county and village levels, and develop community-owned intervention packages. MAAM community-led interventions provide holistic engagement with SBC, malaria prevention, early case management.

At the national level, PMI will continue to support NMCD to complete and disseminate national policy documents, such as the UMRESP and the Uganda National Malaria Control Policy. PMI will continue to support the updating and finalization of case management guidelines, as well as the printing and dissemination of tools for communities and health facilities. Because malaria and family health share similar health facility tools, they will work together and ensure continued availability of these tools.

PMI is supporting the NMCD's second strategic objective: enhancing quality malaria services in the private sector with at least 80 percent of the private health facilities managing malaria according to national guidelines and reporting quality data by 2025. In the five focus regions, PMI will continue to strengthen lower level private health facilities to adhere to national malaria

case management guidelines by disseminating national tools, improving health workers' malaria case management skills, and carrying out supportive supervision for quality improvement with district local governance teams.

PMI will continue supporting the NMCD's post discharge malaria chemoprevention strategy through training of health workers and the provision of adequate quantities of second line ACTs to support its implementation.

Commodities

PMI will procure RDTs to continue support for the NMCD's test and treat policy, which recommends the testing of all fever cases upon presentation at outpatient clinics. Kenya, Ethiopia, and Rwanda have registered HRP2/3 deletions, putting Uganda at high alert. HRP2/3 deletions are the deletion of histidine-rich protein genes pfhrp2/3 in *Plasmodium falciparum*, which causes infections to go undetected by HRP2-based malaria rapid diagnostic tests.Today, there is molecular surveillance in thirty malaria reference centers that regularly disseminate genomic data supported by non-PMI partners. PMI will continue engagement on molecular surveillance for HRP2/3 deletions and provide the appropriate support. Given an anticipated surplus in ACTs and injectable artesunate due to a recent increase in Global Fund investment in these commodities, PMI will focus additional resources to strengthen community based case management. In addition, PMI is not anticipating investing in artesunate suppositories given a substantial Global Fund investment in this commodity.

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.

Facility Level

PMI will continue support to facility case management as described in the progress section with no major changes. Training health workers in quality diagnostics and case management will continue. PMI will support facility-led community outreach to provide SBC, community education, and testing and treatment of fever in areas with high malaria case reporting, in accordance with the NMCD incident management system. Also, PMI will strengthen the capacity to manage severe malaria in two regional referral hospitals through a government-to-government assistance mechanism.

Community Level

PMI will continue to provide support at community level,as highlighted in the progress section. There is sufficient availability of ACTs and injectable artesunate at this time and so PMI will not procure commodities for VHTs supported by public facilities through NMS. PMI is exploring using NMS to deliver community iCCM commodities through NMS. NMS provides more

coverage as it delivers to all public facilities that support iCCM targeted communities.To support community level malaria case management, PMI will use its bilateral mechanisms to provide technical assistance in reporting and quantification of the community commodity needs. Training of trainers will continue for supervision, monitoring and reporting in all iCCM focus districts. While PMI is prioritizing an integrated approach at households, it will use community case management in select districts where non-malaria commodities are unavailable. CHEWs are currently only in two districts so PMI will continue to use VHTs to carry out community case management. PMI will provide them with a transport refund, necessary commodities, training and recognition as incentives for conducting this work.

Monitoring Antimalarial Efficacy

Table 3 explains the ongoing and planned therapeutic efficacy studies. Ongoing studies are being conducted in Busia, Arua City, and Agago utilizing a combination of AL, ASAQ, PA, and DP treatment arms. Samples will be analyzed in laboratories in-country at IDRC and at UCSF.

Table 3. Ongoing and Planned Therapeutic Efficacy Studies

Ongoing Therapeutic Efficacy Studies			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
2022-2023	Busia Arua city Agago	AL, ASAQ AL, PA AL, DP	• In-country at IDRC • UCSF
Planned TESs (funded with previous or current MOP)			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
n.a.	n.a	n.a	n.a

AL: artemether-lumefantrine; ASAQ: artesunate-amodiaquine; DP: dihydroartemisinin-piperaquine; IDRC: Infectious Diseases Research Collaboration; PA: pyronaridine-artesunate.

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 provides technical assistance to the NMCD, DHMTs, and health facilities to improve supply chain management and develop accurate stock inventories of AL, RDTs, SP, ITNs, and drugs for treatment of severe malaria. PMI also provides TA to the quantification and procurement planning unit of the MoH to support proper quantification of malaria commodities.

PMI's supply chain activities take place at the national level, which is in line with the UMRESP 2021-2026. The MoH is implementing the PMI stockout reduction strategy. However, stockout rates range from 12 percent to 51 percent depending on the commodity, which is still above the desired target of 10 percent. More details are available in the country profile.

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

PMI's principal supply chain investments are aimed at improving malaria commodity availability at service delivery sites including forecasting and supply planning, management information systems, warehousing and distribution technical assistance, direct warehousing and delivery of commodities to health facilities. Despite these interventions, the availability of key commodities decreased from 88 percent to 49 percent at health facilities during the March 2022 to March 2023 period. Increased stockout rates were partially due to the upsurge in malaria cases that put pressure on available stocks, and the stock delivery delays by NMS which were impacted by a delayed release of operational funds.

PMI supported phase one of the global standards (GS1) barcoding system at the JMS PNFP central warehouse facility to support commodity receipt. Additional equipment was procured and installed in three JMS PNFP regional warehouses to enable them to implement the barcoding system. PMI supported an End Use Verification (EUV) survey, which was conducted in 75 randomly selected health facilities across the country. The study showed that the majority of health facilities (91 percent) had at least one ACT at the time of the visit. 100 percent of Health Center IIs and IIIs had at least one malaria commodity or product available. During the period of performance, PMI also supported the development of a new EUV tool.

5.3. Plans and Justification with FY 2024 Funding

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

PMI will continue to support the activities as described in the Recent Progress section, including proper quantification, information systems, contract management, warehousing and distribution, regulatory support, global standards, local manufacturing, and End Use Verification surveys. In CY2024, PMI will support phase two of GS1 implementation in the JMS PNFP warehouse. This phase will extend the barcoding functionality to other warehouse functions, including put-away, selection and dispatch functions. PMI will support two EUV surveys to verify availability and utilization of malaria medicines and commodities.

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

6. Malaria Vaccine

The PMI Uganda aims to support the Ministry of Health to strategically deploy the malaria vaccine as a complementary tool to existing ones. This includes technical assistance to the National Malaria Program as it engages with the national Expanded Program on Immunization (EPI) to strategically use data to decide on where to introduce the malaria vaccine. The national EPI will lead vaccine introduction, thus PMI Uganda will work with the NMP and national immunization colleagues to provide complementary support 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 Uganda has not received confirmation on timing of malaria vaccine introduction, PMI will not allocate funding to introduction until the deployment timeline and resource requirements have been determined.

6.1 PMI Goal and Strategic Approach

6.2 Recent Progress

In January 2023, Uganda applied for Gavi funding to support the procurement and deployment of the malaria vaccine, which is planned to start in April 2024 and will be implemented in four phases between 2024 and 2027. The malaria vaccine will be deployed in health facilities to infants at six, seven, eight, and 18 months of age as a part of routine EPI service delivery and complemented by Periodic Intensification of Routine Immunization activities.

The malaria vaccine would supplement the current malaria control interventions in children between six and 24 months of age. Introducing the malaria vaccine would potentially reduce the incidence of malaria, reduce associated morbidity and mortality among children under five years of age in high burden areas, and reduce malaria related hospital admissions and severe forms of malaria in the target age group, thus increasing livelihoods.

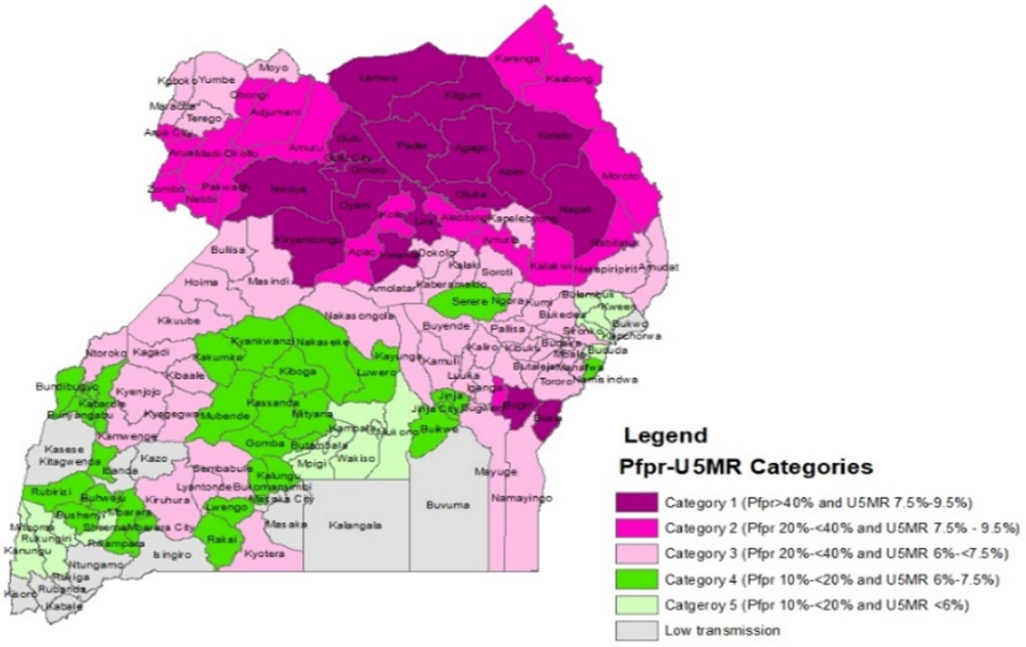
The malaria vaccine allocation was determined by the Gavi criteria, which prioritizes areas with *Plasmodium falciparum* parasite prevalence of more than 40 percent and all-cause mortality among children under five years of age between 7.5 percent - 9.5 percent as Category 1 for initial roll out. Category 1 regions coincide with the high burden regions of mid-northern, Karamoja and West Nile districts where PMI focuses malaria control interventions under its bilateral activity. The MoH plans to introduce the malaria vaccine in 19 districts with the highest burden of malaria: Abim, Agago, Bugiri, Busia, Gulu, Gulu City, Kiryandongo, Kitgum, Kotido, Kwania, Lamwo, Lira, Lira City, Napak, Nwoya, Omoro, Otuke, Oyam and Pader, as shown in Figure 4.

6.3 Plans and Justification for FY 2024 Funding

All malaria vaccine procurement will be supported by United Nations Children's Fund (UNICEF) with Gavi funding. PMI will not commit funds to vaccine support during this FY 2024

but will reprogram funds from previous years to support social behavior change for the effective roll out of the malaria vaccine. PMI in collaboration with partners in the country will establish the gap after the vaccine allocation to Uganda has been confirmed and provide both social behavior change and support health systems strengthening technical assistance. PMI, through its existing activities in the same region, will also strengthen community malaria interventions to ensure effective case management, early diagnosis and referral of malaria cases in the vaccine regions.

Figure 4. Map of Malaria Vaccine Implementation in Uganda



The map in Figure 4 shows target districts for malaria vaccine implementation with malaria vaccine procurement supported by Gavi. The map shows the areas eligible for vaccine (Category 1) and the first phase of introduction which identifies 19 focus districts in the three regions of West Nile, Northern and Karamoja.

7. Social and Behavior Change

7.1. PMI Goal and Strategic Approach

PMI's SBC support to the NMCD's Malaria Communication Plan fully aligns with and contributes to the attainment of Uganda Malaria Reduction Strategic Plan strategic objective three at the national, district, and community levels. PMI works with local media organizations, community-based organizations, VHTs, and key community influencers to ensure gender sensitive, data-driven, coordinated communication and non-communication interventions are deployed across PMI geographic focus areas. PMI supports NMCD's efforts to expand mass media and community level interpersonal communication (IPC) activities aimed at increasing correct and consistent ITN use and care, prompt care-seeking for fever, uptake of RDTs and

IPTp, and provider adherence to diagnostic results for treatment with ACTs. At the national and district levels, PMI provides technical assistance, support for capacity-strengthening activities including for coordination, development and scaling up of SBC interventions and relevant guidelines.

PMI is currently supporting ongoing efforts to finalize the Malaria Communication Plan and other relevant guidelines to align with the UMRESP 2021-2026 Strategic Plan. At the district level, PMI continues to support the adaptation of the national SBC Strategy to local contexts, develop work plans and roll out interventions (e.g. SBC materials for print, mass media, and IPC), and support partner coordination efforts. Inline with strategic objective three of the NMCD Strategic Plan, PMI uses behavioral sentinel surveys to support the generation, analysis, and translation of malaria SBC evidence in the selected program areas of Kaberamaido, Kalaki, Dokolo, Otuke, Alebtong, Amolatar, Yumbe, Adjumani, Maracha, Luuka, Namayingo, Pader, Lamwo, Kaabong, Abim districts, into easily digestible formats. SBC efforts are tailored to multiple audiences and inform near real-time adaptations to ongoing malaria SBC program implementation. In terms of district selection for targeted SBC activities, Kaberamaido, Kalaki, Alebtong, Amolatar, Dokolo, and Otuke are former IRS districts. These districts were chosen based on a historical association of withdrawal of IRS with increase in cases due to a general reduction in immunity in IRS target populations. Yumbe, Adjumani, Maracha, Luuka, Namayingo, Pader, Lamwo, Kaabong, and Abim were chosen based on burden using available DHIS-2 data on malaria-endemic areas.

7.2. Recent Progress (between March 2022 and March 2023)

Progress related to SBC activities in the last year included:

- Rolled out last mile activities in the 15 districts reaching over 76,000 households. These households are malaria vulnerable households, usually below the poverty line, have poor health seeking behavior, and have poor access to services. These households were reached consistently by community malaria champions, VHTs, local council chairpersons, and opinion leaders in the last year through house to house visits supported by PMI.
- Conducted community dialogues for the community ownership of malaria in five high burden districts of Uganda to promote household ownership of the malaria response. Supported the distribution of 2,120 copies of the health promotion handbook to VHTs in the 15 high burden districts of Uganda to promote malaria health literacy within the communities and households.
- Deployed the community score card as part of the last mile activities. This contributed to the community owning and prioritizing the malaria challenge including involving men in the prevention and treatment of malaria. Results from routine monitoring show a positive trend in improvement of ITN use, ANC uptake, and IPTp uptake.
- Provided technical assistance to the MoH/NMCD to develop and finalize the malaria communication plan, in tandem with the health promotion department. The

communication plan will guide the design and implementation of malaria SBC activities in the country.
- Finalized the design of the integrated “happiness” campaign, which will reinforce *‘Obulamu’* malaria SBC campaign messages that have promoted effective malaria prevention and treatment at community, household, and individual level over the last several years.
- Provided technical assistance on the malaria strategic plan 2021-2025 mid-term review.
- Supported the MoH/NMCD during the commemoration of the World Malaria Day activities as an avenue for reinforcing malaria SBC messages and as a platform encouraging the active participation of political, religious, and opinion leaders in malaria control in the country.

Challenges per intervention area over the last year included:

- **ITNs:** Data from the malaria indicator survey (2018-2019) indicates that regions such as West Nile, Acholi, Busoga, Bukedi, Teso, Lango, and Karamoja have moderate ITN access and moderate ITN use. All regions of the country are below the national targets of 80 percent ITN access and 79 percent ITN use (UMRESP 2021-2025); however, when considering overall ITN use given access, 84% of those with access use a net. The other challenge is unfavorable or negative attitudes among men for sleeping under an ITN as noted through routine monitoring reports from implementing partners.The ITN access and use report of 2018/2019 indicates that in some areas, ITN access is high while it is suboptimal in others, for example, the use to access ratio was 0.7 in Karamoja and 0.9 in Acholi. Based on this, PMI will prioritize ITN use in some areas and promote access in others depending on the targeted area.
- **IRS:** IRS conducted over multiple years is associated with lowered risk perception and lower perceived severity for malaria. As part of a comprehensive IRS withdrawal strategy, PMI will distribute the new dual active ingredient nets in IRS withdrawal districts, promote correct and consistent ITN use and prompt care while addressing perceptions of lower risk perception and severity.

Based on routine monitoring data from implementing partners, the following challenges are associated with MIP, case management and service delivery:

- **MIP:** The challenges related to adoption and maintenance of early and repeat ANC and IPTp uptake by the different group categories include:
  Pregnant women: Lack of male emotional, physical, financial and social support. Remoteness and inability to walk the distance between the home and facility. Preference for seeking services from Traditional Birth Attendants (TBAs) causing delayed uptake of ANC and IPTp.
  Communities: Community espousal of traditional birthing as a family value in contrast to facility ANC & IPTp uptake.

ANC providers: Clients do not often tell the health workers when they have taken herbs at home or gone to a traditional healer for fear of mistreatment or being denied care. Providers frequently blame clients for poor health outcomes without taking responsibility for their own role in counseling and relationship building. Most providers believe discussing cultural care practices is a waste of time. Client confidentiality is often not upheld.

- **Case Management:** Routine partner monitoring indicates there is limited scale of SBC interventions and failure to implement them with fidelity and low malaria risk perception, particularly among men and the resultant delay in seeking treatment. Other factors include, perception of absence of drugs at health facilities, existence of alternative service delivery points such as drug shops and clinics that do not adhere to the treatment guidelines.
- **Service Delivery:** Gaps in the provider ecosystem contribute to poor provider behavioral outcomes at the health facility and community levels. These include unfriendliness, bias, abuse of power, and lack of empathy and compassion for clients. VHTs are generally less motivated to support malaria-related interventions because they perceive them to have less financial and material benefit compared to other public health programs.

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.

While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, the three behaviors outlined in table 4 below will be prioritized with FY 2024 funds. PMI will continue to prioritize the use of radio, facility and community-led outreach by health workers, and IPC (especially for engaging key influencers such as political leaders, cultural and religious leaders, parents, health workers), which were identified as the best communication channels by the PMI-supported SBC baseline assessment. Other communication channels that will be used include social media, TV, and print materials. PMI will assess and monitor preference for the various methods for each targeted intervention and make course corrections as necessary to improve reach.

Priorities

Social and Behavioral Change (SBC) activities will target priority behaviors including correct and consistent net use (focused at the district, regional and national level), prompt care-seeking for fever for children under five years of age (national level) and early and frequent ANC attendance (national level). The table below lays out these priorities by target audience, geographic focus, and programming.

Table 4. Priority Behaviors to Address

Behavior	Target Population	Geographic Focus	Programming to Address Behavior

Correct and consistent net use	Pregnant women, mothers of children under five of age, men (male partners), heads of households and health workers	National, regional, and district level	● Conduct community and household level IPC informed by data on correct and consistent net use ● Provide TA to media stations for production and airing of radio shows and spots nationally and regionally to promote correct and consistent net use ● At a district level, provide on-the-job mentoring and provider behavior change tools for health workers to promote net distribution along with correct and consistent net use messages
Prompt care-seeking for fever for children under five years of age	Mothers of children under five years of age, men (male partners), heads of households, and health workers	National	● Conduct community and household level IPC informed by data on prompt care-seeking ● Promote improved quality of care at health facilities through community health action groups and VHTs ● Provide TA to media stations for production and airing of radio shows and spots to promote prompt care-seeking
Early and frequent ANC attendance	Pregnant women, mothers of children under five years of age, men (male partners), heads of households, and health workers	National	● Conduct community and household level IPC informed by data on early and frequent ANC attendance ● Promote improved quality of care at health facilities through community health action groups and VHTs ● Provide TA to media stations for production and airing of radio shows and spots to promote early and frequent ANC attendance

ANC: antenatal care; TA: technical assistance; IPC: interpersonal communication; VHT: village health team.

PMI will continue to collect data on the specific behavioral factors for prompt care-seeking and net use on the patient side, and factors associated with provider behavior for diagnosis and treatment of malaria in order to remain abreast of behaviors that may impact program implementation activities.

Continued SBC capacity strengthening is needed at both the national and district levels, with increased focus at the community level. To bolster the NMCD's and Health Promotion Department's capacity for the planning, design, implementation, and evaluation of SBC activities, PMI will continue to support:

- Coordination at the national level through targeted support to improve the effectiveness of the SBC technical working group;
- District-specific SBC focal persons to increase coordination and ensure the impact of SBC investments, specifically;
- Capacity strengthening of key malaria champions (non-governmental, private sector, and government) for effective SBC design, implementation, and evaluation; and

- Capacity strengthening for NMCD staff on the use of data (e.g. from the expanded SBC module in Malaria Indicator Survey (MIS) to inform SBC program priorities and strategies.

Additional Support Activities:

Additional data collection is needed on the specific behavioral factors for prompt care-seeking and those factors associated with provider behavior for diagnosis and treatment of malaria. Through the expanded SBC module in the MIS and ongoing operational research studies for community delivery of IPTp and expanded iCCM, specific determinants for the community and provider will be determined.

8. Surveillance, Monitoring, and Evaluation

8.1. PMI Goal and Strategic Approach

PMI collaborates with the NMCD, the Global Fund, and other partners to provide technical assistance and resources for SM&E activities. In support of the NMCD strategy, PMI and the NMCD have prioritized interventions that address the challenges resulting from the underutilization of data at health facility and community levels; low private sector reporting; and limitations in epidemic detection, prevention, preparedness, and response. With FY 2024 funds, PMI will increase investments in strengthening surveillance at lower-level facilities and in the community to ensure consistent reporting, data management and use. PMI will support national and regional Data Quality Assessments and increase the frequency of data review meetings from quarterly to monthly.

In response to an increasing number of malaria outbreaks since 2022, the MoH activated the IMS for malaria emergency response. The highest increases in malaria cases have been reported in Bukedi, Busoga, Lango, Acholi and Teso regions. In accordance with IMS activation, NMCD is transforming malaria control efforts from routine malaria programming to emergency response, which focuses on an emergency response framework (from watch → alert → response → recovery). PMI will support IMS activities to implement emergency response plans at the district and regional levels in PMI supported regions. Guided by the Digital Health and Health Information Strategic Plan 2020/21–2024/25, PMI will support piloting the Electronic Community Information System (eCHIS) in a few districts to improve community level reporting, increase data quality and use, reduce reporting time, and improve service delivery at community level. Currently the eCHIS is being implemented in nine districts.

8.2. Recent Progress (between March 2022 and March 2023)

PMI supported the following activities:

National Level

- Supported surveillance capacity strengthening through the Field Epidemiology Training program (FETP). Funded four FETP fellows, assigned to the NMCD, in completing priority NMCD and PMI project activities. These activities included: drafting Uganda's quarterly/weekly malaria bulletin; conducting outbreak investigations; training district staff on malaria control; and developing risk assessments, program evaluations, and quality assurance projects.
- Supported the MoH with the review of community HMIS tools, developed and disseminated the community dashboard.
- Participated in the NMCD's SM&E technical working group to ensure coordination of data collection, use, and decision-making across partners. This included review and finalization of the M&E plan for the UMRESP; malaria quarterly performance review and analysis meetings; and an annual data review exercise.
- Contributed to two USAID/Uganda Mission-wide mechanisms focused on data collection and use.
- Supported M&E needs under the UMRESP, including collecting and tracking data on key program indicators, conducting data quality assessments, and assisting with the development of performance management plans and external project evaluations.

District Level

- Supported malaria related Health Management Information System (HMIS) tools redistributions in PMI supported regions.
- Conducted malaria performance reviews, data quality improvements, data cleaning exercises through mentorships but also supported districts to improve on weekly, monthly and quarterly HMIS reporting and oriented district biostatisticians on DHIS-2 application and use.
- Developed and rolled out HAAM (Household Action Against Malaria) checklist and monitoring tool (Community-level tracking,Independent of the HMIS reporting system).
- Strengthened data use through supporting data analytics, provided mentorship to districts for quarterly performance reviews, supported weekly malaria bulletin specific to PMI supported regions.
- Provided routine coaching to district teams on malaria normal channel use.
- Convened 40 district lessons, learned workshops or data driven meetings to promote data use and improve best practices including adherence to clinical guidelines as well as in this performance period.

Facility and Community Level

- Transferred guidelines and tools developed with PMI support, such as normal channel development guides created in collaboration with district management teams, to health facilities to ensure they have continued access to these resources.
- Supported pilot roll-out, launch and implementation of the CHEW strategy, and also finalized, validated and disseminated the CHEW baseline study.

- Supported the MoH Division of Health Information to develop procedures for data quality control (validation checks) for the community iCCM quarterly report HMIS 097b.
- Supported districts to improve reporting at the community level through the use of the community level reporting dashboard. Reporting has improved from 54 percent to 57 percent (HMIS reporting tools largely stocked out at community level).

The main challenge–which could affect SM&E progress–is the inconsistent availability (sometimes stockout) of community HMIS tools that the government and other non-PMI partners offer. Additional challenges include non-reporting from many private health facilities, absence of biostatisticians in districts due to other national level activities, and gaps in reporting community stock status. To address these challenges at the community level, PMI together with the MoH, will pilot support for the use of the electronic Community Information System (eCHIS) that is currently being implemented in 9 districts (7 are within the PMI supported regions of West Nile, Lango and Acholi). PMI will also consider supporting digitalization of community reporting with the help of this tool in selected communities where iCCM is implemented.

8.3. Plans and Justification with FY 2024 Funding

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

PMI plans to maintain investments in SM&E at the national, district, and health facility levels, with a focus on community, lower-level, and private health facilities. In accordance with the country's efforts to strengthen community health systems, PMI will increase investments to improve data reporting and use including:

- Supporting monthly community level data review meetings to promote data use for community decision-making;
- Digitalization of data reporting tools as needed;
- Training and mentoring health facility and community service providers on surveillance, reporting and monitoring, and implementation of interventions at all health care levels;
- Data quality assessments for evaluating targeted control measures; and
- Enhancing data reporting and use, especially at district, health facility and community levels for timely decision making. Examples include using data to identify the high burden regions of Acholi, Busoga, Karamoja, Lango, and West Nile, and targeting national-level interventions to close system gaps for national surveillance strengthening.

Table 5. Available Malaria Surveillance Sources

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Household Surveys	Demographic Health Survey				X*		
Household Surveys	Malaria Indicator Survey					P*	
Household Surveys	Multiple Indicator Cluster Survey						
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						
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies				X	P*	P
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System						
Malaria Surveillance and Routine System Support	Support to HMIS	X	X	X	X	P	P
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response	X	X	X	X	P	P
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System	X	X	X	X	P	P
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System						
Other	End-Use Verification Survey	X	X	X	X	P	P
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey			P			
Other	Malaria Impact Evaluation						
Other	Entomologic Monitoring Surveys	X	X	X	X	P	P

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

PMI supports various activities to improve malaria data access, use and quality. This table describes the many malaria data sources available and the years certain data activities have been conducted or are planned in the future.

9. Operational Research and Program Evaluation

9.1. PMI Goal and Strategic Approach

The NMCD objective for operational research (OR), as outlined in the UMRESP, prioritizes support for OR including through research collaborations, conducting pilot studies of innovative tools or delivery approaches, and disseminating research findings to impact policy. PMI supports the NMCD's malaria OR agenda and program evaluation activities. Currently, the PMI in-country team and headquarters-based staff serve as co-investigators or liaisons for OR projects co-led by NMCD and partners, such as IDRC and PMI Insights.

9.2. Recent Progress (between March 2022 and March 2023)

- **PMI/Uganda Housing Modification Study (HMS)**. As described in the FY 2023 MOP, PMI continues to support a core-funded housing modification study led by IDRC in Jinja and Luuka districts. This cluster-randomized trial is currently evaluating the impact of two types of housing modifications (full screening and eave tubes), combined with PBO nets, as compared to PBO nets alone (control), on the malaria incidence in children under five years of age. Secondary study objectives include assessing the impact of the housing modifications on malaria prevalence and anemia (through seroprevalence surveys), mosquito density and other entomologic outcomes, as well as determining the cost-effectiveness, sustainability, and acceptability of the modifications. PMI completed housing modifications in April 2022 with full screening of 2,042 houses and eave tube placement in 1,964 houses, with more than 85 percent coverage of households in 40 intervention villages. This signifies high acceptability of the interventions and was confirmed by qualitative evaluation. Cohort follow up will be completed in April 2023 and preliminary data are pending analysis and dissemination in Q3 2023.
- **PMI Insights Commodity Forecasting Dashboard.** PMI, with MOP resources, is supporting a malaria commodity needs modeling study led by the Malaria Atlas Project. The objective of the study is to provide country-level insight into malaria diagnostic and drug commodity needs under various scenarios (e.g., expanded diagnostic testing, etc) using mathematical modeling for four countries (Guinea, Mozambique, Uganda, and Zambia). Data analysis has been completed using Uganda country-level data in M-DIVE and DHIS-2, and the forecasting dashboard is under development.
- **PMI Insights Malaria Rapid Diagnostic Test (RDT) Capture and Reporting Assessment (MaCRA) Study.** PMI, with core funding and co-funding from the Bill & Melinda Gates Foundation, is supporting the MaCRA study, led by PATH and the Child Health and Development Center at Makerere University. The study measures the degree of agreement between RDT results interpreted by health care workers compared to an expert panel. The study is being conducted in Uganda, Nigeria, Côte

d'Ivoire, and Benin. At the time of writing, the study protocol was drafted and survey tools were in development.

- **PMI Insights Commodity Level Stockouts Study.** PMI, with core funding, is supporting the design of a landscaping activity and implementation of co-creation workshops, both aimed at developing interventions that address community level stockouts. An initial scope of work for the landscaping activity has been developed and is under review.

Table 6. PMI-funded Operational Research/Program Evaluation Studies in Uganda

Ongoing or Planned OR/PE Studies	Status	Start date	End date
Impact of housing modification combined with PBO ITNs on the reduction of malaria burden. Evaluation of the epidemiological and entomological effectiveness, cost-effectiveness, feasibility, and acceptability of housing modification.	Pilot completed; trial data collection ongoing	August 2020	August 2023
Case management dashboard for commodity forecasting	Dashboard developed, testing ongoing	September 2022	September 2023
Malaria RDT capture and reporting assessment (MaCRA) study to measure the degree of agreement between RDT results as interpreted by healthcare workers compared to an expert panel.	Protocol and study tools in development	November 2022	November 2023
Community level stockouts study to evaluate intervention packages for addressing malaria case management commodity stockouts among CHWs in Uganda.	Scope of work completed	February 2023	June 2023

Research is an important aspect of PMI's activities as it helps us gain crucial knowledge to more effectively guide program and resource allocation decisions. Currently, PMI is supporting operational research and evaluations in Uganda investigating the impact of housing modification combined with PBO ITNs, development of case management dashboard for commodity forecasting, malaria RDT capture and reporting assessment and interventions to address community level stockouts among community health workers. The activities are planned to end in 2023.

Table 7. Non-PMI Funded Operational Research/Program Evaluation Studies Planned/Ongoing in Uganda

Source of Funding	Implementing institution	Research Question/Topic	Current status/ timeline
National Institutes of Health, Bill & Melinda Gates Foundation	Infectious Diseases Research Collaboration, University of California San Francisco, London School of Hygiene and Tropical Medicine, Liverpool School of Tropical Medicine	Impact of Pyriproxyfen LLINs (Royal Guard®) versus PBO LLINs (PermaNet 3.0®) on malaria incidence in Uganda: a cluster-randomized trial (LLINEUP2)[1]	25 month survey from April to September 2019; results published September 2022

National Institutes of Health	Infectious Diseases Research Collaboration, University of California San Francisco	Program for Resistance, Immunology, Surveillance and Modeling of Malaria in Uganda	Ongoing until 2024

[1] Maiteki-Sebuguzi, Catherine, Samuel Gonahasa, Moses R. Kamya, Agaba Katureebe, Irene Bagala, Amy Lynd, Peter Mutungi, et al. "Effect of Long-Lasting Insecticidal Nets with and without Piperonyl Butoxide on Malaria Indicators in Uganda (LLINEUP): Final Results of a Cluster-Randomised Trial Embedded in a National Distribution Campaign." *Lancet Infectious Diseases* 23, no. 2 (February 1, 2023): 247–58. https://doi.org/10.1016/s1473-3099(22)00469-8.

Other global malaria partners are also supporting key malaria operational research and program evaluations. The National Institutes of Health and Bill & Melinda Gates Foundation are supporting an impact assessment of Pyriproxyfen LLINs (Royal Guard®) versus PBO LLINs (PermaNet 3.0®) on malaria incidence in Uganda.

9.3. Plans and Justification with FY 2024 Funding

No OR/PE activities are proposed with FY 2024 funding. PMI will continue to support ongoing malaria OR studies supported by NMCD and partners.

10. Capacity Strengthening

10.1. PMI Goal and Strategic Approach

The MoH's plan for health systems strengthening, including community health systems, is articulated in national legal and policy frameworks, namely the National Development Plan III, National Health Plan III, and the MoH Strategic Plan. The strategic actions are outlined in the multisectoral Programme Implementation Action Plans.

In alignment with the UMRESP, PMI's capacity strengthening strategy supports a whole of society approach to improve health service delivery systems. A strong national malaria program requires a multi-sectoral approach with coordination and malaria service delivery strengthened at the national, regional, district, community, and household level. PMI funding will continue to support the collection, analysis, and use of epidemiological, entomological, and behavioral surveillance data. PMI will support the health workforce at all service delivery levels through technical assistance, including training, mentoring, coaching, and secondment of experts in critical technical areas, such as community malaria surveillance. PMI will strengthen the capacity of local partners to implement PMI programs through direct support and/or sub-awards. This support will focus on organizational capacity strengthening, including but not limited to governance, program management and financial management, with the goal of incrementally increasing support when justified by progress and performance. PMI will also provide small grants to community service organizations, through a grants under contract mechanism. In addition to supporting community malaria interventions, these grants will help build leadership and accountability systems, which PMI will continuously monitor.

10.2. Recent Progress (between March 2022 and March 2023)

PMI continued to support on-the-job mentorships for health workers, which helped to sustain gains in routine ITN distribution through ANC, uptake of IPTp, and prompt treatment of fever.

These mentorships continued to complement existing approaches such as formal training and continuing medical education sessions. Mentorships formed a critical part of capacity strengthening efforts. At the district level, PMI continued to support supportive supervision and mentorship in the target districts. PMI supported national-level surveillance capacity strengthening efforts, supported HMIS strengthening, and promoted HMIS data use by funding three advanced FETP fellows assigned to the monitoring and evaluation unit at the NMCD. The fellows continued supporting the NMCD during outbreak investigations, risk assessments, and program evaluations. Additionally, the FETP fellows provided needed support in the upsurge detection and response in Eastern Uganda. PMI also continued supporting net distribution through Peace Corps affiliate organizations.

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 will continue to support capacity strengthening activities as described in the Recent Progress section. PMI will promote regular coordination and engagement with implementing partners to promote cross learning and application of best practices to program implementation. PMI will contribute to the government-to-government assistance mechanism at two public regional referral hospitals to strengthen their capacity to implement malaria interventions, particularly for treatment of severe malaria. Additionally at these hospitals, PMI will provide support for two intermediate FETP residents in order to improve skills in data collection and analysis, to improve quality and use of surveillance data, and to strengthen emergency response capacity. Intermediate FETP is a supervised, on-the-job, workforce development program to improve epidemiologic capacity at the regional level to build skills in surveillance, data analysis, outbreak investigation, communication and mentorship. For Advanced FETP fellows, PMI will support mini grants for FETP trainees to serve as principal investigator on a project designed to analyze existing health surveillance data in a particular topic area and address key issues related to malaria. Further, PMI will contribute to upgrading the procurement software and seek opportunities for direct contracting with JMS in warehousing and distribution in order to promote efficiencies in the malaria commodity supply chain function and contribute to PMI's efforts to invest locally.

11. Staffing and Administration

A minimum of three health professionals oversee PMI in Uganda. 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	46,784,817	48,572,400	49,983,147
Total population at risk for malaria	46,784,817	48,572,400	49,983,147
PMI-targeted at-risk population	46,784,817	48,572,400	49,983,147
Population targeted for ITNs	46,784,817	48,572,400	49,983,147
Continuous distribution needs			
Channel 1: ANC	1,809,587	2,076,470	2,136,780
Channel 1: ANC Type of ITN	Dual AI and PBO	Dual AI and PBO	Dual AI and PBO
Channel 2: EPI	1,693,181	3,179,106	3,271,441
Channel 2: EPI Type of ITN	Dual AI and PBO	Dual AI and PBO	Dual AI and PBO
Channel 3: School	878,793	267,293	275,392
Channel 3: School Type of ITN	Dual AI and PBO	Dual AI and PBO	Dual AI and PBO
Channel 4: Community			
Channel 4: Community type of ITN			
Channel 5: Smart discharge		693,394	623,943
Channel 5: Type of ITN		Dual AI and PBO	Dual AI and PBO
Estimated Total need for continuous channels	4,381,562	6,216,263	6,307,555
Mass Campaign Distribution Needs			
Mass distribution campaigns	28,590,721	0	0
Mass distribution ITN type	Dual AI, PBO and Single Pyrethroid		
Estimated Total need for campaigns	28,590,721	0	0
Total ITN Need: Continuous and campaign	**32,972,283**	**6,216,263**	**6,307,555**
Partner contributions			
ITNs carried over from previous year	1,768,465	0	0
ITNs from Government	0	0	0
Type of ITNs from Government			
ITNs from Global Fund	17,886,761	1,484,620	1,389,345
Type of ITNs from Global Fund	Dual AI, PBO and Single Pyrethroid	Dual AI and PBO	Dual AI and PBO
ITNs from other donors	10,897,615	0	0
Type of ITNs from other donors	Dual AI and PBO		
ITNs planned with PMI funding	1,103,729	1,800,000	1,540,000
Type of ITNs with PMI funding	Dual AI	Dual AI	Dual AI
Total ITNs contribution per calendar year	**31,656,570**	**3,284,620**	**2,929,345**
Total ITN surplus (gap)	**(1,315,713)**	**(2,931,643)**	**(3,378,210)**

AI: active ingredient ; ANC: antenatal care; EPI: Expanded Program on Immunization; ITN: insecticide-treated mosquito net; PBO: piperonyl butoxide.

Table A-2. RDT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	46,784,817	48,572,400	49,983,147
Population at risk for malaria	46,784,817	48,572,400	49,983,147
PMI-targeted at-risk population	46,784,817	48,572,400	49,983,147
RDT needs			
Total # of projected suspected malaria cases	43,633,644	33,851,077	37,275,763
% of suspected malaria cases tested with an RDT	90%	89%	86%
	4,363,364	**3,385,108**	**7,455,153**
RDT needs (tests)	**43,798,447**	**33,355,401**	**39,639,205**
Needs estimated based on other			
Partner contributions (tests)			
RDTs from Government	0	0	0
RDTs from Global Fund	29,986,450	29,738,895	32,501,531
RDTs from other donors	0	0	0
RDTs planned with PMI funding	3,090,675	3,304,322	3,611,281
Total RDT contributions per calendar year	**33,077,125**	**33,043,216**	**36,112,812**
Stock balance (tests)			
Beginning balance	19,283,050	8,561,728	8,249,544
- Product need	43,798,447	33,355,401	39,639,205
+ Total contributions (received/expected)	33,077,125	33,043,216	36,112,812
Ending balance	**8,561,728**	**8,249,544**	**4,723,151**
Desired end of year stock (months of stock)	3	3	3
Desired end of year stock (quantities)	10,949,612	8,338,850	9,909,801
Total surplus (gap)	**(2,387,884)**	**(89,307)**	**(5,186,651)**

RDT: rapid diagnostic test

Table A-3. ACT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	46,784,817	48,572,400	49,983,147
Population at risk for malaria	46,784,817	48,572,400	49,983,147
PMI-targeted at-risk population	46,784,817	48,572,400	49,983,147
ACT needs			
Total projected # of malaria cases	16,077,924	14,782,058	16,781,385
Retreatment for the first treatment failure and post severe malaria discharge	964,675	1,779,360	1,604,458
Epidemic response	**1,607,792**	**1,478,206**	**3,356,277**
Total ACT needs (treatments)	**18,650,392**	**18,039,624**	**21,742,119**
Needs based on other			
Partner contributions (treatments)			
ACTs from Government	1,560,000	1,560,000	1,560,000
ACTs from Global Fund	24,415,935	14,280,188	13,381,789
ACTs from other donors	0	0	0
ACTs planned with PMI funding	2,072,380	1,206,861	0
Total ACTs contributions per calendar year	**28,048,315**	**17,047,049**	**14,941,789**
Stock balance (treatments)			
Beginning balance	5,184,360	14,582,283	13,589,708
- Product need	18,650,392	18,039,624	21,742,119
+ Total contributions (received/expected)	28,048,315	17,047,049	14,941,789
Ending balance	**14,582,283**	**13,589,708**	**6,789,377**
Desired end of year stock (months of stock)	3	3	3
Desired end of year stock (quantities)	4,662,598	4,509,906	5,435,530
Total surplus (gap)	**9,919,685**	**9,079,802**	**1,353,847**

ACT: Artemisinin-based Combination Therapy.

Table A-4. Injectable Artesunate Gap Analysis Table

Calendar Year	2023	2024	2025
Injectable artesunate needs			
Projected # of severe cases	673,426	693,394	623,943
Projected # of severe cases among children greater than or equal to 5 kilograms but less than 20 kilograms	543,921	533,380	479,956
Average # of vials required for severe cases among children	3	3	3
Projected # of severe cases among children between 20kg and <35kg	86,337	106,676	95,991
Average # of vials required for severe cases among children between 20kg and <35kg	6	6	6
Projected # of severe cases among adults	43,168	53,338	47,996
Average # of vials required for severe cases among adults	12	12	12
Epidemic response	**266,780**	**288,025**	**518,352**
Total injectable artesunate needs (vials)	**2,934,582**	**3,168,277**	**3,110,115**
Needs estimated based on other			
Partner contributions (vials)			
Injectable artesunate from Government	0	0	0
Injectable artesunate from Global Fund	2,553,221	3,385,496	3,132,643
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding	438,840	376,166	0
Total injectable artesunate contributions per calendar year	**2,992,061**	**3,761,662**	**3,132,643**
Stock balance (vials)			
Beginning balance	803,436	860,915	1,454,300
- Product need	2,934,582	3,168,277	3,110,115
+ Total contributions (received/expected)	2,992,061	3,761,662	3,132,643
Ending balance	**860,915**	**1,454,300**	**1,476,828**
Desired end of year stock (months of stock)	3	3	3
Desired end of year stock (quantities)	733,645	792,069	777,529
Total surplus (gap)	**127,270**	**662,231**	**699,300**

Table A-5. 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)	132,864	139,526	128,274
Projected # of severe cases among children less than three years of age	81,812	85,914	78,986
Average # of suppositories required for each prereferral severe cases	1	1	1
Projected # of severe cases among children 3 years to 5 years of age	51,052	53,612	49,289
Average # of suppositories required for each prereferral severe cases	2	2	2
Total artesunate suppository needs (suppositories)	**183,916**	**193,139**	**177,563**
Needs estimated based on other			
Partner contributions (suppositories)			
Artesunate suppositories from Government	0	0	0
Artesunate suppositories from Global Fund	221,668	164,036	151,350
Artesunate suppositories from other donors	0	0	0
Artesunate suppositories planned with PMI funding	0	0	0
Total artesunate suppositories available	**221,668**	**164,036**	**151,350**
Stock balance (suppositories)			
Beginning balance	44,138	81,890	52,787
- Product need	*183,916*	*193,139*	*177,563*
+ Total contributions (received/expected)	*221,668*	*164,036*	*151,350*
Ending balance	**81,890**	**52,787**	**26,573**
Desired end of year stock (months of stock)	3	3	3
Desired end of year stock (quantities)	45,979	48,285	44,391
Total surplus (gap)	**35,910**	**4,502**	**(17,818)**

RAS: Rectal artesunate

Table A-6. SP Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	46,784,817	48,572,400	49,983,147
Total population at risk for malaria	46,784,817	48,572,400	49,983,147
PMI targeted at risk population	46,784,817	48,572,400	49,983,147
SP Needs			
Total # of pregnant women	1,638,994	1,700,034	1,761,906
% of pregnant women expected to receive IPTp1	95%	99%	100%
% of pregnant women expected to receive IPTp2	92%	92%	95%
% of pregnant women expected to receive IPTp3	85%	85%	90%
% of pregnant women expected to receive IPTp4	75%	75%	80%
Total SP needs (doses)	**5,687,309**	**5,967,119**	**6,430,957**
Needs estimated based on other			
Partner contributions (doses)			
SP from Government	5,687,309	3,499,085	3,499,085
SP from Global Fund	0	0	0
SP from other donors	0	0	0
SP planned with PMI funding	0	0	0
Total SP contributions per calendar year	**5,687,309**	**3,499,085**	**3,499,085**
Stock balance (doses)			
Beginning balance	5,832,100	5,832,100	3,364,065
- Product need	5,687,309	5,967,119	6,430,957
+ Total contributions (received/expected)	5,687,309	3,499,085	3,499,085
Ending balance	**5,832,100**	**3,364,065**	**432,194**
Desired end of year stock (months of stock)	3	3	3
Desired end of year stock (quantities)	1,421,827	1,491,780	1,607,739
Total surplus (gap)	**4,410,273**	**1,872,286**	**(1,175,546)**

SP: Sulfadoxine-pyrimethamine.