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Ghana

Malaria Operational Plan FY 2024

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This Fiscal Year (FY) 2024 Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with national malaria control programs and other partners. Funding available to support outlined plans relies on the final FY 2024 appropriation from U.S. Congress. Any updates will be reflected in revised postings.

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ANC	Antenatal care
AP	Artesunate pyronaridine
ASAQ	Artesunate-amodiaquine
AS-PY	artesunate-pyronaridine
CE4HW	Community Engagement for Health and Wellbeing
CHO	Community health officer
CHPS	Community-based health planning and services
DHIMS-2	District Health Information Management Software 2
DHS	Demographic and Health Survey
EPI	Expanded Program on Immunization
FDA	Food and Drugs Authority
FELTP	Field Epidemiology and Laboratory Training Program
FY	Fiscal year
GHS	Ghana Health Service
GhiLMIS	Ghana Integrated Logistics Management Information System
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	Health management information system
HPD	Health promotion division
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ISS	Integrated supportive supervision
ITN	Insecticide-treated net
MBS	Malaria Behavior Survey
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MOP	Malaria Operational Plan
MVIP	Malaria Vaccine Implementation Programme
NIRMOP	National Insecticide Resistance Monitoring Partnership
NOP	Network of practice
NMEP	National Malaria Elimination Program
NMESP	National Malaria Elimination Strategic Plan
NMIMR	Noguchi Memorial Institute for Medical Research
NMSP	National Malaria Strategic Plan
OTSS	Outreach training and supportive supervision
OTSS+	Outreach training and improved supportive supervision
OR	Operational research
PBO	Piperonyl butoxide
PE	Program evaluation

PMI	U.S. President's Malaria Initiative
PPME	Policy, planning, monitoring, and evaluation
RAS	Rectal artesunate suppository
RDT	Rapid diagnostic test
RTS,S	RTS,S/AS01 (malaria vaccine-Mosquirix)
SBC	Social and behavior change
SCMP	Supply Chain Master Plan
SM&E	Surveillance, monitoring, and evaluation
SMC	Seasonal malaria chemoprevention
SP	Sulfadoxine-pyrimethamine
SPAQ	Sulfadoxine-pyrimethamine + amodiaquine
TES	therapeutic efficacy studies
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

To review the specific country context for Ghana, please refer to the Country Malaria Profile, which provides an overview of the country's malaria situation, key indicators, the strategic plan of the National Malaria Elimination Program (NMEP) 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 3 programs across the Greater Mekong Subregion (GMS) in Southeast Asia to control and eliminate malaria. Ghana began implementation as a PMI partner country in fiscal year (FY) 2008.

Rationale for PMI's Approach in Ghana

PMI supports the goals and objectives outlined in Ghana's National Malaria Strategic Plan (NMSP) 2021–2025, including a reduction in malaria mortality by 90 percent and malaria case incidence by 50 percent (using 2019 as the base year), and six districts with test positivity rates of <10 percent as of 2018 will be supported to achieve pre-elimination status by 2025. Surveillance will also be enhanced in these districts (National Strategic Plan) by building their capacity to undertake weekly case notification. Thresholds to identify outbreaks (starting with mortality for 2021) and peer review systems will be established with provision of adequate logistics to ensure 100 percent adherence to treatment protocols achieving malaria pre-elimination[1] in at least six[2] districts. NMEP has drafted the National Malaria Elimination Strategic Plan (NMESP) 2024–2028, aimed at reducing malaria mortality by 100 percent and case incidence by 50 percent by 2028, using 2022 as a baseline. The FY 2024 Malaria Operational Plan (MOP) is aligned with the NMSP; after the NMESP is finalized, activities will be reviewed and adjusted, as needed.

PMI provides support for vector control; case management; malaria in pregnancy (MIP); seasonal malaria chemoprevention (SMC); social and behavior change (SBC); supply chain management; and surveillance, monitoring, and evaluation (SM&E). There are no key changes to budget levels in this MOP. However, there are key changes to the strategic orientation in response to the country's decision to adopt a malaria elimination agenda. Following the national decision to change the focus from control to elimination, the National Malaria Control Program was renamed the National Malaria Elimination Program. For case management, in

[1] Areas targeted for or already at the pre-elimination stage achieve annual parasite index and slide positivity rate of <5 percent for two consecutive years.

[2] Ghana's NMSP states that at least seven districts are targeted for pre-elimination. Since the implementation of the NMSP, however, the National Malaria Control Program reduced this target to six districts to reach pre-elimination status by 2025.

addition to the procurement of injectable artesunate and prereferral rectal artesunate suppositories (RAS), PMI will support the procurement of artesunate pyronaridine (AP) for phased use in select SMC districts, along with artemether-lumefantrine (AL) in an effort to manage and delay artemisinin-based combination therapy (ACT) resistance. Other case management commodity needs are covered by the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). The Ghanaian government, which since 2019 had regularly procured commodities, defaulted on its 2022 procurement commitment, and it is unclear when government-funded procurement will resume, given the ongoing economic hardship.

Overview of Planned Interventions

The proposed FY 2024 PMI funding for Ghana is $27 million. PMI will support the following intervention areas with these funds.

1. Vector Monitoring and Control

In line with the NMSP, PMI supports entomological monitoring, procurement, and distribution of insecticide-treated nets (ITNs) through mass campaigns and school-based distribution, and implementation of indoor residual spraying (IRS) in districts with high malaria burdens. In coordination with the Global Fund, PMI will continue to support insecticide-resistance monitoring at 30 national entomological surveillance sites and will support monthly vector bionomics monitoring at six of the 20 national sites. Additionally, PMI will support insecticide-resistance monitoring, vector bionomics, and insecticide residual efficacy monitoring within 10 PMI-supported IRS districts in the North East and Northern regions. Support will also cover entomological surveillance for *An. stephensi* in response to the detection of the species in Accra. PMI will continue to support the procurement of piperonyl butoxide (PBO) synergist and dual active ingredient ITNs for school-based distribution in 2026. PMI will continue to support implementation of IRS in FY 2024 in 10 districts in the Northern and North East regions.

2. Malaria in Pregnancy

PMI/Ghana's objectives for MIP are aligned with the national guidelines, including the provision of ITNs at the first antenatal care (ANC) visit, a minimum of three doses of intermittent preventive treatment for pregnant women (IPTp) in malaria-endemic areas starting at 16 weeks gestational age, and effective case management of malaria per World Health Organization (WHO) guidelines. With FY 2024 funds, PMI plans to continue support for providers' supportive supervision and SBC activities to increase uptake of MIP interventions, including adherence to IPTp protocols for pregnant women, with an increase in the number of IPTp monthly doses, and responsiveness of health workers to women's needs. PMI will continue to support efforts to improve data capture and understanding of consumption data from the e-tracker and the Ghana Integrated Logistics Management Information System (GhiLMIS), to help align facilities to national supply chain system processes and avoid stockouts of ANC commodities.

3. Drug-Based Prevention

In accordance with WHO recommendations, Ghana's guidelines for SMC call for treating children ages 3–59 months with sulfadoxine-pyrimethamine and amodiaquine (SPAQ) in zones with highly seasonal malaria transmission. With FY 2024 funding, PMI plans to continue to support SMC, including the procurement, temporary warehousing, and distribution of SPAQ in five districts in Bono East Region, 16 in Northern Region, 7 in Savannah Region, 6 in North East Region, and 9 in Oti Region. Along with the Global Fund and the Ghanaian government, PMI will jointly support operational costs associated with the calendar year (CY) 2025 SMC campaign in all seven target regions (the five mentioned above plus Upper East and Upper West), which will be implemented by the Ghana Health Service (GHS)/NMEP. One key change with this activity is to increase the number of treatment cycles from four to five in certain SMC districts. NMEP is reviewing health facility data by district before selecting those to target for five cycles. The second change with SMC will be the reduction of the number of delivery days; SMC delivery has been done over five days with two days for "mop up" activities; however, NMEP found that after five days of delivery, coverage was so high that mop up activities were not needed. The savings from eliminating the mop-up activities will allow for additional cycles in eligible districts without increasing implementation costs.

4. Case Management

PMI/Ghana supports NMEP's objective to reduce malaria-related deaths by 100 percent, as well as reducing malaria case incidence in Ghana, especially among children under five years of age and pregnant women through the provision of prompt and accurate malaria case management at community-based health planning and service (CHPS) compounds and referrals to health facilities. With FY 2024 funding, PMI plans to continue to support NMEP, regional health directorates, and district health management teams to strengthen the test, treat, and track approach through malaria-specific laboratory and clinical outreach training and improved supportive supervision (OTSS+). This effort is aimed at improving both health facility and provider competency using a quality improvement approach. It encompasses malaria laboratory diagnosis, uncomplicated and severe malaria case management, quarterly data analysis/review, and holistic assessments to improve laboratory confirmation and adherence to testing results. This support will encourage the engagement of regional and district health management and supervision teams to conduct biannual clinical OTSS+ visits at district hospitals, health centers, and CHPS compounds. CHPS outreach activities to the community (house-to-house) will also be strengthened. PMI plans to procure injectable and rectal artesunate in support of case management for severe malaria. In addition, PMI will procure AP to support NMEP's plan to delay and manage ACT resistance.

5. Health Supply Chain and Pharmaceutical Management

PMI will continue to support NMEP's national quantification and routine supply plan reviews to inform procurement decisions. PMI will support the warehousing of commodities and downstream distribution, including continued implementation of last-mile distribution. Increased focus will be given to the implementation of the Supply Chain Master Plan (SCMP) 2021–2025, including supporting the country's warehousing strategy. PMI will support the strengthening of the GhiLMIS, the increase of data visibility down to the CHPS level, and improvement of data utilization. PMI will continue to strengthen the continuous distribution of ITNs to pregnant women in ANC clinics and to children receiving measles vaccines via the Expanded Program on Immunization (EPI) by supporting a staff member with ITN distribution experience embedded in NMEP vector control team. PMI will also support school-based distribution of ITNs procured under the 2023 MOP for CY 2025. In addition, PMI will continue to support the implementation of activities designed to achieve the stockout reduction initiative for malaria commodities at all levels of the supply chain.

6. Malaria Vaccine

Since May 2019, Ghana has piloted the RTS,S/AS01 (RTS,S) malaria vaccine in 42 districts in the regions of Upper East, Central, Volta, and Brong Ahafo.[3] An additional 51 districts served as comparators to the pilot districts in the same regions. Following the October 2021 WHO recommendation for widespread use of the RTS,S malaria vaccine among children in Sub-Saharan Africa and in other regions with moderate to high *P. falciparum* malaria transmission, Ghana expanded the vaccine to the 51 comparator districts. An application to Gavi is under review for the expansion of the vaccine beyond the 93 (42 piloted and 51 comparator districts). With the malaria elimination agenda, NMEP is prioritizing support for malaria vaccination to advance malaria elimination in Ghana. There is no investment to support the malaria vaccine included in the FY 2024 MOP.

7. Social and Behavior Change

With FY 2024 funds, PMI plans to support the GHS's health promotion division (HPD) and a Mission bilateral project to strengthen malaria SBC activities through the expansion of community engagement aimed at ensuring ownership of malaria elimination plans and activities by the population. Efforts include developing community health action plans, strengthening interpersonal communication at service delivery points, supporting CHPS nurses, health officers, and health volunteers to conduct outreach visits, enhancing community engagement, and promoting correct and consistent uptake of malaria interventions. PMI will also support the use of community scorecards intended to maintain collaboration efforts between the population and health providers, to ensure uninterrupted availability and access to malaria elimination services.

[3] Note: Later Brong Ahafo was divided into three regions: Ahafo, Bono, and Bono East; while Volta was divided into two regions: Volta and Oti.

8. Surveillance, Monitoring, and Evaluation

PMI/Ghana will support the national malaria elimination SM&E plan, which is aligned with the 2024–2028 NMESP. It aims to strengthen passive and active SM&E systems and ensure that 100 percent of all active foci of infection in areas with very low transmission be identified and eliminated through intensified surveillance, targeted vector and environmental management, and human parasite reservoir interventions. With FY 2024 funding, PMI will continue to support SM&E activities, shifting efforts to the national malaria elimination agenda. PMI will provide technical assistance to improve availability and real-time data, where possible and support the development and use of subdistrict and facility-specific dashboards. PMI will also continue to support implementation of an electronic tracker (e-tracker) through the policy, planning, monitoring, and evaluation (PPME) division to strengthen and improve routine malaria data, analysis and evidence-based decision making.

9. Operational Research and Program Evaluation

No PMI-supported operational research (OR) or program evaluation (PE) is ongoing or has been recently completed, and none is planned with FY 2024 funding. However, a core-funded OR study to determine the impact of a combination of the RTS,S/AS01 malaria vaccine and perennial chemoprevention of malaria in Ghanaian children will begin in June 2023 and continue during the implementation period of the FY 2024 MOP.

10. Capacity Strengthening

PMI/Ghana's approach to capacity strengthening is to support NMEP in efficiently planning and implementing activities defined in the NMESP 2024–2028. With FY 2024 funding, PMI will lend support for effective coordination among malaria control partners, continued improvement in the supply and distribution management of malaria commodities, timely planning and implementation of integrated supportive supervision (ISS), OTSS+ visits, and follow up on findings and response plans drawn at the conclusion of supervision visits. PMI support will continue to ensure the broad range of cross-cutting strengthening activities for health systems, where NMEP works with the appropriate GHS divisions, primarily PPME, HPD, family health division, and institutional care division, to increase capacity in of the health management information system (HMIS), reinforce use of data to inform program decisions, enhance community engagement for malaria control and elimination, smooth uptake of malaria interventions integrated with maternal and child health activities, and improve service delivery quality. PMI will continue to support the Ghana Food and Drugs Authority (FDA) to ensure availability of quality antimalarials and ITNs and coordination with supply and distribution systems. In addition, PMI will support the Frontline Field Epidemiology Training Program to train district, subdistrict, and health center health care workers in data analysis and use. PMI will continue to support Peace Corps Volunteers small community projects for malaria prevention in their host communities.

11. Staffing and Administration

With FY 2024 MOP funds, PMI/Ghana will support six staff persons, including four health professionals, one administrative support staff person, and a malaria data scientist, in a single interagency team led by the designee of the United States Agency for International Development (USAID) mission director: the health population and nutrition office director.

I. CONTEXT & STRATEGY

1. Introduction

Ghana began implementation as a PMI partner country in fiscal year (FY) 2008. This FY 2024 Malaria Operational Plan (MOP) presents a detailed implementation plan for Ghana based on the strategies of PMI and the National Malaria Elimination Program (NMEP). It was developed in consultation with NMEP 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 Ghana, describes progress to date, identifies challenges and relevant contextual factors, and provides a description of activities that are planned using FY 2024 funding. For more detailed information on the country context, refer to the country malaria profile, which provides an overview of the country's malaria situation, key indicators, NMEP's strategic plan, and the partner landscape. The FY 2024 MOP was developed after the Ghanaian national government shifted its focus from malaria control to malaria elimination. In addition, this MOP was developed after Ghana planned to expand the implementation of the malaria vaccine, following the October 2021 World Health Organization (WHO) recommendation for widespread use of the RTS,S/AS01 (RTS,S) malaria vaccine among children in Sub-Saharan Africa and other regions with moderate to high *P. falciparum* malaria transmission.

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

PMI is led by the United States Agency for International Development (USAID) and implemented with the U.S. Centers for Disease Control and Prevention. Launched in 2005, PMI supports the implementation of malaria prevention and treatment measures such as insecticide-treated nets (ITNs), indoor residual spraying (IRS), accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs), intermittent preventive treatment for pregnant women (IPTp), and drug-based prevention, as well as cross-cutting interventions such as surveillance, monitoring, and evaluation (SM&E); social and behavior change (SBC); and capacity strengthening. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria in 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 3 programs in the Greater Mekong Subregion (GMS) 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 on progress already made in PMI-supported countries, PMI will work with national malaria control programs 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 10 PMI partner countries toward national or subnational elimination and assist at least one country in the Greater Mekong Subregion to eliminate malaria.

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

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

3. Rationale for PMI's Approach in Ghana

3.1. Malaria Overview for Ghana

Malaria is a public health concern in Ghana, accounting for most outpatient department consultations. It is endemic and affects all ages, with the majority of infections observed in children under the age of five and pregnant women. Malaria transmission is perennial but has seasonal variations with peaks at the onset of the rains spanning from April to November. The southern areas experience two transmission peaks: April to June and September to November. The northern areas experience one intense transmission period between May and September. *Plasmodium falciparum* is the major parasite accounting for over 90 percent of malaria infections, and *An. gambiae* and *An. funestus* are the main vector species contributing to transmission.

Ghana has sustained its malaria prevention and control interventions for years, making steady progress according to nationwide indicators, including a decline in parasite prevalence among children 6–59 months (based on microscopy) from 28 percent in 2011 to 14 percent in 2019. Preliminary data from the 2022 Demographic Health Survey (DHS) indicate a further decline to 8.6 percent. Based on a stratification exercise conducted in 2019, NMEP deployed

interventions to specific areas in response to the shifts in malaria prevalence and the high burden of malaria cases in health facilities observed in certain areas from the health management information system (HMIS) data, and also to mitigate resistance development based on data from entomological sentinel sites. Recent implementation progress indicates that the coverage of continuous distribution of ITNs has improved at antenatal clinics (93 to 95 percent) and at child immunization clinics channels (92 to 94 percent). Similarly, testing before treating has improved from 94 percent in 2021 to 98 percent in 2022; and IPTp-3 coverage has improved from 55 to 60 percent over the same period. As a consequence of these improvements, in-patient malaria deaths have decreased from 275 in 2021 to 151 in 2022. For more detailed information on malaria indicators, refer to the country malaria profile.

The National Malaria Elimination Strategic Plan (NMESP) was designed after the 2022 decision by the Ghanaian government to shift its focus from malaria control to malaria elimination. Therefore, the 2024–2028 NMESP begins before the 2021–2025 malaria control strategic plan ends. The malaria elimination targets are expected to be achieved gradually. The initial goals of the 2024–2028 malaria elimination strategic plan are to:

- Reduce malaria mortality by 100 percent by the year 2028 (using 2022 as baseline); and
- Reduce malaria case incidence by 50 percent by 2028 (using 2022 as baseline).

The two goals are supported by the following objectives to be achieved by 2028:

- Ensure 100 percent of the population has adequate knowledge, attitudes, practices, and requisite skills for malaria elimination by 2028;
- Ensure 100 percent of the population use at least one malaria preventive measure;
- Ensure that 100 percent of malaria infections are identified by parasitological tests and treatment initiated within 24 hours by 2028;
- Ensure that 100 percent of all confirmed malaria cases are appropriately, effectively, and completely treated with parasite clearance within 72 hours by 2028;
- Strengthen passive and active surveillance and monitoring and evaluation systems by 2028;
- Ensure that 100 percent of all active foci of infection in areas with very low transmission are identified and eliminated through intensified surveillance, targeted vector and environmental management, and human parasite reservoir interventions by 2028;
- Ensure the timely and adequate supply of quality-assured malaria commodities to all service delivery points by 2028;
- Strengthen and maintain capacity for governance and program management to achieve programmatic objectives at all levels of the health care system toward malaria elimination by 2028; and
- Improve resource mobilization and efficiently use available resources toward malaria elimination.

The FY 2024 MOP is aligned with the NMSP 2021–2025. Once the NMESP is finalized, activities will be reviewed and adjusted as needed.

3.2. Key Challenges and Contextual Factors

Rates of ITN use are relatively low in Ghana compared with neighboring countries, ranging from 19 percent in the Greater Accra Region to 66 percent in Upper East Region.[4] Prescriber adherence to treatment protocols is suboptimal, and partners collaborating with NMEP engage the Health Facilities Regulatory Agency to ensure prescribers adhere to treatment protocols and maintain standards at all health facilities. Additional test, treat, and track training and refresher orientation training on revised protocols, including SBC for prescribers to change behavior, all seek to improve prescriber adherence. While IRS campaigns often achieve more than 90 percent coverage annually, issues with some eligible structures being locked and some households refusing remain challenging. Myriad reasons account for refusals, including residents being unwilling to prepare rooms.[5] Resistance to insecticides used for IRS and ITNs, coupled with growing global resistance to ACT, are additional challenges to note. More recently, the identification of *An. stephensi* in Accra could potentially lead to increased malaria cases, which may have programming and resource implications and also necessitate increased vector surveillance in support of the elimination agenda. Lastly, care seeking for children under five years of age with fever could be improved—it is currently 74 percent in urban areas and 65 percent in rural areas.

Ghana piloted RTS,S/AS01 malaria vaccine in 42 districts in seven regions. In 2023, the country received Gavi funding to begin vaccinations in the 51 districts that served as comparators during the pilot. Over 185,000 children were fully vaccinated with four doses by 2022 in the pilot districts. The Expanded Program on Immunization (EPI) is responsible for the promotion, management, and administration of the malaria vaccine. PMI/Ghana will remain informed on implementation of the malaria vaccine program, and if NMEP and stakeholders determine relevant needs are required, PMI may provide complementary support.

To improve the quality of services, the Ghana Health Service (GHS) has begun implementing a network of practice (NOP) health care service delivery model, which arranges service delivery assets into a network consisting of an anchor establishment, called a hub, which offers a full array of services, complemented by secondary establishments, called spokes, which offer more limited service arrays. Model health centers serve as hubs, acting as referral links between the district hospitals and community-based health planning and service (CHPS) zones.

Through high-level tracking and advocacy, USAID Ghana has been giving increased attention to the availability of commodities, including malaria products, to raise visibility of the issue; and is focusing on the Ghanaian government's accountability to ensure health product availability.

[4] Ghana Malaria Indicator Survey 2019.
[5] Vector Link, End of Spray Report, Ghana Spray Campaign March 2–April 12, 2022.

USAID Ghana is working closely with the National Health Insurance Authority and GHS to ensure that a reasonable portion of the revenue received by the health facilities is used to pay the Regional Medical Stores to cover the commodity needs for services offered at the health facilities. This approach is sustainable as it includes business management and automated digital tracking of the flow of funds from the National Health Insurance Authority to facilities.

3.3. PMI's Approach for Ghana

PMI support in Ghana has continued in line with the national strategy, and the planned activities reflect the priorities of the national strategy. PMI supports all core malaria vector control activities, except larval source management. PMI also supports case management, malaria in pregnancy (MIP), seasonal malaria chemoprevention (SMC), SBC, supply chain management, and SM&E. Jointly with the Global Fund, PMI also supports procurement and distribution of malaria commodities, including drugs for the treatment of severe malaria, IPTp and SMC, malaria rapid diagnostic tests (RDTs), and insecticides for IRS. PMI and the Global Fund jointly procure ITNs for mass distribution campaigns. The Global Fund generally procures ITNs for continuous distribution through antenatal care (ANC) and child welfare clinic, while PMI procures ITNs for school-based distribution. PMI has not procured ACT medicines since FY 2018; however, in 2024, PMI will procure artesunate pyronaridine (AP) in response to revised antimalarial policy and guidelines that are in line with the new elimination agenda. PMI and the Global Fund jointly support a local research partner to conduct nationwide entomological monitoring.

PMI supports nationwide malaria case management and laboratory training, malaria outreach training and supportive supervision (OTSS), and integrated supportive supervision (ISS), which is jointly supported through USAID Ghana maternal and child health and reproductive health programming at all levels of the health system. PMI supports MIP activities throughout Ghana with training for health staff and supportive supervision. PMI supports strengthening of the District Health Information Management Software (DHIMS-2) with data validation, data use with wall charts, data review meetings and implementation, and expansion of an e-tracker)—an individual-based electronic patient monitoring system used in outpatient departments and ANC services. PMI also supports periodic household surveys, including the DHS and the Malaria Indicator Survey (MIS), as well as routine SM&E activities.

Ghana is a USAID Primary Impact[6] country, and PMI support for this initiative will be primarily through the (to be awarded) bilateral Integrated Health Project and from the government-to-government funding to GHS. Supported activities include: implementation of community health officers (CHOs) at the CHPS level engaging in internships at higher-level health facilities, such as hospitals, to improve clinical skills in malaria case management; ISS efforts

[6] Ghana is one of seven USAID Global Health Bureau Primary Impact focus countries. Primary Impact is a USAID initiative to accelerate progress on primary health care (PHC), with the recognition that PHC is the foundation to improve health outcomes across the lifespan. Primary Impact aims to improve coordination and integration of PHC programming across USAID with a focus on five priority domains: effective models of PHC delivery, community engagement and partnership, subnational and facility management, system integration and interoperability, and resilient health systems and services.

to improve clinical case management, commodity management, data use, and referrals at all health facility levels; development and implementation of community health action plans by community health management committees to support community-level malaria interventions, such as SBC to promote ITN use, early treatment-seeking behaviors in mothers with children under the age of five, and IRS uptake.

3.4. Key Changes in this MOP

Changes in the FY 2024 MOP include: the increase in the number of SMC treatment cycles from four to five in certain SMC districts coupled with the reduction of delivery days from seven to five days; the support for therapeutic efficacy studies (TES), which will be the first study supported by PMI; the expansion of entomological surveillance for *An. stephensi*; and the procurement of AP in line with NMEP priorities to support the elimination strategy and the revised antimalarial medicine policy.

II. OPERATIONAL PLAN FOR FY 2024

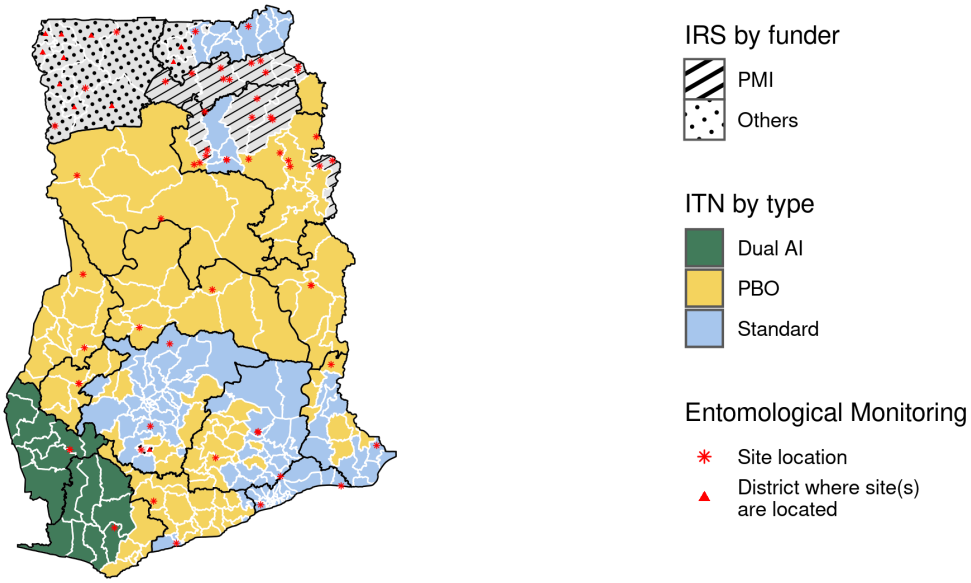
1. Vector Monitoring and Control

1.1. PMI Goal and Strategic Approach

The current National Malaria Strategic Plan (NMSP 2021–2025) aims to protect at least 80 percent of the Ghanaian population with effective malaria prevention interventions, including universal coverage of ITNs (one net for every two persons in a household) through mass campaigns every three years and continuous distribution channels; IRS targeting of areas with high malaria burdens per stratification; larval source management in targeted urban/peri-urban areas as well as in rural areas where breeding sites are few, fixed, and findable; entomological surveillance to support implementation, monitoring, and evaluation of vector control interventions; and adoption of novel vector control interventions or tools approved by WHO and the Ghana Food and Drugs Authority (FDA).

In line with the NMSP, PMI supports the procurement and distribution of ITNs through mass campaign and school-based distribution, as well as IRS implementation and monitoring in nine districts with high malaria burdens (expanding to 10 districts in CY 2024) in the North East and Northern regions. PMI does not currently support larval source management, but using FY 2021 funds, is supporting program evaluation (PE) through entomological monitoring to assess the effectiveness of the intervention for NMEP's own impact evaluation of the activity. The Global Fund also supports procurement and distribution of ITNs through mass campaigns and ANC and child welfare clinic channels nationwide, as well as implementation of IRS by AngloGold Ashanti Malaria Control Ltd. in 16 districts in Ashanti, Upper East, and Upper West regions. PMI and the Global Fund jointly support entomological monitoring activities at 30 national surveillance sites.

Figure 1. Map of Vector Control Activities in Ghana, 2022



1.2. Recent Progress (January 2022–December 2022)

- Supported insecticide resistance monitoring at 15 of the 30 National Insecticide Resistance Monitoring Partnership (NIRMOP) sentinel sites in 16 regions. This activity is jointly funded by the Global Fund, which supports monitoring at the other 15 sites in collaboration with NMEP and the Noguchi Memorial Institute for Medical Research (NMIMR).
- Provided technical assistance to Navrongo Health Research Centre to conduct longitudinal vector bionomics monitoring at six of the 20 National Entomological Surveillance Program sites. This activity is jointly funded by the Global Fund, which supports monitoring at the remaining 14 sites, in collaboration with NMEP and NMIMR.
- Supported insecticide resistance (at 13 sites), vector bionomics (at eight sites, including two National Entomological Surveillance Program Sites), and IRS insecticide residual efficacy monitoring in PMI-supported IRS and adjacent unsprayed districts (at six sites).
- Provided technical assistance for the implementation of last-mile distribution of ITNs in five regions.
- Provided technical assistance for both continuous distribution of ITNs in health facilities and planning the 2022 ITN school-based distribution, which distributed 1,442,511 piperonyl butoxide (PBO) ITNs to children in primary classes two and six nationwide. The activity was conducted in collaboration with Ghana Education Service and NMEP.
- Supported facility- and community-level SBC activities to improve demand for ITNs, increase appropriate use, promote care, and mitigate against misuse. For more information, refer to the SBC section.
- Supported the planning and implementation of the March–April 2022 IRS campaign conducted in nine districts in the Northern and North East regions, spraying 355,940 living/sleeping structures and 4,358 animal structures, protecting 961,413 people. For more information about the IRS, refer to the most recent End of Spray Report.
- Trained and engaged community-based volunteers in nine districts in Northern and North East regions supported 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 to support in Ghana with FY 2024 funding.

1.3.1. Entomological Monitoring

Jointly with the Global Fund, PMI will continue to support insecticide resistance monitoring in the 30 NIRMOP sites and vector bionomics monitoring at the 20 National Entomological Surveillance Program sites. Comprehensive entomological monitoring, including insecticide resistance, vector bionomics, and insecticide residual efficacy monitoring, will continue in PMI-supported IRS districts. Following the detection of *An. stephensi* in areas of the greater Accra region in CY 2022, PMI will initiate surveillance support CY 2023, which is expected to continue in FY 2024.

Summary of Distribution and Bionomics of Malaria Vectors in Ghana

An. gambiae is the dominant malaria vector species, co-existing with *An. coluzzi* across all sentinel sites. Other vector species include *An. nili* (mainly in coastal areas), *An. funestus s.l.* (mainly in forest areas), and *An. arabiensis* (mainly in dry arid northern areas). Only members of the *An. gambiae s.l.* and *An. funestus* species complexes are incriminated in malaria transmission in Ghana. Peak night biting times for these two main malaria vectors is between 1:00 a.m. and 2:00 a.m., and peak densities are observed between May and July and between August and October. *An. stephensi* was recently detected in two locations in Accra (Tuba in the Weija area and Dansoman in the city center of Accra). Surveillance activities will be enhanced at all sentinel sites to assess the spread of the *An. stephensi.*

Status of Insecticide Resistance in Ghana

An. gambiae s.l is resistant to pyrethroids at all 30 NIRMOP sites, with a relatively high intensity of deltamethrin and permethrin resistance at the majority of sites. Pre-exposure to PBO increases susceptibility to both deltamethrin and permethrin at most sites. Local *An. gambiae* vector populations are susceptible to organophosphate insecticides, specifically pirimiphos methyl, at all NIRMOP sites, except those in Obuasi (Ashanti Region) and Sunyani (Bono Region). Possible resistance has been reported at two sites in the PMI-supported IRS districts. Resistance to clothianidin was detected at all but two of the NIRMOP sites where it was tested, but *An. gambiae s.l.* remains susceptible in PMI-supported IRS districts. Resistance or possible resistance to chlorfenapyr has been detected at all but five of the NIRMOP sites where it was tested, but *An. gambiae s.l.* remains susceptible in PMI-supported IRS districts.

1.3.2. Insecticide-Treated Nets

PMI will support the distribution of ITNs and provide technical assistance for the CY 2024 mass campaign. PMI will also support a staff member at NMEP to provide technical assistance for ITN continuous distribution and operational planning for this activity. PMI is supporting procurement of ITNs for the CY 2024 campaign with FY 2020, FY 2021, and FY 2022 funding and with the existing commodity pipeline. PMI will also support the distribution of ITNs for the CY 2025 school-based distribution as well as the procurement of about 1.2 million ITNs for the CY 2026 school-based distribution. In line with current insecticide-resistance data, PMI will continue to procure only PBO or dual active ingredient ITNs. PMI also supports SBC to improve use and care of ITNs and to mitigate against misuse. See the SBC section for details on challenges and opportunities to improve intervention uptake and maintenance.

ITN Distribution in Ghana

In Ghana, ITNs are distributed via mass campaign every three years and through school-based distribution to students in primary grades two and six in intervening years. Continuous distribution channels include distribution to pregnant women during ANC visits and to children receiving a second dose of measles/rubella vaccination at child welfare clinic visits. IRS districts and some urban centers are excluded from mass campaigns and school-based distributions. The country has transitioned from standard to PBO and dual active ingredient nets based on insecticide-resistance data, and plans to distribute all three types of nets during the CY 2024 campaign. For the CY 2024 campaign and continuous distribution, an ITN gap of around 1.6 million is currently anticipated; this gap is expected to be filled by the Global Fund. Refer to the ITN gap analysis table in the annex for more details on planned quantities and distribution channels.

1.3.3. Indoor Residual Spraying

In CY 2025, PMI will support IRS implementation in 10 districts in the Northern and North East regions using neonicotinoid or combination insecticides based on the resistance management plan. In addition to spraying eligible living or sleeping structures, beginning in CY 2022, IRS has been expanded to include eligible animal shelters in all districts following results from the operational research (OR) on mosquito behavior (conducted 2017–2019) and pilot study (conducted 2020–2023), confirming that animal shelters are alternative resting places for mosquitoes. Support for IRS will include planning, implementation, and technical support related to the IRS program. Additional support will be provided for coordination of partners, including the GHS and NMEP for a successful IRS implementation in FY 2024.

Table 1. PMI-Supported IRS Coverage

Calendar Year	District[1]	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide
2022	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasuan	355,940	93.3	961,413	Neonicotinoid, neonicotinoid+ pyrethroid
2023[1]	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasuan	372,603	93.4	1,001,654	Neonicotinoid, neonicotinoid+ pyrethroid
2024[2]	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasua, Chereponi	390,000	90	TBD	TBD
2025[2]	Bunkpurugu-Nakpanduri, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moadori, Tatale-Sangue, West Mamprusi, Yunyoo-Nasua, Chereponi	390,000	90	TBD	TBD

[1] Preliminary results of the end of spray report are not available. [2] Planned. TBD: to be determined.

IRS Insecticide Residual Efficacy in Ghana

Monthly wall bioassays to monitor insecticide residual efficacy conducted on various sprayed surfaces (mud, cement, and wood) in PMI-funded IRS districts indicate high-quality and uniform spraying at all sites where tests were performed. The residual effect of the neonicotinoid + pyrethroid combination insecticide and neonicotinoid-only insecticide lasted at least 10 months on all types of surfaces sprayed when tests were performed on the *An. gambiae* Kisumu strain. Complete data from the most recent campaign (2022) are found here.

1.3.4 Other Vector Control

Through a private entity, the Ghanaian government commenced larviciding for malaria control in 2019. NMEP together with NMIMR, provides limited technical support and implementation guidance for such activities. In 2022, 42,395 larval sites were mapped and treated (97 percent coverage) in the 105 eligible districts receiving larviciding. PMI does not fund larviciding activities but will support an impact evaluation of the current program with FY 2021 funding (with preparations beginning in CY 2023).

2. Malaria in Pregnancy

2.1. PMI Goal and Strategic Approach

PMI supports the MIP objectives of the 2021–2025 NMSP, including:

- By 2025, to provide appropriate diagnosis of all suspected malaria cases and prompt and effective treatment for 100 percent of confirmed malaria cases, in accordance with the treatment guidelines;
- To increase coverage of all doses of IPTp;
- To increase the availability of sulfadoxine-pyrimethamine (SP) for IPTp;
- To strengthen malaria case management capacity at health training institutions (preservice); and
- To strengthen referral systems and quality management for severe malaria case management at all levels.

According to WHO guidelines as adopted by Ghana, a minimum of three doses of IPTp in malaria endemic areas are administered starting at 16 weeks gestational age until delivery for effective case management of malaria. WHO's recommendation of a minimum of eight contacts is articulated in the revised Ghana National Safe Motherhood Service Protocol (2016). However, the guidelines have been adapted to recommend one contact (booking) in the first trimester; three contacts in the second trimester (instead of the recommended two contacts, thus providing for early access to IPTp at 16 weeks); and a minimum of four contacts in the third trimester.

The objective of the MIP strategy is to support national-level coordination of oversight for the effective delivery of malaria prevention services to pregnant women by health care workers at health facilities, including CHPS compounds in all 16 regions, using supportive supervision and on-site training for IPTp at every ANC visit and ensuring the distribution of an ITN at the first ANC visit.

To reinforce country ownership and sustainability of the implemented activities and to operate in line with PMI's 2021–2025 strategy, four core principles are applied:

1. Deliver at scale;
2. Generate evidence to improve performance;
3. Build capacity for quality malaria service delivery; and
4. Reinvigorate national technical leadership.

Identified gaps

- Low usage of long-lasting ITNs, especially among children (54 percent) and pregnant women (49 percent), although the ownership rate is high at 74 percent (MIS 2019).
- Low IPTp-SP 3 uptake among pregnant women at 61 percent (MIS 2019.

- Frequent stockout of SP and other commodities for malaria interventions in some health facilities, especially at the lower levels, due to poor stock management and a delay in last mile distribution.
- Poor data management resulting from incomplete and inaccurate documentation of IPTp data in the ANC register, collation, reporting, and use of IPTp and ITN data for decision making priorities.
- Disparity between population surveys and routine reporting of IPTp coverage—the 2019 MIS found the percentage of women who received three or more doses of SP during their last pregnancy leading to the most recent live birth at 61 percent, while routine HMIS data in the district HMIS for the same period reported 48.2 percent.
- Lack of default tracing for women who register but do not show up to continue IPTp.
- Missed opportunities to administer SP to pregnant women due to limited capacity for logistics management using bin cards, leading to a stockout of SP.

2.2. Recent Progress (January 2022–December 2022)

MIP post-training coaching visits form an essential component of capacity strengthening and provide an opportunity to reinforce the knowledge and skills acquired during the training. These visits provide a platform to build mentorship relationships with midwives and the use of quality improvement tools to identify MIP service delivery challenges, identify change ideas, and prepare action plans to address those challenges.

- Conducted post-training coaching visits to targeted facilities for CHO task-shifting for improved access to MIP services at the community level in four regions (Oti, Savannah, North East, and Western North); reinforced the capacity of 320 CHOs, enrolled nurses and midwives in 16 districts for 160 CHPS zones.
- With continuous mentoring and supportive supervision, there was an increase in access to and utilization of ANC services, including uptake of IPTp and ITN at the community level to achieve the national target of over 80 percent in the 16 districts that received post-training coaching visits.
- Increased knowledge of MIP activities among service providers in the 16 districts from 72 to 91 percent between 2019 and 2022. Documentation and improvement in ANC increased from 79 to 92 percent in 2022.
- Skills in inventory management improved from 40 to 68 percent through on-site coaching of health care workers managing malaria commodities.
- PMI continued to support the MIP technical working group to sustain and improve maternal and child health coordination, review MIP implementation strategies, drive the national agenda for MIP, improve the uptake of IPTp, and enhance supportive supervision through localization and community engagement to improve IPTp and ITN use at the community level.

2.3. Plans and Justification for FY 2024 Funding

PMI will prioritize strengthening effective triage and referral systems in both private and public health care facilities as part of efforts to reduce malaria complications and mortality as we work toward malaria elimination. PMI will provide communication strategies to empower family heads, social groups, and communities to understand and own the efforts to prevent and improve MIP outcomes. PMI will prioritize case management, including MIP elimination at preservice training level, to equip future health care workers to understand and implement MIP activities. PMI will make efforts to co-design, plan, and implement innovative strategies in which local partners/stakeholders take the lead. In collaboration with NMEP/family health division, PMI will continue to conduct task-shifting training programs to increase access to quality MIP services. PMI will continue to put measures in place to increase quality data management through data coaching, reviews, ownership, and use for decision making at all levels of care.

Refer to the SP gap analysis table in the annex for more detail on planned quantities and distribution channels.

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

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

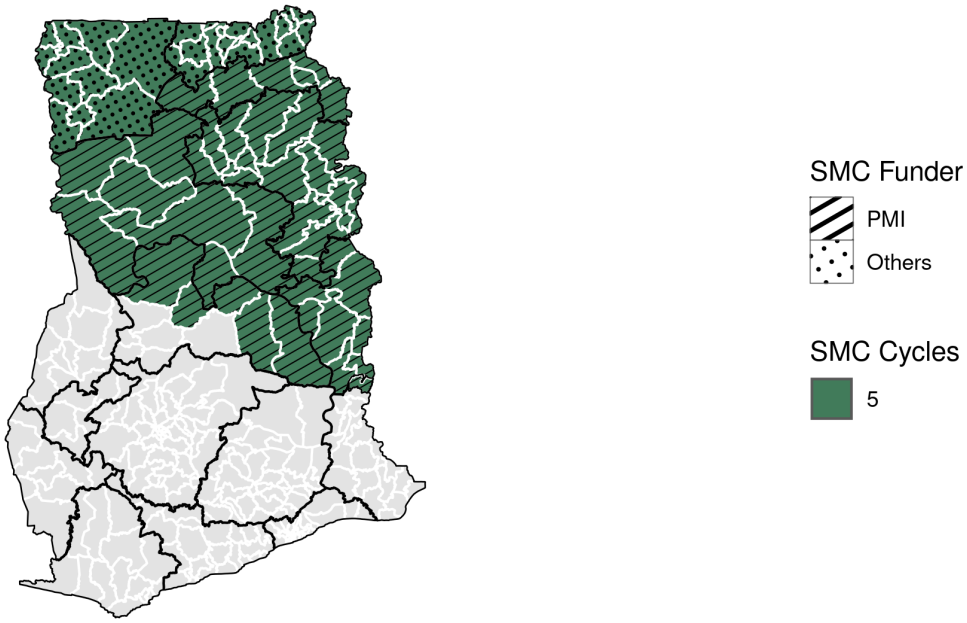
3. Drug-Based Prevention

3.1. Seasonal Malaria Chemoprevention

3.1.1. PMI Goal and Strategic Approach

Under the 2021–2025 NMSP, Ghana aims to protect at least 80 percent of children ages 3–59 months living in zones where malaria transmission is highly seasonal with sulfadoxine-pyrimethamine + amodiaquine (SPAQ) in accordance with WHO recommendations. Ghana implements SMC yearly via door-to-door campaigns for a period of four months during the peak malaria transmission season (July–October) in seven Sahel regions (select districts in Bono East, North East, Northern, Savannah, Oti, Upper East, and Upper West). SMC delivery in Ghana has consisted of five days of delivery followed by two days of “mop up” activities; however, NMEP has found that, by day five, coverage has been so high that mop-up activities have not been needed. Thus, in CY 2023, SMC delivery will be reduced from seven to five days. Savings from reduced delivery days will be used to increase the number of SMC cycles to five beginning in CY 2024 in districts where cases start to increase in June. PMI support for SMC is in line with that of the national strategy. PMI, along with the Global Fund, supports the procurement of SPAQ and operational costs for SMC implementation in select districts in collaboration with the Ghanaian government.

Figure 2. Map of SMC Implementation in Ghana, 2024



3.1.2. Recent Progress (January 2022–December 2022)

In CY 2022, PMI supported the following SMC activities:

- Procurement of 2,900,000 SPAQ blister packs to help meet the need for the SMC campaigns for CYs 2022 and 2023.
- Completion of four cycles of SMC in 72 districts within seven regions
    - The campaign was conducted from June 27 to October 9, 2022.
    - SMC treatments were given to 1,446,282 children aged 3–59 months for an estimated coverage of 90 percent of the target population.
    - SiCapp, a mobile application for data collection for SMC campaigns in Ghana, has been used since 2019; efforts to improve interoperability with DHIMS-2 and other advances are ongoing.
- Human resource training and support for planning and coordination, SBC, procurement, supply chain management, monitoring and evaluation, and information technology for national supervisors (one per district), regional supervisors (one per district), district supervisors (six per district), subdistrict supervisors (five per subdistrict), and community SMC distributors (number required is based on the population of children ages 3–59 months).
- Adverse drug reaction management training for facility health workers.

- Engagement of stakeholders at the regional and district levels (regional/district health management teams, regional/district assemblies, religious leaders, traditional leaders, and all other relevant departments and agencies) before and during SMC implementation for the purposes of community mobilization, information dissemination, logistical support, pharmacovigilance, and security.
- Implementation of SBC activities focused on demand generation at the community level through collaboration with women's groups and civil society organizations. For more information, see the SBC section.

3.1.3. Plans and Justification for FY 2024 Funding

With FY 2024 funding, PMI will continue to support SMC, including the procurement, temporary warehousing, and distribution of approximately 4 million doses of co-blistered SPAQ, combining doses needed for children ages 3–11 months and 12–59 months in Bono East, North East, Northern, Oti, and Savannah regions. A gap of approximately 3.1 million SPAQ doses is anticipated for FY 2024; efforts to close this gap by the Global Fund and the Ghanaian government will be undertaken. See the SPAQ gap analysis table in the annex for more detail on the planned quantities and distribution channels. PMI will also support operational costs associated with the CY 2024 SMC campaign in all implementing regions, which will be conducted by GHS. The total operational cost for SMC is supported by the Global Fund and PMI. In CY 2023, the PMI contribution of $755,000 represents 15.3 percent of the total operational cost of $4,931,506.80. See the SBC section for details on challenges and opportunities to improve intervention uptake and maintenance.

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

4. Case Management

4.1. PMI Goal and Strategic Approach

The NMSP 2021–2025 aims to provide appropriate diagnoses of all suspected malaria cases and prompt and effective treatment for 100 percent of confirmed cases. Ghana subscribes to the test, treat, and track approach, which seeks to test every suspected malaria case, treat positive cases with the recommended quality-assured antimalarial medicine, and track the disease through timely and accurate reporting to guide policy and operational decisions. PMI support for case management is aligned with the NMSP to improve implementation of the test, treat, and track strategy, including national-level policy and programmatic activities, commodity procurement, and improvement of facility- and community-level health worker performance. PMI has supported the procurement of RDTs and injectable and rectal artesunate in close coordination and collaboration with the Global Fund and the Ghanaian government. PMI also supports malaria-specific OTSS+, which aims to improve health facility and provider competency using a quality improvement approach. It encompasses malaria laboratory diagnosis, uncomplicated and severe malaria case management, and MIP. PMI further

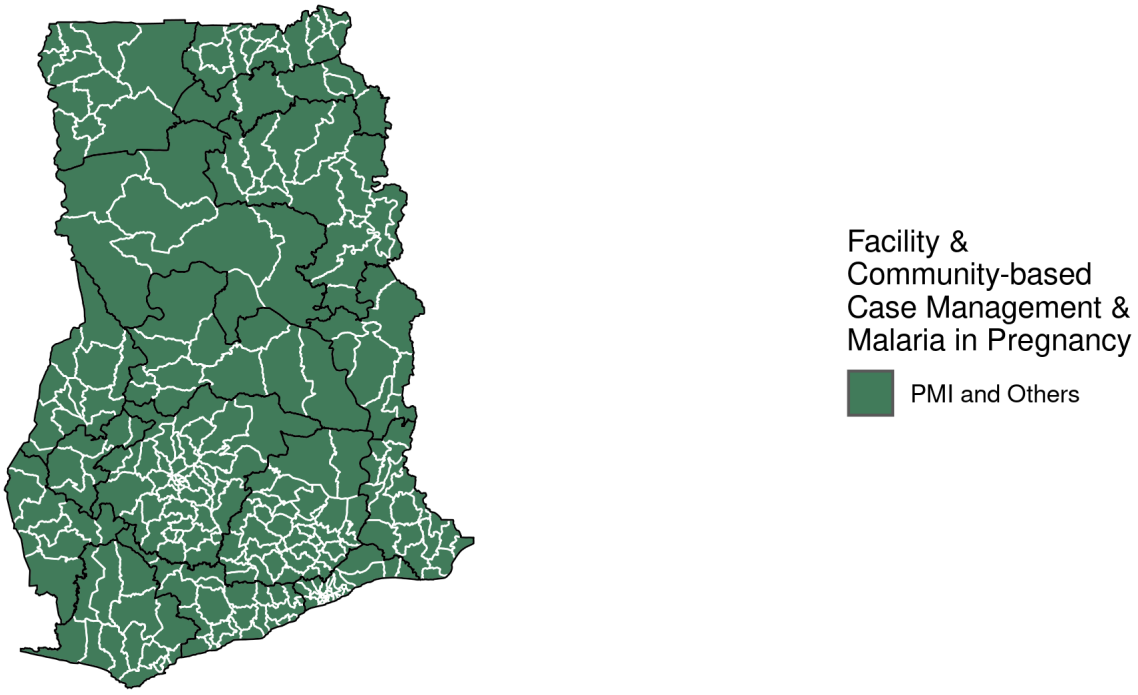
supports ISS activities nationwide through regional and district interdisciplinary teams, using a comprehensive integrated checklist that includes adherence to treatment guidelines; laboratory and supply chain management, monitoring and evaluation, maternal and child health, nutrition, and malaria.

In 1999, Ghana adopted the CHPS policy to expand health access at the community level, where a trained community health nurse and midwife provide integrated community case management and ANC services in a facility constructed by the community and coordinated through a community health committee. Each CHPS compound serves a catchment population of around 5,000 people, and community health nurses and midwives at each CHPS are supported by community health volunteers. Health care services delivered at the CHPS include ACT treatment, IPTp through ANC, ITNs through ANC and child welfare clinics, and RDTs. At CHPS, rectal artesunate suppositories (RAS) are given as prereferral treatment for children under five years of age with severe disease, and all severe malaria cases, including MIP, are referred to the next higher level as described in the case management guidelines. CHPS staff are government employees who receive salaries through GHS and are supervised and provisioned through their subdistricts and district health management team. Ghana CHPS policy continues to evolve, and many new CHPS compounds are constructed, staffed, and accredited annually, improving access. PMI supports capacity-strengthening activities at CHPS through OTSS and CHO internships through which staff from CHPS facilities are attached to a district hospital under the mentorship of a medical doctor to acquire additional knowledge and skills on how to manage febrile conditions as well as to learn prereferral precautions to be taken before patients are referred to the next higher level.

The GHS's NOP model aims to further expand the coverage of quality primary health care, including malaria diagnosis and treatment, by ensuring that community and subdistrict health services are organized within the formal district health system. PMI supports GHS by contributing to the strengthening of the NOP model. For example, PMI will work through the NOP model to support post-ISS supportive supervision follow-up visits from the district to the health center level, and from the health center to the CHPS compound level. These quarterly supervision visits will complement the twice-annual ISS visits to ensure implementation of action plans drawn during the previous ISS visit and further strengthen the quality of case management at health facilities.

In the NMESP 2024–2028, NMEP has proposed relevant case management strategies to support elimination efforts. In areas with very low malaria burdens (1–49 cases per 1,000 population with less than 1 percent parasite prevalence), low-dose primaquine will be given to patients with confirmed malaria cases for gametocyte clearance and for the clearance of *P. ovale*, in addition to first-line antimalarials. In areas with perennial malaria transmission, postdischarge treatment (malaria chemoprevention) for children with severe anemia resulting from malaria will be implemented. This intervention is currently at the planning stages; findings from the pilot implementation will be used to inform future rollout.

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



4.2. Recent Progress (January–December 2022)

PMI supported the following case management and commodity activities at the national, facility, and community level in CY 2022:

National Level

- Delivered and distributed 2,500,000 RDTs.
- Delivered and distributed 545,000 vials of injectable artesunate.
- Delivered and distributed 30,000 RAS.
- Contributed to the development of a comprehensive care checklist for ISS, including supply chain, management, and quality assurance of malaria services.
- Continued to support GHS to digitize ISS checklists.
- Provided cascade training to 40 national-level supervisors in ISS implementation, reaching 176 regional-level supervisors.
- Provided support for the organization of two case management technical working group meetings.

Facility Level

- Conducted clinical OTSS+ in 1,468 prioritized facilities in 14 regions to strengthen malaria diagnosis and treatment.
- Supported the GHS to roll out ISS implementation training to RHMTs in all 260 districts, reaching 1,702 district-level supervisors.
- Supported implementation of ISS nationwide.
- Supported GHS to strengthen the capacity of national, regional, and district supervisors to use the Health Network Quality Improvement System platform to enhance OTSS visits.
- Supported the migration of national laboratory OTSS+ and the ISS checklist from a paper-based to an electronic platform (Health Network Quality Improvement System App). The electronic checklists were used to conduct five rounds of laboratory OTSS+ and one round of ISS.
- Conducted two rounds of laboratory OTSS+ in 400 health facilities, supporting quality improvement of microscopy, RDT use, and coordination between laboratory staff and prescribers.
- Conducted data coaching visits in five regions, focusing on malaria data recording and use, reaching 1,211 health workers in 206 facilities.

Community Level

- Conducted clinical OTSS at CHPS compounds nationwide to strengthen malaria diagnosis and treatment.
- Supported post-internship coaching visits to all 520 targeted CHPS facilities to reinforce learning and goals following CHO participation in the internship program. The visits targeted 1,060 CHOs.

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

4.3. Plans and Justification for FY 2024 Funding

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

National-Level Case Management Activities

In FY 2024, PMI/Ghana will provide technical support to NMEP for the revision of national treatment guidelines and support for coordination and convenings of the case management technical working group, which meets biannually. PMI will also provide support for four National Public Health Laboratory staff to participate in WHO's External Competence Assessment for Malaria Microscopy certification.

Facility-Level Case Management Activities

PMI/Ghana will use FY 2024 funds to support refresher training in malaria case management, including diagnosis and treatment of uncomplicated malaria and referral and management of severe malaria, although the frequency of visits will vary based on performance (lower performing facilities will receive more frequent on-the-job training). Private-sector facilities are included in OTSS for quality improvement. PMI will support GHS/NMEP efforts to build the capacity of private-sector actors in malaria case management, including promoting the appropriate use of RDTs. Along with USAID Ghana, maternal and child health, family planning, and HIV activities, PMI will support GHS in implementing ISS using a comprehensive care checklist that includes supply chains, management, and quality assurance, among other factors, to improve case management throughout the Ghana health system.

Community-Level Case Management Activities

In FY 2024, PMI will support the training of CHOs/community health nurses in the management of uncomplicated malaria cases at the community level and the use of RAS as prereferral treatment for children with severe malaria through routine OTSS visits and in-service training. The Ghanaian government takes full responsibility for CHO/community health nurse salary compensation. Via OTSS and ISS, PMI will support the coaching and or mentoring of up to 10,000 health workers (approximately 30 percent of total health workers in the country) at public and private hospitals, health centers, and health posts, including 1,000 midwives and nurses (approximately 20 percent of the total number of midwives and nurses). PMI will also support two rounds of OTSS+ in all regions and will cover 60 percent of facilities. Each facility will be visited at least once per year. PMI will continue to support CHO internships to improve the clinical skills of service providers and to improve referral networks between CHPS compounds, health centers, and district and regional hospitals.

Commodities

In FY 2024, PMI/Ghana will procure injectable artesunate for the treatment of severe malaria; RAS for prereferral treatment of severe malaria, and artesunate-pyronaridine (AS-PY). All other commodities will be procured by the Global Fund and/or the Ghanaian government. While PMI/Ghana has not procured ACTs in recent years, this year's procurement of a limited quantity of AS-PY will contribute to NMEP's efforts to diversify frontline ACT treatment for malaria.

Refer to the ACT, RDT, injectable artesunate, and artesunate suppository gap tables in the annex for more details on planned quantities and distribution channels.

Monitoring Antimalarial Efficacy

PMI/Ghana will provide funding and technical assistance to the therapeutic efficacy study to be implemented in CY 2025. NMEP will seek additional funds from the Global Fund to support implementation of the TES. The TES will provide continuous data for Ghana's first-line

antimalarials for uncomplicated malaria. The TES will assess the therapeutic efficacy of ASAQ, artemether-lumefantrine (AL), and AS-PY for the treatment of uncomplicated *P. falciparum* malaria at 10 sentinel sites across Ghana: Yendi, Wa, and Navrongo in the northern belt, which is savannah; Sunyani, Bekwai, Begoro, and Hohoe in the middle belt, which is forest; Ada Foah and Cape-Coast in the southern belt, which is coastal; and Tarkwa, which is in the forest zone in the southern belt. Since AL is the most widely used ACT in Ghana, all 10 sites will generate data on AL efficacy every two years as recommended by WHO. The other first-line ACTs (ASAQ and AS-PY) will be studied at selected sites representing the three main ecological zones of Ghana: savannah, forest, and coastal. However, sites within the savannah zone will not study ASAQ because it is not recommended for areas implementing SMC with SPAQ.

Table 2. Ongoing and Planned Therapeutic Efficacy Studies

Year	Site Name	Treatment Arm(s)	Plan for Laboratory Testing of Samples
Ongoing Studies			
2023	TBD	AL, ASAQ	Noguchi Memorial Institute for Medical Research, Ghana
Planned Studies			
N/A	N/A	N/A	N/A

AL: artemether-lumefantrine; ASAQ: artesunate-amodiaquine.

See the SBC section for details on challenges and opportunities to improve intervention uptake and maintenance.

Other Planned Case Management Activities

PMI/Ghana will support GHS to conduct quarterly laboratory OTSS and annual malaria diagnostic training-of-trainers, and to support the implementation of laboratory quality management systems.

5. Health Supply Chain and Pharmaceutical Management

5.1. PMI Goal and Strategic Approach

As described in the 2021–2025 NMSP, Ghana aims to ensure timely and adequate supply of quality-assured malaria commodities to all service delivery points by 2025. The strategies to achieve this objective are:

- Advocate for accurate data-driven forecasting and supply planning of malaria commodities;
- Advocate for effective procurement and timely delivery of malaria commodities;
- Advocate for efficient warehousing and a sustainable distribution system across the supply chain;

- Strengthen quality assurance systems for malaria commodities;
- Support full implementation of Ghana Integrated Logistics Management Information System (GhiLMIS) for the provision of accurate and timely supply chain information for decision making at all levels (may not be possible at all health facilities);
- Strengthen the capacity of health care workers involved in commodity management at the subnational level; and
- Establish guidelines and policies to guide implementation for the supply of RDTs and SP to the private sector.

The Supply Chain Master Plan (SCMP) 2021–2025 builds on experience and lessons learned from the SCMP 2015–2020 and a national supply chain assessment that was conducted in 2019. The SCMP provides a broad strategic framework to guide investments and interventions that strengthen health commodity financing, governance, warehousing, and distribution, as well as logistics information management to benefit all products, including malaria commodities. The SCMP describes supply chain strengthening activities and interventions across 11 functional areas of focus.

PMI/Ghana contributes to the strategies described in the NMSP and the SCMP through the following priority areas:

- **Logistics management information systems:** Support for the utilization of GhiLMIS to ensure end-to-end commodity visibility across the supply chain;
- **Quantification:** Technical program assistance in forecasting, supply planning, and pipeline updates of health commodities;
- **Procurement:** Strengthen capacity and improve the procurement process for malaria commodities;
- **Warehousing and distribution:** Enhance storage, inventory management, transportation, and waste management;
- **Policy, legal, and regulatory environment:** Provide technical assistance to the Ministry of Health/GHS to improve commodity security; and
- **Strategy and planning:** Conduct evidence-based assessments to identify and address in-country, high-risk challenges and barriers to malaria commodity availability at service delivery points.

For more information on the country's supply chain, refer to country malaria profile.

To address stockouts of malaria commodities, PMI developed the Malaria Stockout Reduction Initiative, which outlines specific activities designed to improve product availability. In Ghana, the target is a 15 percent reduction of stockouts in year 1 (2021), and a 20 percent reduction in years 2 and 3.

5.2. Recent Progress (January 2022–December 2022)

In CY 2022, PMI's principal supply chain investments aimed at improving malaria commodity availability at service sites included:

- Rolled out the stockout reduction initiative, helping to reduce stockouts of SP and RDTs: SP stockouts were at 4 percent (target: below 25 percent) while RDT stockouts were at 8 percent (target: below 12 percent), based on end-use verification surveys).
- A malaria medicine tracer list is at the final stage of adoption into a national medicine tracer list to guide stocking at service delivery points (ACT list reduced from 8 to 4 for all age cohorts—the program intends to phase out A/L 6x1, A/L 6x3, ASAQ 100 mg/ 270 mg FDC 3 tabs and ASAQ 50 mg/135 mg FDC 3 tabs).
- Provided technical support for NMEP-led annual quantification, routine updates, and monthly supply plan reviews of malaria commodities to inform procurement decisions.
- Facilitated procurement of PMI-funded commodities (e.g., RDT, ITNs, severe malaria medicines, RAS, and SPAQ) to fill identified gaps.
- Conducted end-use-verification and targeted supportive supervision activities. (The stockout rate for artesunate injection 60 mg declined from 28 to 17 percent. The Ability of service delivery points to treat malaria cases has improved from 95 to 97 percent since the last end-use verification study.)
- Provided monthly stock status and quarterly reporting for procurement planning and for the malaria monitoring report.
- Leveraged private sector transportation capacity for last-mile distribution and to improve cost efficiency of ITN distribution through continuous distribution mechanisms.
- Supported the integration of ITNs into last-mile distribution. Installed storage containers at three Regional Medical Stores. ITNs have been integrated into last-mile distribution in five regions: Eastern, Western, Western North, Oti, and Volta achieved 97 percent availability at the service delivery point compared with 95 percent in September 2021 (September 2021 end-use verification and SS November 2022).
- Provided technical support for logistics training and distribution monitoring of SMC commodities; about 2.7 million doses distributed in CY 2022.
- Provided support for the GhiLMIS rollout in health facilities and integration of GhiLMIS into Ghana's supply chain to provide end-to-end visibility and real-time data for decision making. Onboarded over 3,800 sites, including all hospitals and health centers, as well as 1,208 CHPS, as of December 2022.
- Focused on improving GhiLMIS utilization in targeted regions.
- Secured appropriate warehousing for PMI procured commodities.
- Distributed ITNs to 129 out of a total of 139 orphanages across 13 regions in Ghana as distinct distribution channels to complement other channels of distribution.
- Strengthened coordination mechanisms between the government and key stakeholders at various levels of the supply chain to further improve supply chain performance.

- Provided technical assistance to the Ministry of Health and GHS to continue implementation progress on the Global Standards 1 among local manufacturers and importers of malaria and other health program commodities; a national traceability strategy for implementation was developed and disseminated.
- Provided technical assistance to the Ghana FDA to:
    - Improve country and regional regulatory systems to assure the quality of medical products in the public and private sectors through the creation and facilitation of a national post-market surveillance technical working group, and the implementation of risk-based post-market surveillance of antimalarial drugs; and
    - Increase the supply of quality-assured essential medical products of public health importance by providing technical assistance to two local manufacturers toward WHO prequalification of AL tablets.
- Facilitated the process for local manufacturers and FDA to adopt the Global Standards 1.

5.3. Plans and Justification with FY 2024 Funding

Ghana will continue to support the activities as described in the recent progress section across the broad categories of activities (logistics management information system; quantification; procurement; policy, legal, and regulatory environment; strategy; and planning). In addition, increased focus will be given to technical assistance for SCMP implementation, including supporting implementation of the country's warehousing strategy and supporting last-mile distribution, while providing technical assistance for the implementation of plans for a full transition. As GhiLMIS rollout continues down to the CHPS level, efforts will seek to increase GhiLMIS use and cultivate a culture of data use. Activities will be implemented to achieve the targets described in the stockout reduction initiative.

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

6. Malaria Vaccine

Ghana is one of the three countries that participated in the Malaria Vaccine Implementation Programme (MVIP) with the RTS,S/AS01 (RTS,S) malaria vaccine. The MVIP was piloted in 42 districts in seven regions and, as of December 2022, 1.4 million doses of vaccine had been administered to eligible children, with 459,446 receiving at least one dose and 184,418 completing all four doses. In January 2022, Ghana received funding to support the deployment of the vaccine to 51 additional districts across seven regions (Ahafo, Bono, Bono East, Central, Oti, Upper East, and Volta). These 51 districts were the comparator districts for the MVIP. Implementation began in March 2023. In September 2022, Ghana successfully applied to Gavi to support the continued deployment of the malaria vaccine in the pilot and comparator districts to ensure uninterrupted access to malaria vaccine when the MVIP ends. Ghana has applied to

Gavi to support the procurement and deployment of the RTS,S malaria vaccine to areas with high malaria burdens beyond the 93 districts (42 MVIP districts and 51 comparator districts). The malaria vaccine in Ghana will be deployed in health facilities to infants at the ages of 6, 7, 9, and 18 months as a part of routine EPI service delivery.

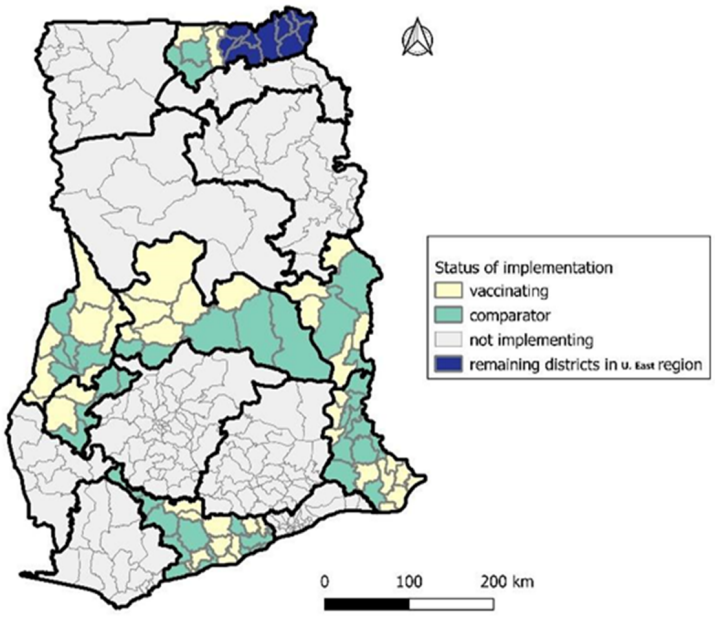
6.1. PMI Goal and Strategic Approach

PMI/Ghana's goal for the malaria vaccine is to support the GHS to strategically deploy this intervention as a complementary tool for the existing core interventions, including technical assistance to NMEP as it engages with the national EPI to strategically use data to decide on where to introduce the malaria vaccine. Vaccine introduction will be led by the national EPI, thus PMI/Ghana will work with NMEP to provide complementary support in the planning, delivery, and monitoring of vaccine deployment, including support to maximize uptake of the vaccine without adversely affecting coverage of other malaria interventions. NMEP is changing their strategy from control to elimination and is prioritizing support for malaria vaccine as one of the tools that will lead to malaria elimination in Ghana. Currently, there is no specific planned investment to support the malaria vaccine included in this FY 2024 MOP. However, PMI/Ghana will keep track of the malaria vaccine program, and if NMEP and stakeholders determine relevant needs or support are required, PMI will revisit the planned investment to provide the needed support.

6.2. Recent Progress (January 2022–December 2022)

In CY 2022, 1.4 million doses of the RTS,S malaria vaccine were administered to eligible children in 42 districts: 459,446 doses of RTS,S1; 428,143 doses of RTS,S2; 412,790 doses of RTS,S3; and 184,418 doses of RTS,S4 doses.

Figure 4. Map of Malaria Vaccine Implementation in Ghana



6.3 Plans and Justification for FY 2024 Funding

There are no specific planned investments to support the malaria vaccine in this FY 2024 MOP. However, PMI/Ghana will keep track of the malaria vaccine program, and if NMEP and stakeholders determine relevant needs or support are required, PMI may provide complementary support.

The FY 2024 funding tables contain a full list of activities related to other drug-based prevention that PMI proposes to support in Ghana with FY 2024 funding.

7. Social and Behavior Change

7.1. PMI Goal and Strategic Approach

Per the NMSP 2021–2025, Ghana's objective is to ensure at least 95 percent of the population will use at least one malaria preventive measure, and 95 percent of those with fever will seek care within 24 hours of onset of symptoms by 2025.

PMI's approach is focused on understanding and addressing the barriers to behavior change in Ghana's efforts to increase the uptake of diagnostic, treatment, and prevention services. PMI's approach for behavior change is fully aligned with the 2020–2025 USAID Ghana behavior-led Country Development Cooperation Strategy. Key behavioral risk factors that threaten the effort to interrupt onward transmission of malaria exist, including delays in care seeking due to long distances to access health care, low use of ITNs, limited uptake of RDTs, low uptake of IPTp, and poor adherence to guidelines by health care personnel. Ghana will use multipronged strategies to encourage the adoption of desired malaria prevention and treatment behaviors at various levels.

7.2. Recent Progress (January 2022–December 2022)

PMI/Ghana supports the GHS in implementing the Community Engagement for Health and Wellbeing (CE4HW) program across Ghana. This program seeks to strengthen community action to promote healthy behavior change, to encourage community participation in the planning of health services and interventions, and to improve health seeking and home-based prevention measures across various health areas, including malaria. Over the course of 2022, illustrative achievements of the program with support from PMI/Ghana include:

- Trained of 1,672 CHO/community health nurses and 115 field officers trained in 570 CHPS zones across 17 USAID Zone of Influence (ZOI) districts on using CE4HW behavior change methods to drive demand for effective ITN use, IPTp uptake, and acceptance of IRS. Also trained 47 regional officers and 250 district and subdistrict officials on CE4HW.

- Developed and validated 511 community health action plans in targeted USAID Zone of Influence districts for MNCH and malaria. Implementation is ongoing.
- Primary data from health facilities demonstrates evidence of positive shifts in malaria behaviors and associated factors across Ghana, such as shifting community norms around ANC attendance and IPTp uptake for pregnant women, and increased exposure to SBC activities targeting ITN use.

Additionally, in 2022, PMI/Ghana supported the implementation of the Malaria Behavior Survey (MBS), a standardized and validated tool to assess malaria-related behaviors and a range of factors that influence those behaviors. Malaria behaviors covered by the MBS include net use, net care, prompt and appropriate care seeking, ANC, receipt of IPTp, administration and adherence to SMC doses, and acceptance of IRS. Data on respondents' media habits were also collected.

SMC: The 2022 MBS provided useful data on behavioral determinants of SMC uptake and adherence in Ghana. Overall, respondents demonstrated a high level of perceived efficacy (88.9 percent), and nearly 90 percent of respondents expressed favorable attitudes toward SMC, with consistently high ratings across age and education groups, wealth quintiles, and urban and rural residents. However, several gaps remain. Less than 50 percent of women reported being involved in decision making regarding SMC for their children. Further, only 63 percent of women between the ages of 15 and 24 knew how many days SMC should be given each month, and only 70 percent of respondents believe most children in the community take SMC. These gaps demonstrate opportunities to address knowledge and perceptions of community norms to improve SMC uptake and correct usage. PMI supports NMEP's work with CHOs and community health volunteers to identify challenges with SMC uptake, including community-based SBC to promote SMC adherence.

ITNs: According to the 2019 Malaria Indicator Survey (MIS), the population in Ghana generally has a moderate to high level of access to an ITN, but use levels remain moderate to low. The ITN use-to-access ratio is 0.4–0.6 in most of the country, with lower values in urban/peri-urban areas. The use-to-access ratio is 0.47 in urban areas and 0.77 in rural areas. Regions with low ITN use-to-access ratios include Ashanti (0.60), Central (0.65), Eastern (0.52), Greater Accra (0.37), and Western (0.65). Given that Ashanti and Greater Accra regions are predominantly urban, with improved housing, investment in SBC should be channeled to regions such Central, Eastern, and Western.

MIP: Challenges related to early and repeat ANC visits and IPTp uptake include late visits to health facilities, limited or poor patient education regarding the IPTp schedule, and unsupportive attitudes of providers toward pregnant women, which makes them feel unwelcome. The same attitude of providers toward teenagers (pregnancy), makes the teenagers feel shy and reluctant to visit health facilities for ANC. All of these factors contribute to gaps in ANC and IPTp outcomes.

Case management: The 2019 MIS showed that, among children with recent fever, 34 percent received advice or treatment from the public health sector, 35 percent sought treatment in the private sector, and 31 percent did not seek advice or treatment. Although care seeking is improving in Ghana, progress in this area is impacted by negative experiences with health care workers, local beliefs, and costs associated with testing and treatment, compounded by lack of knowledge, attitudes surrounding fevers, and social norms. For instance, the 2022 MBS reports that only 35.1 percent of respondents perceived positive efficacy for malaria testing, and only 75.9 percent perceived positive efficacy for malaria treatment. However, the MBS also demonstrated that the belief that care seeking for fever is the norm in a community results in a twofold increase in likelihood for seeking care, demonstrating the importance of SBC interventions that target perceptions of community norms.

Service delivery: Provider adherence to the test, treat, and track strategy remains suboptimal in Ghana.[7,8] While adherence to case management guidelines is often affected by supply chain and human resource constraints, several behavioral challenges remain, such as mistrust of RDT and microscopy results. To improve adherence to treatment guidelines for malaria, existing knowledge-sharing and supervision interventions must incorporate SBC components to address persistent behavioral barriers.

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 in Ghana with FY 2024 funding.

In FY 2024, PMI will continue to support GHS's health promotion division (HPD) to strengthen malaria SBC activities through the expansion of malaria community engagement at the national level, including national-level support for CE4HW. PMI will also provide support to strengthen interpersonal communications at service delivery points for malaria quality services by supporting CHPS nurses, health officers, and health volunteers to engage with communities and promote correct and consistent uptake of malaria interventions. The current Ghana Country Development Cooperation Strategy has a geographic focus in 17 districts in Zone of Influence regions in the northern part of the country (Northern, Upper West, Upper East, and North East). PMI investments in FY 2024 will align with this strategy to achieve its goal.

[7] Agbemafle, E. E., et al. 2023. "Adherence to the Test, Treat and Track Strategy for Malaria Control among Prescribers, Mfantseman Municipality, Central Region, Ghana." *PLoS ONE* 18 (2): e0279712.
[8] Kolekang, A. S., et al. 2022. "Challenges with Adherence to the 'Test, Treat, and Track' Malaria Case Management Guideline among Prescribers in Ghana." *Malaria Journal*, *21* (1): 1–12.

PMI will continue to support the following strategies and activities in coordination and collaboration with partners:

- Advocacy with stakeholders to ensure malaria interventions are prioritized and supported. The advocacy focuses on increasing the commitment of policy makers at all levels (national, district, and community) to allocate resources for the prevention and treatment of malaria, and mobilizing the support of traditional, religious, and opinion leaders, including queen mothers, chiefs, and policy makers (e.g., regional house of chief), district assembly members, and the private sector.
- Use of mass media to engage individuals and communities in target regions and to support individuals and communities to overcome identified barriers to appropriate care seeking for fever, ITN use, IRS acceptance, larviciding acceptance, and malaria vaccine acceptance (if appropriate). Both electronic media, such as television, radio, and videos, as well as outdoor media, such as billboards, may be employed. Mobile vans and community information centers will broadcast prerecorded malaria-related messages to the general public.
- Strengthening development and implementation of community health action plans through CHPS to increase ownership, acceptance, and sustainability of community health services, including malaria intervention and treatment interventions. Through this approach, local leaders, citizens, nongovernmental organizations, faith-based organizations, and community-based organizations are mobilized to increase awareness, influence social norms, and correct misinformation and misconceptions about malaria. Illustrative activities of the community health action plans include door-to-door education visits by CHOs and volunteers to motivate people to use key malaria prevention and treatment interventions; the facilitation of night or evening video shows on cinema vans to educate communities on appropriate use of ITNs and other malaria prevention interventions; educational sessions at mosques and churches on malaria prevention; and development of SBC materials to facilitate and complement communications with general and specific audiences of the population, including posters, counseling cards, leaflets, and television spots.
- Strengthening of the capacity of health workers and stakeholders in both private and public institutions to effectively engage communities at all levels. Health workers are an instant source of information for the general public. The interpersonal communication capacity of health workers in the public and private sectors as well as of sellers of over-the-counter medicine will be improved to effectively engage communities at all levels.

Priorities

PMI/Ghana supports SBC activities that promote the uptake and maintenance of all key malaria interventions, with a particular emphasis on IPTp use, ITN use, and provider adherence to MIP guidelines for IPTp administration. These will be prioritized with FY 2024 funding (Table 3).

Table 3. Priority Behaviors to Address

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Pregnant women take IPTp during ANC visits	Newly pregnant women, husbands/spouses, family members of pregnant women, community members/leaders	17 USAID Zones of Influence; selected regions and districts nationwide	● Community- and household-level infection prevention and control ● Engagement of opinion leaders, religious leaders, and community leaders to address cultural barriers to ANC ● Community radio and television programming ● Community theater/drama/film ● Using community health workers/community-level influencers to advocate for early ANC visits ● Expansion of outreach services by community health volunteers, championing mothers and other local safe pregnancy community mobilizers. ● Expansion of the use of nonmonetary incentives to attend ANC with family members
ITN use	General population	Nationwide	● Community durbar sessions and dialogues on ITN use ● Engagement of mother-to-mother support groups, village savings and loans associations, groups on ITNs, other community level groups ● Expansion of health fairs across many communities in the country. ● To drive positive health seeking behaviors, use a customized, deep-learning architecture (YOLO-mp) based on design criteria to optimize accuracy and speed of detection with minimal resources.
Adherence to MIP guidelines for the administration of IPTp	Health care providers	Nationwide	● Expansion of malaria community engagement through HPD ● Engagement of community health volunteers to mobilize community implementation of iCAPs ● Strengthening of interpersonal communication skills of health actors at points of service

ANC: antenatal care; HPD: health promotion division; IPTp: intermittent preventive treatment for pregnant women; ITN: insecticide-treated net; MIP: malaria in pregnancy.

Additional Support Activities

To bolster the national government's capacity for the planning, design, implementation, and evaluation of SBC activities, PMI will continue to support development activities directed toward GHS's HPD and related government bodies. USAID Ghana, including PMI, will support HPD to design and roll out integrated, evidence-based SBC programming on malaria; family planning; reproductive, maternal, newborn, and child health; nutrition; and emerging infectious diseases at the national and regional levels, focusing on the community level in 17 USAID Zone of Influence districts and beyond. PMI will provide support to synthesize and utilize insights from the 2022 MBS. Additionally, PMI will support routine monitoring activities of SBC output and outcome indicators by implementing partners, as well as the monitoring of routine data captured via the DHIMS-2.

8. Surveillance, Monitoring, and Evaluation

8.1. PMI Goal and Strategic Approach

The National Malaria Control Monitoring and Evaluation Plan 2021–2025 aims to strengthen malaria surveillance systems to ensure the timely availability of high-quality, consistent, and relevant malaria data at all levels to track the progress of malaria control and prevention interventions toward 2025 malaria control targets. One key goal for PMI/Ghana is to strengthen NMEP's capacity to conduct surveillance as a core malaria intervention using high-quality data from both surveys and routine health information systems. Currently, PMI is supporting surveillance activities in districts with low-quality malaria data with the goal of improving routine malaria data quality by strengthening the capacity of the district staff, improving their knowledge, skills, and competencies for data verification and validation as well as addressing issues in malaria data management. In addition to these districts, PMI is supporting surveillance activities in pre-elimination districts where NMEP has prioritized interventions. In light of the elimination strategy, NMEP is planning to enhance epidemiologic surveillance and react to case detection. PMI contributes to Ghana's SM&E strategy for malaria by prioritizing DHIMS-2 data validation, analysis, and use at all levels of the health system through quarterly data review meetings at the district level and capacity strengthening of health information officers at the district, subdistrict, health center, and CHPS compound level. PMI support for SM&E is nationwide, in line with the national SM&E plan. The support includes:

- Improving supportive supervision and training at all health levels to ensure proper data collection, reporting, and interpretation;
- Continuing to support regional malaria data review workshops to discuss DHIMS-2 data use and programmatic implications to improve the malaria quality assurance system at all levels;
- Working with NMEP on the integration of DHIMS-2 data with ISS and other health facility data from GhiLMIS to strengthen the logistics structure for surveillance at all levels;

- Supporting the deployment of the e-tracker, a transactional electronic register for tracking patient service delivery and streamlining data collection at health facilities through the policy, planning, monitoring, and evaluation (PPME) division. This will strengthen and improve maternal and child health, including malaria routine data, analysis, and evidence-based decision making;
- Providing support to implement household surveys, including MIS, as needed, to inform program direction; and
- Working with NMEP to establish a surveillance system for reporting malaria data from pharmacies, over-the-counter medicine sellers, and alternative health care providers.

8.2. Recent Progress (January 2022–December 2022)

In CY 2022, PMI supported the following SM&E activities:

- Trained 251 staff (HIO, Malaria focal person and DDHS) from 78 districts in 6 regions on data quality improvement;
- Supported data validation and verification meetings of the district health management team in six regions;
- Conducted post-training follow-up supportive supervision in eight districts in four regions;
- Trained staff from six districts (pre-elimination) on data analysis, interpretation, and use;
- Supported post-training follow-up SS by CHIM and NMEP to three pre-elimination districts; and
- Prioritized 211 health facilities for data coaching visits in nine regions, coaching and mentoring 844 on malaria standard registers, monthly reporting forms, GHS SOP HMIS, and visualization of data on facility-based wallcharts.

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 in Ghana with FY 2024 funding.

In FY 2024, PMI will maintain support for routine SM&E activities, including support for integrated data coaching visits to health facility data management staff to validate and audit data collection, analysis, and reporting to improve data quality as well as quarterly data review meetings at the subdistrict levels where service providers must analyze, present, and make programmatic improvements based on their data. PMI will also support NMEP review meetings on improved analysis and data use and the PPME Center for Health Information Management bootcamp meetings to routinely assess and discuss malaria data. PMI will support surveillance system enhancement in line with elimination, as well as data quality audits. PMI will also provide logistical support for data validation and verification meetings at the subnational level. PMI will continue to support malaria surveillance data quality in pre-elimination districts, continue to support the integration of supportive supervision and malaria OTSS data into

DHIMS, and expand support for the e-tracker to additional regions. Finally, PMI will support implementation of the 2025 MIS in calendar year 2024.

Table 4. Available Malaria Surveillance Sources

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Household survey	Demographic Health Survey (DHS)			X			
Household survey	Malaria Indicator Survey (MIS)						P
Household survey	Multiple Indicator Cluster Survey (MICS)						
Household survey	EPI survey						
Health facility survey	Service Provision Assessment (SPA)						
Health facility survey	Service Availability Readiness Assessment (SARA) survey						
Health facility survey	Other Health Facility Survey						
Malaria surveillance and routine system support	Therapeutic efficacy studies (TES)		X		P	P	P
Malaria surveillance and routine system support	Support to Parallel Malaria Surveillance System						
Malaria surveillance and routine system support	Support to Health Management Information Sysem	X	X	X	P	P	P
Malaria surveillance and routine system support	Support to Integrated Disease Surveillance and Response (IDSR)				P[1]	P[1]	P[1]
Malaria surveillance and routine system support	Electronic Logistics Management Information System (eLMIS)	X	X	X	P	P	P
Malaria surveillance and routine system support	Malaria Rapid Reporting System						
Other	End-use verification	X	X	X	P	P	P
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey						
Other	Malaria Impact Evaluation						
Other	Entomologic Monitoring Surveys	X	X	X	P	P	P

[1] Non-PMI funded activities, X = completed activities; P = planned activities.

9. Operational Research and Program Evaluation

9.1. PMI Goal and Strategic Approach

PMI objectives for OR are in sync with NMEP objectives. PMI will support OR to assess the effectiveness of interventions and the feasibility of delivery of interventions, including cost efficiency assessments; and to evaluate programs. A new elimination strategy is under development, and specific elimination considerations have not yet been specified. PMI will support relevant considerations as funding will allow, following OR guidelines set by PMI headquarters. Currently, no PMI-supported OR is ongoing or has been recently completed, and none is planned with FY 2024 funding. However, a core-funded OR study is planned to begin in June 2023 and continue during the implementation period of the FY 2024 MOP. The OR will assess the impact of a combination of the RTS,S/AS01 malaria vaccine and perennial malaria chemoprevention in Ghanaian children. The objective is to determine whether the combination of the vaccine with perennial malaria chemoprevention-SP is more effective at reducing the incidence of clinical malaria in children up to 18 months of age than the vaccine alone—the new standard of care in Atebubu District, Bono East Region.

9.2. Recent Progress (January 2022–December 2022)

At the time of this writing, no PMI-supported OR/PE was ongoing or had been recently completed; and no OR/PE was being supported by other donors.

9.3. Plans and Justification with FY 2024 Funding

No OR/PE activities are proposed with FY 2024 funding.

10. Capacity Strengthening

10.1. PMI Goal and Strategic Approach

PMI/Ghana's objective for capacity strengthening supports NMEP's objective to strengthen and maintain capacity for governance and program management to achieve programmatic objectives at all levels of the health care system as defined in the 2024–2028 NMESP.

PMI support seeks to improve coordination among malaria control partners; management of malaria commodity supplies and distribution; timely planning and conducting of ISS and OTSS activities; strengthening of case management and referral of severe malaria cases; and continuous management, analysis, and use of data to inform program decisions.

Specific efforts will be invested in supporting the efficient implementation of the new Networks of Practices (NOP) initiative, a design model that arranges service delivery assets into a network consisting of an anchor establishment, called the hub, which offers a full array of services, complemented by secondary establishments, called spokes, which offer more limited service arrays. Through the implementation of NOP, GHS aims to improve the quality of services offered at the lowest level of the health pyramid: the CHPS compound. PMI funding

will support the goal of the NOP aim to provide an increased range of service delivery activities at appropriate levels, and stronger referral and feedback systems. Attention will be focused on strengthening the capacity of health centers to be effective hubs in the network, including strengthening staff capacity.

PMI support also targets NMEP with several capacity strengthening activities, including facilitating linkages between NMEP and the PPME, HPD, family health division, and institutional care division divisions to improve HMIS, community engagement, consistent and sustained uptake of IPTp, and other malaria interventions integrated with maternal and child health activities, as well as quality service delivery.

While the 2021–2025 NMSP did not include specific HSS objectives, the 2024–2028 NMESP clearly spells out the objective to "strengthen and maintain capacity for Governance and Program Management to achieve programmatic objectives at all levels of the health care system toward malaria elimination by 2028." This objective is aligned with Ghana's Universal Health Coverage Roadmap to achieve the 2030 objectives of the Ministry of Health:

- To contribute to socioeconomic development and wealth creation by promoting health and vitality; ensuring access to quality health, population, and nutrition services for all people living in Ghana; and promoting the development of a local health industry.
- Health Sector goal: To foster a healthy and productive population that reproduces itself safely by ensuring increased life expectancy, and people who live healthy and productive lives and reproduce without an increased risk of injury or death; reducing the excessive risk and burden of morbidity, mortality, and disability—especially among poor and marginalized groups; and reducing inequalities in access to health.

Once the NMESP (2024–2028) is finalized, PMI will coordinate with NMEP and the Global Fund to determine where PMI support may be needed.

10.2. Recent Progress (January–December 2022)

In CY 2022, PMI supported the following capacity-strengthening activities:

- Continued support of a malaria data specialist seconded to NMEP, with the objective of strengthening skills and establishing a culture of regularly interrogating data to inform malaria control programming.
- Continued technical assistance to ensure the development and use of subdistrict and facility-specific dashboards.
- Supported the Frontline Field Epidemiology Training Program to train district, subdistrict, and health center health care workers in data analysis and use.
- Continued work with GHS to coordinate ISS implementation by strengthening regional and district supervision health teams. PMI, along with other USAID Ghana technical teams, supports integrated planning and management of supervision aimed at building strong regional and district teams to run independent and efficient systems for

on-the-job training, cutting down the high costs of traditional classroom training and, more importantly, ensuring the continued improvement of quality health services.
- Supported the continued strengthening of the capacity of FDA to effectively monitor the quality of available antimalarial drugs in the country and to monitor and regulate locally procured antimalarial drugs not prequalified by WHO, such as through batch testing of Ghana-manufactured ACTs, SP, and severe malaria drugs and increasing the regulation and removal of drugs that fail quality testing.
- Supported four local manufacturers to work toward meeting Good Manufacturing Practice and WHO prequalification standards for AL production; two of the manufacturers are projected to submit their dossiers to WHO by the end of 2023.
- The coronavirus pandemic and the evacuation of Peace Corps volunteers continued to disrupt the involvement of the Peace Corps in community activities, however, a new class of Peace Corps volunteers arrived in CY 2022, and support will resume in 2023.
- Supported the Field Epidemiology and Laboratory Training Program (FELTP) by identifying malaria-specific projects for two FELTP fellows.

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 in Ghana with FY 2024 funding.

In FY 2024, PMI/Ghana will continue to support capacity-strengthening activities using the content described in the recent progress section as a solid foundation. PMI support will be refocused to support the Ghanaian government's shift from malaria control to malaria elimination. PMI will support the GHS new NOP approach to improving the quality of malaria service delivery at the lowest level of the health pyramid. Planned investments for FY 2024 include:

- Support for approximately 15 frontline FELTP fellows to strengthen capacity for data analysis and use at the district and subdistrict level;
- Support for the malaria data scientist embedded in NMEP to consolidate achievements in data management, reporting, and skills training at the national, regional, and district level;
- Continued strengthening of the institutional capacity of the Ghanaian government to promote and oversee the delivery of quality of health services in the public and private sectors; improve coordination at the central level between GHS, the National Health Insurance Authority, and the Health Facilities Regulatory Agency—the national bodies jointly responsible for service delivery; and strengthen NOPs;
- Resuming support for the Peace Corps through small grants to engage volunteers in malaria control and prevention activities, such as community mobilization for SBC and ITN distribution and the promotion of desired malaria prevention behaviors in host communities;

- Continued strengthening of the Ghana FDA capacity to effectively monitor the quality of antimalarial drugs available in the country, as well as the capacity to monitor and regulate locally procured non-WHO prequalified antimalarial drugs, including batch testing of Ghana-manufactured ACTs, SP, and severe malaria drugs; and
- Support for local manufacturers to work toward meeting Good Manufacturing Practice and/or maintain the WHO prequalification standards.

11. Staffing and Administration

The PMI/Ghana team is composed of six health professionals. The single interagency team is led by the USAID mission director's designee: the USAID health office director. The team also consists of two resident advisors, representing USAID and the Centers for Disease Control and Prevention, and two Ghanaian public health experts. In addition, the team is supported by an administrative assistant shared with the President's Emergency Plan for AIDS Relief team, and a PMI-supported malaria data specialist seconded to NMEP. 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. Technical expertise from PMI headquarters complements the PMI/Ghana programmatic efforts.

ANNEX: GAP ANALYSIS TABLES

Table A-1. ITN Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	32,140,561	32,815,512	33,504,638
Total population at risk for malaria	32,140,561	32,815,512	33,504,638
PMI-targeted at-risk population	32,140,561	32,815,512	33,504,638
Population targeted for ITNs	26,496,212	27,028,812	27,571,664
Continuous distribution needs			
Channel 1: ANC	977,073	997,592	1,018,541
Channel 1: ANC type of ITN	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)	Dual AI and PBO
Channel 2: EPI	977,073	997,592	1,018,541
Channel 2: EPI type of ITN	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)	Dual AI and PBO
Channel 3: School	2,047,967	446,000	2,338,834
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: People living with HIV and TB	242,595	242,595	242,595
Channel 5: Type of ITN	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)	Dual AI and PBO
Estimated total need for continuous channels	4,244,708	2,683,778	4,618,511
Mass campaign distribution needs			
Mass distribution campaigns		16,703,806	
Mass distribution ITN type		All three (Dual AI, PBO and Single Pyrethroid)	
Estimated total need for campaigns		16,703,806	
Total ITN need: Continuous and campaign	**4,244,708**	**19,387,584**	**4,618,511**
Partner contributions			
ITNs carried over from previous year	1,905,650	1,861,592	0

ITNs from government	446,000	446,000	446,000
Type of ITNs from government	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)
ITNs from Global Fund	2,254,650	12,400,250	
Type of ITNs from Global Fund	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)	All three (Dual AI, PBO and Single Pyrethroid)
ITNs from other donors	0	0	0
Type of ITNs from other donors			
ITNs planned with PMI funding	1,500,000	3,000,000	1,500,000
Type of ITNs with PMI funding	Dual AI and PBO	PBO	Dual AI and PBO
Total ITNs contribution per calendar year	**6,106,300**	**17,707,842**	**1,946,000**
Total ITN surplus (gap)	**1,861,592**	**(1,679,742)**	**(2,672,511)**

Table A-2. RDT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	32,140,561	32,815,512	33,504,638
Population at risk for malaria	32,140,561	32,815,512	33,504,638
PMI-targeted at-risk population	32,140,561	32,815,512	33,504,638
RDT needs			
Total number of projected suspected malaria cases	10,696,976	10,162,127	9,654,021
Percent of suspected malaria cases tested with RDT	70%	70%	70%
RDT needs (tests)	**8,236,672**	**7,824,838**	**7,433,596**
Needs estimated based on HMIS data			
Partner contributions (tests)			
RDTs from government	0	0	0
RDTs from Global Fund	7,625,000		
RDTs from other donors	0	0	0
RDTs planned with PMI funding	0	0	0
Total RDT contributions per calendar year	**7,625,000**	**0**	**0**
Stock balance (tests)			
Beginning balance	10,126,920	9,515,248	1,690,410
- Product need	8,236,672	7,824,838	7,433,596
+ Total contributions (received/expected)	7,625,000	0	0
Ending balance	**9,515,248**	**1,690,410**	**(5,743,186)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	4,118,336	3,912,419	3,716,798
Total surplus (gap)	**5,396,912**	**(2,222,009)**	**(9,459,984)**

Table A-3. ACT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	32,140,561	32,815,512	33,504,638
Population at risk for malaria	32,140,561	32,815,512	33,504,638
PMI-targeted at-risk population	32,140,561	32,815,512	33,504,638
ACT needs			
Total projected number of malaria cases	5,078,747	4,769,372	4,484,319
Total ACT needs (treatments)	**5,076,207**	**4,766,987**	**4,482,077**
Needs estimated based on a combination of HMIS and consumption data			
Partner contributions (treatments)			
ACTs from government	866,934		
ACTs from Global Fund	2,674,374		
ACTs from other donors	0	0	0
ACTs planned with PMI funding	0	0	300,000
Total ACTs contributions per calendar year	**3,541,308**	**0**	**300,000**
Stock balance (treatments)			
Beginning balance	1,607,521	72,622	0
- Product need	5,076,207	4,766,987	4,482,077
+ Total contributions (received/expected)	3,541,308	0	300,000
Ending balance	**72,622**	**(4,694,366)**	**(4,182,077)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	2,538,104	2,383,494	2,241,038
Total surplus (gap)	**(2,465,482)**	**(7,077,859)**	**(6,423,115)**

Table A-4. Inj. Artesunate Gap Analysis Table

Calendar Year	2023	2024	2025
Injectable artesunate needs			
Projected number of severe cases	355,513	333,856	313,902
Projected number of severe cases among children	311,429	292,458	274,978
Average number of vials required for severe cases among children	6	6	6
Projected number of severe cases among adults	44,084	41,398	38,924
Average number of vials required for severe cases among adults	6	6	6
Total Injectable artesunate needs (vials)	**2,303,724**	**2,163,387**	**2,034,085**
Needs estimated based on HMIS data			
Partner contributions (vials)			
Injectable artesunate from government	82,000	0	0
Injectable artesunate from Global Fund	1,002,272		
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding	325,000	300,000	300,000
Total injectable artesunate contributions per calendar year	**1,409,272**	**300,000**	**300,000**
Stock balance (vials)			
Beginning balance	594,482	0	0
- Product need	2,303,724	2,163,387	2,034,085
+ Total contributions (received/expected)	1,409,272	300,000	300,000
Ending balance	**(299,970)**	**(1,863,387)**	**(1,734,085)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	1,151,862	1,081,693	1,017,042
Total surplus (gap)	**(1,451,832)**	**(2,945,080)**	**(2,751,127)**

Table A-5. RAS Gap Analysis Table

Calendar Year	2023	2024	2025
Artesunate suppository needs			
Number of severe cases expected to require prereferral dose (or expected to require prereferral dose based on number of providers for the service)	7,110	6,677	6,278
Total artesunate suppository needs (suppositories)	**10,665**	**10,016**	**9,417**
Needs estimated based on HMIS data			
Partner contributions (suppositories)			
Artesunate suppositories from government			
Artesunate suppositories from Global Fund			
Artesunate suppositories from other donors			
Artesunate suppositories planned with PMI funding	30,000		30,000
Total artesunate suppositories available	**30,000**	**0**	**30,000**
Stock balance (suppositories)			
Beginning balance	2,912	22,247	12,231
- Product need	10,665	10,016	9,417
+ Total contributions (received/expected)	30,000	0	30,000
Ending balance	**22,247**	**12,231**	**32,814**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	5,333	5,008	4,709
Total surplus (gap)	**16,915**	**7,223**	**28,106**

Table A-6. SP Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	32,140,561	32,815,512	33,504,638
Total population at risk for malaria	32,140,561	32,815,512	33,504,638
PMI targeted at-risk population	32,140,561	32,815,512	33,504,638
SP needs			
Total number of pregnant women	1,285,622	1,312,620	1,340,186
Total number of pregnant women expected to register for ANC	1,028,498	1,050,096	1,072,148
Percent of pregnant women expected to receive IPTp1	76.6%	78.3%	80.0%
Percent of pregnant women expected to receive IPTp2	73.5%	76.8%	80.0%
Percent of pregnant women expected to receive IPTp3	69.4%	74.7%	80.0%
Percent of pregnant women expected to receive IPTp4	42.5%	46.2%	50.0%
Percent of pregnant women expected to receive IPTp5	37.6%	43.8%	50.0%
Total SP needs (doses)	**3,081,380**	**3,358,208**	**3,645,305**
Needs estimated based on HMIS data			
Partner contributions (doses)			
SP from government	2,680,559	0	0
SP from Global Fund	510,000		
SP from other donors	0	0	0
SP planned with PMI funding	0	1,800,000	0
Total SP contributions per calendar year	**3,190,559**	**1,800,000**	**0**
Stock balance (doses)			
Beginning balance	1,186,745	1,295,924	0
- Product need	3,081,380	3,358,208	3,645,305
+ Total contributions (received/expected)	3,190,559	1,800,000	0
Ending balance	**1,295,924**	**(262,284)**	**(3,645,305)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	1,540,690	1,679,104	1,822,652
Total surplus (gap)	**(244,766)**	**(1,941,388)**	**(5,467,957)**

Table A-6. SMC Gap Analysis Table

Calendar Year	2023	2024	2025
Total population in the SMC-targeted age range	4,743,014	4,842,617	4,944,312
SMC drug (SP+AQ) needs			
National population 3–11 months targeted for SMC	438,265	450,986	457,751
National population 12–59 months targeted for SMC	931,313	958,345	972,721
Total national population targeted for SMC	**1,369,577**	**1,409,332**	**1,430,472**
PMI population 3–11 months targeted for SMC	322,759	333,024	338,020
PMI population 12–59 months targeted for SMC	685,863	707,677	718,292
Total PMI population targeted for SMC	**1,008,621**	**1,040,701**	**1,056,311**
Total SP+AQ needs (co-blisters)	**5,478,310**	**7,046,658**	**7,152,358**
Partner contributions (co-blisters, national)			
SP+AQ carried over from previous year	0	0	0
SP+AQ from government	0	0	0
SP+AQ from Global Fund	1,365,000		
SP+AQ from other donors	0	0	0
SP+AQ planned with PMI funding	4,018,549	3,000,000	4,000,000
Total SP+AQ contributions per calendar year	5,383,549	3,000,000	4,000,000
Total SP+AQ surplus (gap)	**(94,761)**	**(4,046,658)**	**(3,152,358)**

Table A-7. Primaquine Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	32,140,561	32,815,512	33,504,638
Total population at risk for malaria	32,140,561	32,815,512	33,504,638
PMI-targeted at-risk population	32,140,561	32,815,512	33,504,638
Primaquine needs			
Total projected number of malaria cases	5,078,747	4,769,372	4,484,319
Total projected number of Pf cases	178,059	167,008	156,643
Total projected number of Pv cases	344,055	323,096	303,786
Total projected number of mixed cases (Pf + Pv)			
Total primaquine needs (tablets)	**11,160,505**	**10,480,299**	**9,853,247**
Needs estimated based on HMIS data			
Partner contributions (tablets)			
Primaquine from government			
Primaquine from Global Fund			
Primaquine from other donors			
Primaquine planned with PMI funding			
Total primaquine contributions per calendar year	**0**	**0**	**0**
Stock balance (tablets)			
Beginning balance		0	0
- Product need	11,160,505	10,480,299	9,853,247
+ Total contributions (received/expected)	0	0	0
Ending balance	**(11,160,505)**	**(10,480,299)**	**(9,853,247)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	5,580,253	5,240,149	4,926,624
Total surplus (gap)	**(16,740,758)**	**(15,720,448)**	**(14,779,871)**