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Rwanda

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
AI	Active ingredient
AL	Artemether-lumefantrine
ANC	Antenatal care
CHW	Community health worker
CY	Calendar year
DDT	Dichlorodiphenyltrichloroethane
DP	Dihydroartemisinin-piperaquine
EPI	Expanded Program on Immunization
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HBM	Home-based management of malaria
HMIS	Health management information system
iCCM	Integrated community case management
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated net
MIP	Malaria in pregnancy
MoH	Ministry of Health
MOP	Malaria Operational Plan
MOPDD	Malaria and Other Parasitic Diseases Division
MSP	Malaria Strategic Plan
PBO	Piperonyl butoxide
PMI	U.S. President's Malaria Initiative
RBC	Rwanda Biomedical Center
RDT	Rapid diagnostic test
RMS	Rwanda Medical Supply
SBC	Social and behavior change
SISCom	*Système d'information Sanitaire des Communautés* (CHW data system)
SLDPQ	Single low-dose primaquine
TA	Technical assistance
TES	Therapeutic efficacy study
TWG	Technical working group
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

To review the specific country context for Rwanda, please refer to the country malaria profile located on PMI's country team landing page, which provides an overview of the country's malaria situation, key indicators, the national malaria control 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. Rwanda began implementation as a PMI partner country in fiscal year (FY) 2007.

Rationale for PMI's Approach in Rwanda

Malaria is among the leading causes of morbidity and mortality[1] and remains a public health priority in Rwanda. PMI's support is closely aligned with the Rwanda Malaria Strategic Plan (MSP) 2020–2024,[2] which is based on risk stratification to target malaria control interventions and a multisectoral collaboration for malaria response. Malaria incidence in Rwanda has declined from a recent high of 403 cases per 1,000 population per year in 2016–2017 to 76 cases per 1,000 population per year in 2021–2022, a decline of more than 80 percent.[1] PMI's End Malaria Faster strategy is well aligned with the Rwanda MSP 2020–2024, which focuses on strengthening community health systems, keeping malaria services resilient, and innovating and leading.

Overview of Planned Interventions

The proposed FY 2024 PMI funding for Rwanda is $19 million. PMI will support the national malaria control program—the Malaria and Other Parasitic Diseases Division (MOPDD)—with the following intervention areas.

[1] Rwanda Ministry of Health. 2021. *Rwanda Malaria and Neglected Tropical Diseases Annual Report 2021–2022*.
[2] Rwanda Ministry of Health. 2020. *Rwanda Malaria Strategic Plan 2020–2024*.

1. Vector Monitoring and Control

PMI, along with other partners, supports MOPDD's integrated vector management approach, including entomological monitoring, indoor residual spraying (IRS), procurement and distribution of insecticide-treated nets (ITNs) through mass campaigns and continuous distribution at the first antenatal care (ANC) and the first Expanded Program on Immunization (EPI) clinic visits, and ITN durability monitoring. With FY 2024 funding, PMI will continue to support entomological monitoring with the collection of vector bionomics and insecticide-resistance monitoring at 12 sites in 12 districts; IRS in 3 districts; quality control and assessment of IRS in 3 districts; and procurement, warehousing, and distribution of ITNs for mass campaigns. PMI will also continue to provide technical support to the vector monitoring and control activities of the Global Fund to Fight AIDS, Tuberculosis and Malaria and the Rwandan government, including biological resistance monitoring at 30 sites in 23 districts.

2. Malaria in Pregnancy

Rwanda's malaria in pregnancy (MIP) strategy follows World Health Organization (WHO) recommendations to prevent, promptly detect, and treat malaria in pregnant women. MOPDD does not support intermittent preventive treatment for pregnant women (IPTp) because of continued evidence of resistance to sulfadoxine-pyrimethamine. With FY 2024 funding, PMI will continue to support MOPDD by assisting with national coordination of MIP activities; distribution of ITNs to all pregnant women at first ANC and to caregivers at first EPI visits (see vector monitoring and control section); and ensuring training, supervision, and capacity strengthening of health care providers at ANC visits and for the prompt treatment of malaria in pregnancy.

3. Drug-based Prevention

PMI does not support seasonal malaria chemoprevention or other drug-based prevention in Rwanda.

4. Case Management

In alignment with the objective of the Rwanda MSP 2020–2024 to maintain 100 percent prompt testing and treatment of all suspected malaria cases and with the 2020 national treatment guidelines, PMI supports funding for national-level policy, programmatic activities, commodity procurement, and improvement of facility- and community-level health worker performance. With FY 2024 funds, PMI will continue to support national-level case management activities; capacity strengthening at the national reference laboratory; procurement of artemisinin-based combination therapies (ACTs) and injectable artesunate; training, supervision, and mentoring for facility-based and community health workers (CHWs); and monitoring ACT efficacy through therapeutic efficacy studies given the identification of the k13 561H mutation conferring artemether-lumefantrine (AL) partial resistance.

5. Health Supply Chain and Pharmaceutical Management

PMI supports the Rwanda Medical Supply Ltd. and MOPDD to further strengthen commodity stock management and integration; warehousing, procurement, and distribution of malaria commodities; and quality control of ACTs. PMI also supports forecasting and supply planning activities, including annual quantification of all malaria commodities, quarterly supply plan reviews, and the commodities stockout reduction strategy. With FY 2024 funds, PMI will continue to support commodity stock management and integration activities; warehousing, procurement, and distribution of malaria commodities; quality control of ACTs; forecasting and supply planning; and improvement of supply chain efficiencies.

6. Malaria Vaccine

The WHO recommendation for implementation of the malaria vaccine states that in the context of comprehensive malaria control, the RTS,S/AS01 malaria vaccine can be used to prevent *P. falciparum* malaria in children living in regions with moderate (250–450 cases per 1,000 population) to high (> 450 cases per 1,000 population) transmission. Because there are no districts in Rwanda in the moderate or high transmission category and only 5 districts in the low (100–250 cases per 1,000 population) transmission category, the Rwandan government and MOPDD did not apply to GAVI to be considered for the initial malaria vaccine allocation and do not currently plan to support its implementation in the immediate future.

7. Social and Behavior Change

PMI supports the Rwanda malaria social and behavior change (SBC) activities at the national level through the health promotion technical working group (TWG) by developing malaria prevention messages and at the district level by supporting the dissemination of the messages through various channels, including radio and interpersonal communication. With FY 2024 funds, PMI will continue to support SBC activities focused on ITN use and prompt care seeking at the community level using CHWs and at the health facility level using health education sessions. PMI will also continue support of SBC activities at the national level through the health promotion TWG and the Rwanda Health Communication Center.

8. Surveillance, Monitoring, and Evaluation

Consistent with the Rwanda MSP 2020–2024, PMI supports strengthening surveillance and reporting to provide complete, timely, and accurate information for appropriate decision making at all levels. PMI supports MOPDD to maintain and strengthen reporting of routine malaria data from all levels of health facilities (through the Health Management Information System [HMIS]) and CHWs (through *Système d'information sanitaire des communautés*, or SISCom) through training and mentoring, data quality assessments, death audits in hospitals, and digitizing supervision tools and checklists. With FY 2024 funding, PMI will continue supporting data review and quality assessment activities; training health facility staff, including monitoring and evaluation officers and data managers; and supporting supportive supervision at all health levels to improve performance and digitalization of the community program in select districts.

9. Operational Research and Program Evaluation

PMI works together with MOPDD, implementing partners, and other donors and research institutions to support relevant program evaluation and operational research designed to provide data to inform the Rwanda Biomedical Center (RBC) and MOPDD programs and policy. However, no operational research or program evaluation activities are currently proposed with FY 2024 funding.

10. Capacity Strengthening

PMI supports an array of capacity strengthening activities that cut across intervention areas, such as health workers, supply chain management, health information systems, and drug quality monitoring. With FY 2024 funds, PMI will continue its support for MOPDD capacity strengthening via conferences and workshop attendance, country-level coordination through TWGs, and the RBC laboratory. PMI will also continue its support for the Field Epidemiology Training Program residents working on malaria-specific projects and Peace Corps Response. Lastly, PMI will continue to support the Ministry of Health and other partners and stakeholders as they digitize the community health platform.

11. Staffing and Administration

The single interagency team led by the the United States Agency for International Development (USAID) Mission Director or their designee consists of a resident advisor representing USAID, a resident advisor representing the U.S. Centers for Disease Control and Prevention, and one or more locally hired experts. 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.

I. CONTEXT AND STRATEGY

1. Introduction

Rwanda began implementation as a U.S. President's Malaria Initiative (PMI) partner country in fiscal year (FY) 2007. This FY 2024 Malaria Operational Plan (MOP) presents a detailed implementation plan for Rwanda based on the strategies of PMI and the Malaria and Other Parasitic Diseases Division (MOPDD). It was developed in consultation with MOPDD 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 Rwanda, describes progress to date, identifies challenges and relevant contextual factors, and provides a description of activities that are planned with FY 2024 funding. For more detailed information on the country context, refer to the country malaria profile, which provides an overview of Rwanda's malaria situation, key indicators, MOPDD's strategic plan, and the partner landscape.

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 (CDC). Launched in 2005, PMI supports the implementation of malaria prevention and treatment measures such as insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs), intermittent preventive treatment for pregnant women (IPTp), and drug-based prevention, as well as cross-cutting interventions such as surveillance, monitoring, and evaluation; 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 Rwanda

3.1. Malaria Overview for Rwanda

Malaria is among the leading causes of morbidity and mortality[3] and remains a public health priority in Rwanda.[4] Rwanda's entire population of 13.2 million people is at risk for malaria, with pregnant women, children under five years of age, and refugees among the most vulnerable.[5] Between 2005 and 2011, Rwanda's scale-up of interventions successfully reduced malaria case incidence by 86 percent and in-patient malaria deaths by 74 percent, with at least eight districts achieving pre-elimination.[6] Rwanda subsequently experienced an upsurge in malaria cases from 2012 to 2017, with an increase in parasitemia prevalence among children under five years of age from 1 percent (2010) to 7 percent (2017); an increase in malaria incidence from 48 cases per 1,000 population per year (2012) to 403 per 1,000 (2016); and a 41 percent increase in malaria mortality during this period.[7] MOPDD identified several potential factors

[3] Rwanda Ministry of Health. 2022. *Rwanda Malaria and Neglected Tropical Diseases Annual Report 2021–2022*.
[4] Rwanda Ministry of Health. 2020. *Rwanda Malaria Strategic Plan 2020–2024.*
[5] Ibid.
[6] Karema C., et al. 2020. "History of Malaria Control in Rwanda: Implications for Future Elimination in Rwanda and Other Malaria-Endemic Countries." *Malar J.* Oct 7; 19 (1): 356. doi: 10.1186/s12936-020-03407-1.
[7] Rwanda Ministry of Health. 2017. *Revised National Malaria Contingency Plan 2016–2020*.

leading to the upsurge in malaria cases, including increased rainfall, expanded water bodies and irrigation accompanying an increase in rice fields, shifts in mosquito behavior to earlier in the day and outdoor biting, insufficient coverage of vector control interventions, and increased case detection and reporting. In response, in 2016, MOPDD developed and implemented the Malaria Contingency Plan based on mapping and risk stratification. The plan included universal coverage of ITNs, IRS in 12 districts with high malaria burdens, expanded home-based management of malaria (HBM) to all ages with the introduction of free malaria diagnosis and treatment to the most economically vulnerable populations, and multisectoral collaboration for malaria response. Malaria incidence subsequently declined to 76 cases per 1,000 population per year in Rwanda's FY 2021/2022 (July 2021–June 2022), with a concomitant reduction in the national slide positivity rate from 44 percent in FY 2018–2019 to 22 percent in FY 2021–2022.[8]

MOPDD continues to utilize routine data, population-based surveys, and special studies (e.g., entomological monitoring and therapeutic efficacy studies) to inform quarterly multisectoral review meetings at the national and regional level as well as annual national joint assessments, and develops annual malaria action plans and implementation reports in collaboration with partners and stakeholders. The current Rwanda Malaria Strategic Plan (MSP) 2020–2024 continues through the calendar year (CY) 2024. A mid-term review in 2022–2023 indicated that the MSP goals of reducing malaria morbidity and mortality by 50 percent from the 2018–2019 baseline has been achieved. Nationally, the malaria parasite incidence declined by 76 percent and mortality by 73 percent in 2021–2022 from 2018–2019. The upcoming end-term review will help guide the next extended MSP for 2020–2027.

For more detailed information on malaria indicators, please refer to the Rwanda country malaria profile.

3.2. Key Challenges and Contextual Factors

The key challenge that remains is MOPDD's ability to sustain malaria prevention and control interventions, including universal ITN coverage, IRS, and HBM, which were scaled up in response to the surge in malaria cases from 2012–2016. The Ministry of Health (MoH) is aware of this challenge and is keen to mobilize resources to sustain or further expand existing malaria prevention and control interventions to sustain or increase the gains already made. No contextual factors currently pose a threat.

3.3. PMI's Approach for Rwanda

PMI's support is closely aligned with MOPDD's key strategic plans, except for three notable differences, and builds on investments contributed by the Rwandan government and the Global Fund. The three areas of programmatic difference are that PMI does not support larval source management nor the procurement of dual antigen rapid diagnostic tests (RDTs), and MOPDD does not support IPTp because of continued evidence of resistance to

[8] Rwanda Ministry of Health. 2022. *Rwanda Malaria and Neglected Tropical Diseases Annual Report 2021–2022*.

sulfadoxine-pyrimethamine. PMI supports some technical assistance (TA) at the central level while other investments occur in geographically targeted areas. At the central level, PMI supports supervision to districts by central-level staff and their participation in The Partnership for Antimalarial Resistance Monitoring in Africa (PARMA) initiative to conduct therapeutic efficacy studies (TES) and strengthen national laboratory capacity. In geographically targeted areas, PMI supports IRS implementation in three districts, while the Rwandan government and the Global Fund support nine districts. PMI, along with the Global Fund, supports the procurement and distribution of ITNs for nationwide mass campaigns and continuous distribution with subnational targeting of net type based on risk stratification (see Rwanda country malaria profile for more detail). Out of a total of 30 districts, PMI supports case management activities at the health facility in 22 districts and at the community level in 20 districts.

PMI's new five-year *End Malaria Faster* strategy is well aligned with the Rwanda MSP 2020–2024. PMI's support of MOPDD priorities continues to focus on strengthening community health systems, keeping malaria services resilient, and innovating and leading. In 2016, the Rwandan government changed its policy to expand community case management of malaria to all ages and reduce financial barriers, which enabled increased patient access to community-level care. As a result, the percentage of malaria cases managed at the community level increased from 13 percent in 2016 to 57 percent in 2022, and malaria deaths decreased by approximately 65 percent in the same period. Historically, half of Rwanda's community health workers (CHWs), called *binômes*, are trained to provide integrated community case management (iCCM) for children under five years of age and malaria diagnosis and treatment for older children and adults; other CHW positions include *Agents de Santé Maternelle*, who are in charge of maternal health. The MoH, however, is considering a polyvalent approach in which all CHWs will be trained in clinical service delivery, including the diagnosis and treatment of malaria. This will ensure that CHWs are able to reach larger populations at all times, and community members can seek care from any CHW.

PMI, through the PARMA Network, supports the strengthening the capacity of the National Reference Laboratory for molecular testing, as well as onsite TA and mentorship for necessary techniques such as drug sensitivities studies. The Rwandan government and MOPDD continue to innovate and lead through efforts to scale up digitization of the community health platform and piloting strategies to help mitigate the potential spread of parasites with antimalarial resistance mutations.

3.4. Key Changes in this MOP

The majority of the activities in the FY 2024 Rwanda MOP remain consistent with the prior year's strategies and activities. A few notable changes include:

- Increased procurement of ITNs to support the 2024–2025 mass campaign through reprogramming.
- MOPDD plans to procure only piperonyl butoxide (PBO) and dual active ingredient (AI) nets due to pyrethroid resistance for both routine and mass campaigns.
- MOPDD continues to plan for two potential pilot interventions designed to help address partial artemisinin resistance. The two pilot interventions being discussed and developed include:
    - The use of alternative ACTs, such as dihydroartemisinin-piperaquine (DP) and artesunate-pyronaridine, or Pyramax®) as a multiple first-line therapy approach to protect and preserve the efficacy of ACT partner antimalarials in Rwanda
    - Single low-dose primaquine (SLDPQ) treatment in addition to routine ACT for confirmed malaria cases in up to five districts with documented parasite resistance or low malaria transmission to help mitigate forward transmission of resistant parasites and further reduce transmission.

II. OPERATIONAL PLAN FOR FY 2024

1. Vector Monitoring and Control

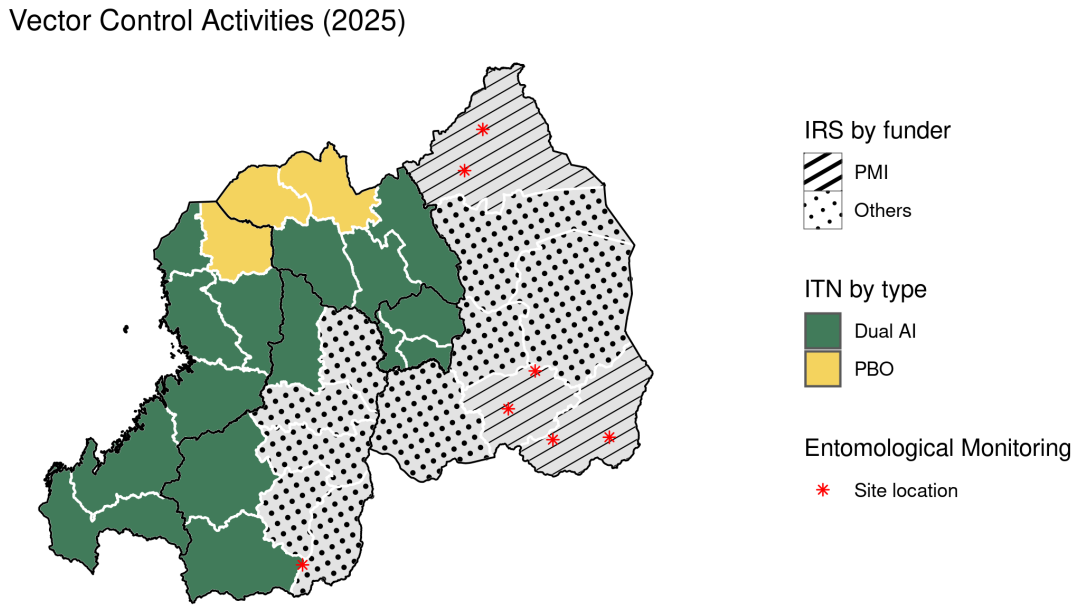
1.1. PMI Goal and Strategic Approach

PMI supports MOPDD to ensure that the country achieves high coverage and usage of effective ITNs with consistent distribution strategies, primarily mass campaigns and continuous distribution. Mass campaigns are nationwide efforts, with quantification and distribution based on one net per 1.8 people; they are conducted every two to three years. Continuous distribution of free ITNs occurs through antenatal care (ANC) and Expanded Program on Immunization (EPI) clinic visits. Recent policy changes include distributing ITNs to all pregnant women at the first ANC visit (as opposed to primigravida only) and children under one year of age. The Global Fund also supports ITN procurement and distribution for mass campaigns and continuous distribution. MOPDD, PMI, and the Global Fund work closely together to coordinate ITN procurement and distribution.

PMI also supports MOPDD with IRS operations within the context of an insecticide resistance program and in a complementary way with other partners. IRS is conducted as funding permits, with an emphasis on prioritizing those districts with the highest burden of malaria and those that have previously received IRS. In the last few years, MOPDD has focused on maintaining IRS in 12 previously sprayed districts to ensure that malaria does not rebound, as has been the case in the past. PMI supports three districts, and the Rwandan government and Global Fund support nine districts. Actellic and Fludora Fusion are rotated every two years (Table 1). To maintain and promote community acceptance, MOPDD employs an insecticide resistance mitigation plan, community mobilization, and SBC activities with all IRS implementations.

The Rwanda MSP 2020–2024, currently being extended to 2027, promotes integrated vector management, including entomological monitoring, insecticide resistance management, continuous and mass distribution of ITNs, geographically targeted IRS, and larval source management in accordance with World Health Organization (WHO) guidelines. MOPDD objective is to ensure that at least 85 percent of the population is protected by preventive interventions by 2024.

Figure 1. Map of IRS Sites, IRS Quality Control Monitoring, and ITN Types (Mass Campaign) in Rwanda in 2024–2025



AI: active ingredient; PBO: piperonyl butoxide. The entomological monitoring sites are indoor residual spraying monitoring sites.

1.2. Recent Progress (January 2022–June 2023)

PMI, in collaboration with the Rwanda Biomedical Center (RBC), MOPDD, and local districts, supported the following activities:

- Entomological monitoring in 12 sentinel sites across 12 districts, including the collection of vector bionomics data, insecticide resistance monitoring, insecticide residual efficacy, and quality control of IRS at seven sites.
- Procurement and distribution of 3,809,348 nets, including 2,667,085 PBOs and 1,142,268 standard pyrethroid ITNs, which were delivered and distributed between January and December 2022 through the continuous distribution to pregnant women at first ANC visit and children under one year of age at the first EPI visit, and through a mass campaign.
- Procurement 701,700 PBO nets, which will be distributed as part of the continuous distribution in 2023.
- Prevention of malaria in pregnancy (MIP) by providing ITNs to women at their first ANC visit.
- Data collection and monitoring of three types of nets (Olyset,® Yahe-LN,® and PermaNet® 3.0) from 3,353 cohort nets distributed in 2020 in support of 24-month ITN durability monitoring. The net durability for 36 months is expected to be completed in June 2023.

- SBC activities in target districts and through national mass media campaigns to increase appropriate ITN use, promote care, and mitigate against misuse.
- Planning and implementation of IRS in three districts covering 354,669 structures and protecting 1,358,152 people from malaria, including training 3,201 community members and other cadres for IRS mobilization and spray activities.
- TA to MOPDD, the Global Fund's principal recipient, and district health offices to plan, train, supervise, and implement IRS in nine districts.

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 Rwanda in FY 2024.

1.3.1. Entomological Monitoring

PMI, in collaboration with the Global Fund and the Rwandan government, will continue to support routine entomological monitoring as described in the recent progress section at 12 sentinel sites, including districts that have received dual AI and PBO ITNs. PMI also will continue to support IRS quality control in select districts.

Summary of Distribution and Bionomics of Malaria Vectors in Rwanda

Mosquito surveillance was conducted using human landing catches and pyrethrum spray catches from July to December 2022 at seven sites: Nyagatare and Rukomo (Nyagatare District), Gatore and Nyamugali (Kirehe District), Zaza and Remera (Ngoma District), and Rwamiko (Gicumbi District). A total of 547 Anopheles mosquitoes were collected: 487 (89 percent) using man landing catches and 60 (11 percent) using pyrethrum spray catches. *An. gambiae s.l.* was the dominant species collected (76.4 percent), followed by *An. ziemanni* (14.6 percent), *An. pharoensis* (4.6 percent), *An. funestus* (2.0 percent), *An. squamosus* (1.6 percent), and *An. maculipalpis* (0.7 percent). *An. gambiae s.l.* was the dominant species at all sentinel sites, except in Zaza (Ngoma District) and Rwamiko (Gicumbi District-control), where *An. ziemanni* was the highest. *An. funestus* was only collected at the Rwamiko site.

Status of Insecticide Resistance in Rwanda

Insecticide resistance monitoring was carried out at 30 sites across Rwanda from October 2021 to May 2022. *An. gambiae s.l.* were tested against nine standard doses of insecticides belonging to the six classes: carbamates (bendiocarb 0.1 percent); organophosphates (fenitrothion 1 percent, and pirimiphos methyl 0.25 percent); organochlorines (dichlorodiphenyltrichloroethane [DDT] 4 percent); pyrethroids (deltamethrin 0.05 percent, permethrin 0.75 percent, and alpha cypermethrin 0.05 percent); and two new classes of pyrrole (chlorfenapyr 200 µg) and neonicotinoid (clothianidin 2 percent). Resistance was confirmed more to pyrethroids than other classes of insecticides, with alpha-cypermethrin at 24 sites (80 percent), permethrin at 21 sites (70 percent), and deltamethrin at 18 sites (60 percent). DDT resistance was confirmed at 8 sites (27 percent) of the total sites surveyed,

and pirimiphos-methyl resistance was confirmed at 12 sites (40 percent). The highest susceptibility (89 percent) was found with clothianidin (16 out of 18 sites surveyed) and chlorfenapyr (24 out of 27 sites surveyed). As such, the country will consider the procurement of both PBO and dual active ingredient or any nets with new molecules, as appropriate. Resistance was not reported for two insecticides products: bendiocarb and fenitrothion. With the addition of a synergist, the PBO was restored to full susceptibility (100 percent) to deltamethrin, 95 percent to permethrin, and 92.3 percent to alpha-cypermethrin at the sites with confirmed resistance to pyrethroids.

The intensity assays were performed at 5 and 10 times the diagnostic doses at 26 sites where resistance to pyrethroid insecticides was confirmed. The intensity of resistance to deltamethrin was found to be high at one site (5.3 percent, n=19) and moderate at 18 sites (94.7 percent, n=19). Alpha-cypermethrin resistance intensity was high at 6 sites (23.1 percent, n=26) and moderate at 20 sites (76.9 percent, n=26) (at 10x ≥ 98 percent mortality = moderate intensity, < 98 percent mortality = high intensity). The resistance intensity was low at 13 sites (61.9 percent, n=21) to moderate at 8 sites (38.1 percent, n=21) for permethrin (at 5x ≥ 98 percent mortality = low intensity, < 98 percent mortality = moderate intensity).

1.3.2. Insecticide-Treated Mosquito Nets

PMI will continue to support MOPDD to conduct ITN activities, including the procurement and distribution of ITNs through continuous and mass campaigns. Based on data on resistance, the policy on types of ITNs to be procured and distributed has changed, and Rwanda will procure only PBO and dual AI ITNs.

See the SBC section for details on challenges and opportunities to improve ITN uptake, consistent use, and best practices.

ITN Distribution in Rwanda

In Rwanda, ITNs are distributed via mass campaigns every two to three years and through continuous distribution channels to pregnant women at first ANC visit and children under the age of one year. The types of ITNs distributed during mass campaigns and through continuous distribution channels are based on disease endemicity and IRS implementation. In 2022, 3,809,348 PBO nets were distributed during the mass campaign. There are plans to distribute PBO nets in 3 districts during the 2024–2025 mass campaign, while 15 districts will receive dual AI nets (Figure 1). In the IRS districts, PBO nets will be distributed to pregnant women and children under the age of one year.

For FY 2024–2025, the country will need an estimated 5,755,895 ITNs. While there is a funding gap in the ITNs required, the MoH and MOPDD are aware of this gap and will work to identify additional resources to procure the additional ITNs. The current Global Fund grant ends in June 2023, and it is expected that the new grant will include support for ITN procurement for the 2024–2025 mass campaign and for routine distribution. Based on available funding, PMI plans to procure 1,004,935 in the Rwandan FY 2024/2025 (July

2024–June 2025), which is an increase from prior years, primarily to support the mass campaign and routine distribution. PMI will continue to coordinate with the MoH, MOPDD, and the Global Fund to ensure that ITN gaps are addressed through Rwandan government and donor funding.

Please refer to the ITN gap analysis table in the annex for more detail on planned quantities and distribution channels.

Net durability monitoring started in 2020 following the mass campaign ITN distribution and is ongoing. Conclusions will be presented in 2023 at the end of the 36-month monitoring period. In coordination with PMI and aligned with internationally recognized guidelines, MOPDD developed a net durability monitoring protocol approved by the Rwanda National Ethics Committee to monitor four ITN brands in four districts for 36 months post-distribution. Brands being monitored include PBO ITNs, one dual AI ITN (Interceptor G2®), and two standard pyrethroid net types with different active ingredients (deltamethrin and permethrin).

Table 1. Standard Durability Monitoring

Campaign Date	Site	Brand	Baseline	12 Months	24 Months	36 Months
February 2020	Burera (Northern Province)	Olyset® Net Standard ITN	September 2020	May–June 2021	March 2022	June 2023
June 2020	Karongi (Western Province)	Interceptor® G2	September 2020	May–June 2021	March 2022	June 2023
February 2020	Kicukiro (Kigali City)	PermaNet® 3.0 PBO ITN	September 2020	May–June 2021	March 2022	June 2023
February 2020	Ruhango (Southern Province)	Yahe® LN Standard ITN	September 2020	March 2022	June 2022	June 2023

1.3.3. Indoor Residual Spraying (IRS)

PMI will continue to support IRS operations in the same three districts as the previous year (Kirehe, Ngoma, and Nyagatare).

Table 2. PMI-supported IRS Coverage

Calendar Year	District	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide
2021	Kirehe, Ngoma, Nyagatare districts	346,277	99.0	1,340,280	Fludora® Fusion (clothianidin and deltamethrin)
2022	Kirehe, Ngoma, Nyagatare districts	354,669	99.6	1,358,152	Actellic 300CS (Pirimiphos Methyl)
2023*	Kirehe, Ngoma, Nyagatare districts (planned)	TBD	TBD	TBD	TBD
2024[1]	Kirehe, Ngoma, Nyagatare districts (planned)	TBD	TBD	TBD	TBD

[1] Planned. TBD: to be determined.

IRS Insecticide Residual Efficacy in Rwanda

Cone wall bioassays were conducted monthly following the 2022 PMI-supported IRS campaign at six sites. The mortality rate of *An. gambiae s.s.* (Kisumu colony) exposed to different walls (painted cement, cement, and mud) sprayed with Actellic® 300CS was 100 percent for residual efficacy at four months post IRS in all PMI-supported sites and over 80 percent of exposed mosquitoes 10 months post IRS.

2. Malaria in Pregnancy

2.1. PMI Goal and Strategic Approach

Rwanda's MIP strategy follows the WHO recommendations to prevent and promptly diagnose and treat malaria in pregnant women. Currently, MOPDD does not implement IPTp due to documented resistance to sulfadoxine-pyrimethamine.[9] MOPDD's approach includes providing ITNs to pregnant women on their first ANC visit, iron and low-dose folate, and case management of pregnant women with suspected malaria. The MSP 2020–2024 objective for MIP is that, by 2024, at least 85 percent of pregnant women will have access to and will correctly and consistently use ITNs. The rate of attendance of at least one ANC visit at any time during pregnancy is high (98 percent); however, four or more ANC visits remains low

[9] Kateera, F., S. L. Nsobya, S. Tukwasibwe, E. Hakizimana, L. Mutesa, P. F. Mens, M. P. Grobusch, M. van Vugt, and N. Kumar. 2016. "Molecular Surveillance of *Plasmodium falciparum* Drug Resistance Markers Reveals Partial Recovery of Chloroquine Susceptibility but Sustained Sulfadoxine-Pyrimethamine Resistance at Two Sites of Different Malaria Transmission Intensities in Rwanda." *Acta Trop.* 164: 329–36.

(47 percent).[10] The findings from a 2017 knowledge, attitude, and practice survey indicated high favorability of the need for ANC (92 percent) and trust in ANC providers (96 percent). Nevertheless, there are challenges and barriers to pregnant women attending the recommended number of ANC visits, including approximately 50 percent of pregnant women starting ANC after the first trimester, pregnant women being required to be accompanied by their partner to go to the first ANC visit, lack of partner support, stigma with being young or unmarried and pregnant, and embarrassment of having yet another pregnancy (formative research report 2019). Additionally, COVID-19 contributed to a decline in attendance rates for the first ANC visit, especially in early 2020.[11] The Maternal, Child Health and Community Division of the RBC is focused on activities to promote early initiation and uptake of ANC services and, in collaboration with MOPDD, to provide supportive supervision for CHWs to improve community-level care and referral of pregnant women to health facilities. PMI is supporting these efforts through the procurement and distribution of ITNs to all pregnant women at the first ANC visit and caregivers at their child's first EPI visit, as well as capacity strengthening of health care providers to provide ANC and to manage clinical malaria during pregnancy (see the case management section for additional details).

2.2. Recent Progress (July 2022–May 2023)

Between July 2022 and May 2023, PMI supported the following activities:

- Convened two national malaria technical working group (TWG) meetings (not topic-specific) that included discussions of MIP.
- Distributed 596,012 ITNs through routine ANC and EPI visits nationwide.
- Conducted health education sessions in 1,708 health centers for 57,488 health workers to promote and reinforce ITN use and early care-seeking behavior for fever among pregnant women at every ANC visit.
- Provided supportive supervision and mentorship by 650 mentors to 9,233 *Agents de Sante Maternelle* (CHWs in charge of maternal health) to sensitize pregnant women in their respective villages on the benefits of sleeping under ITNs, to refer pregnant women to the facility during the first ANC contact, and to seek care early in case of fever.
- Trained 669 health care providers in malaria treatment, including MIP, and conducted quarterly supportive supervision and mentorship for the case management of malaria in pregnant women for 3,953 facility-based health workers in 330 health facilities, including hospitals and health centers.
- Supported MOPDD to lead two rounds of MIP-specific supportive supervision in 10 districts using MIP supervision tools and checklists. Areas of support included strengthening malaria diagnosis and case management for pregnant women, ensuring

[10] Demographic and Health Survey Key Indicators Report 2019–2020.

[11] Wanyana, D., R. Wong, and D. Hakizimana. 2011. "Rapid Assessment on the Utilization of Maternal and Child Health Services During COVID-19 in Rwanda." *Public Health Action* 11(1): 12–21.

the availability of ITNs for ANC, and ensuring that health education includes the benefits of consistent use of ITNs by pregnant women.
- Supported the redistribution of ITNs to mitigate stockouts of ITNs in some health facilities while others were overstocked: 53,668 ITNs were moved from one district to a different district and 28,918 were moved between health centers within the same district.

2.3. Plans and Justification for FY2023 Funding

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

With FY 2024 funding, PMI will continue to support MIP activities in Rwanda as described in the recent progress section and in accordance with MIP priorities in the Rwanda MSP 2020–2024.

See the SBC section for details on challenges and opportunities to improve MIP intervention uptake and maintenance, including ITN use and ANC attendance.

3. Drug-based Prevention

Rwanda does not implement seasonal malaria chemoprevention or other drug-based prevention due to the malaria epidemiology in the country.

4. Case Management

4.1. PMI Goal and Strategic Approach

The MSP 2020–2024 objective for case management is to maintain 100 percent prompt (within 24–48 hours of onset) testing and treatment of all suspected malaria cases, which aligns with the National Malaria Treatment Guidelines (2020). The MSP and treatment guidelines promote a comprehensive case management strategy, including universal, quality-assured parasitological testing of all cases of suspected uncomplicated malaria, prompt and effective treatment with ACT for all confirmed cases of uncomplicated malaria, and prereferral and/or definitive management of severe febrile illness and severe malaria. PMI supports all aspects of this approach by funding national-level policy and programmatic activities, commodity procurement, and improvement of facility and community- level health worker performance. The treatment guidelines recommend dual antigen (histidine-rich protein 2 and Plasmodium lactate dehydrogenase) malaria RDTs at the community level. Because PMI does not support the procurement of dual antigen RDTs in countries such as Rwanda where *P. falciparum* infections remain the predominant cause of symptomatic illness, the Rwandan government and Global Fund procure all the malaria RDTs required nationally. To counterbalance this support, PMI procures all the ACTs required nationally. PMI also funds outreach training and supportive supervision activities at health facilities in 22 (73 percent) of the 30 districts.

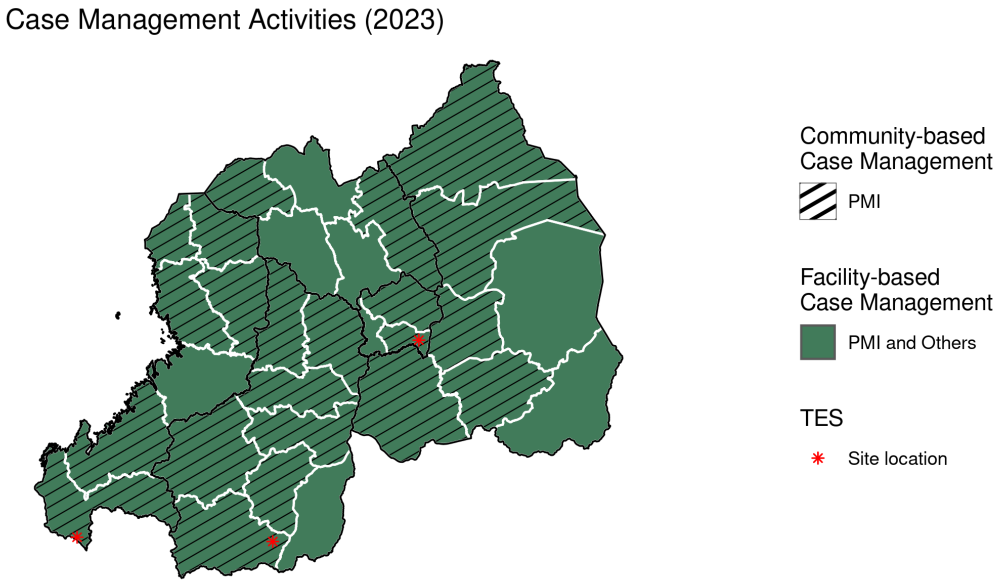
Rwanda has a strong CHW program with community-based case management provided through complementary programs of iCCM and HBM (management of malaria only among children older than five years of age and adults). Among the countrywide cadre of about 58,000 CHWs, each village has two CHWs (referred to as binômes), who are trained to deliver basic care, iCCM, and HBM. PMI supports the training, supportive supervision, and mentoring of the binômes in 20 districts to deliver iCCM, HBM, and referral of severe malaria cases. Currently, approximately 55–60 percent of all diagnosis and treatment of malaria in Rwanda occur at the community level. PMI does not currently provide direct routine payment to CHWs, nor does the Rwandan government have a national policy to pay CHWs. However, the MoH utilizes a strategy of performance-based incentives for CHWs who meet outlined indicators and goals. The biggest current challenge faced by the community health system is the paper-based system that the CHWs use. To address this, PMI and other partners are working with the MoH to support the digitalization of the community health information system.

Although not included in the MSP 2020–2024 or the treatment guidelines, MOPDD has been discussing with PMI, WHO, and other global stakeholders the implications of and strategies for addressing the TES findings of increasing prevalence of the k13 561H mutation associated with delayed parasite clearance.[12,13] MOPDD is planning to pilot the use of SLDPQ in up to five districts with a documented presence of parasites with the k13 561H mutation or with documented low to very low malaria transmission. Additionally, MOPDD is planning to pilot the use of multiple first-line therapies in Rwanda using a geographic approach (i.e., different ACTs as first-line treatment in different geographic regions) as a way to protect the current ACT partner drug—lumefantrine. The current first-line treatment, artemether-lumefantrine (AL), will continue to be used in most districts, while dihydroartemisinin-piperaquine (DP), the current second-line treatment option or other appropriate ACTs (e.g., artesunate-pyronaridine), will be used in a number of yet-to-be-determined remaining districts.

[12] Uwimana, A., E. Legrand, B. H. Stokes, et al.2020. “Emergence and Clonal Expansion of In Vitro Artemisinin-Resistant *Plasmodium falciparum* kelch13 R561H Mutant Parasites in Rwanda.” *Nat Med*. 26 (10): 1602–18. doi: 10.1038/s41591-020-1005-2.

[13] Uwimana, A., N. Umulisa, M. Venkatesan, et al. 2021. “Association of *Plasmodium falciparum* kelch13 R561H Genotypes with Delayed Parasite Clearance in Rwanda: An Open-Label, Single-Arm, Multicentre, Therapeutic Efficacy Study.” *Lancet Infect Dis.* 21 (8): 1120–28. doi: 10.1016/S1473-3099(21)00142-0.

Figure 2. Map of Facility-Based and Community Health Case Management and ANC Support in Rwanda



4.2. Recent Progress (July 2022–June 2023)

National-Level Case Management Activities

- PMI supported two national-level malaria TWG meetings that included malaria case management.
- PMI trained 140 laboratory technicians in malaria diagnostics refresher training (combined basic and advanced) with a focus on parasite counting and species identification, with an improvement in performance from 55 percent pretraining to 84 percent post-training.
- PMI trained 124 trainers on the new community health comprehensive package in Nyanza District.
- PMI supported MOPDD-led quarterly reporting and planning workshops with malaria stakeholders.
- PMI assisted MOPDD in completing a nationwide health facility survey funded by the Bill & Melinda Gates Foundation. Data analysis is in process, in collaboration with MOPDD and the U.S. Centers for Disease Control and Prevention.

Commodities

- PMI supported the distribution of 1,433,760 ACTs. No ACTs were procured during this reporting period because sufficient amounts were available from previous procurements due to the declining numbers of malaria cases.
- PMI supported the distribution of 70,687 vials of injectable artesunate between June 2022 and May 2023.
- PMI funded the procurement of diagnostic commodities required for microscopy at health facility level (e.g., slides, slide boxes, Giemsa stain, immersion oil, safety boxes, and alcohol).

Facility Level

- PMI trained 669 health care providers on the national malaria treatment guidelines.
- PMI supported on-the-job capacity strengthening for 1,341 hospital and 2,612 health center providers, and trained 17 nurses on community mentorship.
- PMI provided direct coaching on improving malaria case management during outpatient consultations.
- PMI conducted supportive supervision at 116 health facilities—for 779 providers at hospitals and 3,805 providers at health centers.
- PMI supported all hospitals to conduct malaria data quality review meetings attended by the heads of health centers, community environmental health officers, data managers, hospital monitoring and evaluation teams, and hospital administrators.
- See the surveillance, monitoring, and evaluation section for details of support to data quality assurance, including CHW report auditing.

Community Level

- PMI reached 19,617 CHWs through its support of monthly CHW coordination meetings in 20 districts and 650 mentors through its support of mentorship coordination meetings.
- PMI supported previously trained mentors and supervisors (650 nurses and community environmental health officers) from 326 health centers to conduct mentorship and supportive supervision, reaching 19,617 CHWs.
- PMI trained 1,649 CHW on the comprehensive iCCM package and distributed 23,534 comprehensive package training manuals to CHWs and supervisors.
- PMI trained 2,410 cell coordinators and CHW cooperative presidents on the management of community drugs and commodities and the analysis of community health indicators.
- PMI procured and distributed tools for CHWs: 98,130 iCCM/HBM treatment registers; 98,130 iCCM/HBM monthly report registers; and 15,304 bags.

- PMI upgraded the national eLearning platform for CHWs with iCCM and HBM course content (from version 3.1 to 4.0) and uploaded new content/courses.
- PMI disseminated the results of the community workers' eLearning pilot.
- PMI planned and conducted a community electronic medical records readiness assessment in seven districts, interviewing 557 CHWs.

Recent progress on 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 Rwanda in FY 2024.

National-Level Case Management Activities

PMI will continue to support the national-level case management activities, including guidelines development, TWGs, and the national reference laboratory, as described in the recent progress section. PMI will also support molecular analysis of TES 2022–2023 samples and the preparations of a TES in 2024–2025 at sentinel sites to monitor the emergence of antimalarial drug resistance. In addition, as noted previously in this section, PMI plans to continue to support two pilot interventions: SLDPQ and multiple first-line therapies—both still in development. PMI support will likely focus on commodity procurement (e.g., alternative ACTs such as DP, primaquine) and training, supervision, and monitoring of the implementation in the select districts.

Commodities

PMI will continue to engage in procurement to meet the national need of ACTs, including AL and injectable artesunate. In addition, the procurement of alternative ACTs such as DP and low-dose primaquine are needed. PMI will also procure malaria diagnostic commodities with FY 2024 funds. The Rwandan government and Global Fund will continue to procure RDTs.

Please refer to the ACT, RDT, injectable artesunate, and artesunate suppository gap analysis tables in the annex for more detail on planned quantities and distribution channels.

Facility Level

PMI will continue to provide support for training, tools, job aids, SBC, and supportive supervision to health facilities nationwide as described in the recent progress subsection above. PMI will support any augmented health worker training and supervision for potential implementation of alternative ACTs as multiple first-line therapy or single low-dose primaquine in select districts.

Community Level

PMI/Rwanda will continue to support the activities described in the recent progress subsection: provide support for training, tools, job aids, and supportive supervision to CHWs. PMI will also support any augmented CHW training and supervision for the potential implementation of alternative ACTs as multiple first-line therapies and/or single low-dose primaquine through iCCM and HBM in select districts.

Monitoring Antimalarial Efficacy

PMI will support the ongoing TES by completing the requirements such as renewal approval from the Rwanda National Ethics Committee and the Rwanda Food and Drugs Authority. PMI also completed the patient enrollment into the AL study arm.

Table 3. Ongoing and Planned Therapeutic Efficacy Studies

Year	Site Name	Treatment Arm(s)	Plan for Laboratory Testing of Samples
2021–2023	Bugarama, Masaka, Ngoma[1]	AL, DP	MOPDD/Rwanda Biomedical Center
2024–2025	TBD	AL, artesunate-pyronaridine/TBD	MOPDD/Rwanda Biomedical Center/TBD

[1] Ngoma replaced Rukara in early 2022 due to reduced malaria cases in Rukara that led to no recruitment of patients.
AL: artemether-lumefantrine; DP: dihydroartemisinin-piperaquine; TBD: to be determined.

Other Planned Case Management Activities

In FY 2023, MOPDD is planning to evaluate the efficacy, safety, and tolerability of artesunate-pyronaridine as a potential future alternative first-line treatment option. PMI will support this activity and provide TA for the implementation and data analysis as part of the TES.

5. Health Supply Chain and Pharmaceutical Management

5.1. PMI Goal and Strategic Approach

The Rwandan government, through MOPDD, continues to commit to its 2015 National Health Policy, which declares, “The first principle is that the health system ensures universal demand and access to affordable quality services.” To achieve this end, the government has detailed the need to focus on fully implementing various programs, strengthening all levels of service delivery, ensuring effective governance, and strengthening the various health system components—notably the health supply chain. Significant investments have been made to strengthen the public health supply chain and improve malaria commodity availability. The Rwandan government regularly triangulates data between the health management information system (HMIS) and the electronic logistics management information system to help with forecasting, understanding unmet needs, and comparing services data with consumption data, which all help to build efficient procurement strategies to the supply chain. PMI supports

MOPDD in the procurement of key malaria commodities and distribution across all districts and health system levels in Rwanda, specifically, ITNs, ACTs, and drugs for severe malaria. PMI also supports ITN distribution and capacity strengthening of health facility staff as well as quality control for ACTs. Rwanda's malaria initiatives are further supported by PMI's supply chain partner through forecasting and supply planning activities, including annual quantification of all malaria commodities, quarterly supply plan reviews, and the implementation of the stockout reduction strategy.

Rwanda Medical Supply (RMS) Ltd. is a parastatal agency whose mission is "to ensure the availability of quality and affordable pharmaceutical products, medical equipment, and consumables to the population of Rwanda." It is responsible for procurement, warehousing, and distribution to all public health facilities in the country. PMI supports RMS to improve its operational and procurement processes, improve its storage capacity efficiency, and strengthen the capacity of RMS staff. PMI also supports the Rwanda mission's efforts to support RMS and the Rwandan government in developing a more self-sufficient and sustainable supply chain operation, complemented by expert external technical assistance and a partnership with the Global Fund and other national supply chain stakeholders, including support for the RMS to procure PMI-funded commodities.

PMI supports the MoH with quality management improvement approaches at all levels of the supply chain. PMI further supports management information systems initiatives of the RMS to strengthen the MoH's oversight of the supply chain and its ability to plan for and respond to changes in demand.

5.2. Recent Progress (July 2022–June 2023)

PMI's principal supply chain investments aimed at improving malaria commodity availability at service delivery sites included the procurement of malaria commodities (ITNs, AL, and drugs for severe malaria), forecasting and supply planning, management of information systems, warehousing and distribution technical assistance, and delivery of commodities to health sites. In addition, Rwanda's high reporting rate allows for excellent visibility into the performance of the supply chain.

Between July 2022 and June 2023, PMI supported the following activities:

- Distribution of 1,433,760 ACTs; no ACTs were procured because existing ACT stocks were sufficient to cover need due to the substantial decline in malaria cases.
- Collection of samples from all health system levels for ACT quality control.
- MOPDD-led capacity strengthening of health facility staff in the supply chain management of malaria commodities, including:
    - Training of 27 members of the Coordinated Procurement and Distribution System in the use of the Quantification Analytics Tool (QAT).
    - Orienting eight new supply chain staff from MoH and RBC on key supply chain activities.

    - Providing regular capacity strengthening support to the RMS and MOPDD teams in malaria order validation and expiry tracking at all levels of the supply chain.
    - Leading monthly HMIS and electronic logistics management information data triangulation exercises for informed decision making.
- Orientation for the Transforming Rwanda Medical Supply procurement manager on procurement requirements using U.S. government funds, maintenance of quality standards for procured commodities, importation requirements, incident management, key procurement and budget expenditure analysis, and the Coordinated Procurement and Distribution System.
- Development of annual procurement plans for malaria commodities to inform the Resources Management Committee funding allocation meetings as well as funding negotiations between the Rwandan government and funding partners.
- Routine updates of the national supply plans and regular stock status assessments
- Implementation of the pharmaceutical pricing policy to improve availability and accessibility of health commodities.
- Conducting the National Supply Chain Assessment.
- Implementation of the Rwanda pharmaceutical traceability strategy using GS1 global standards, including developing GS1 compliance metrics (pending approval by Rwanda Food and Drugs Authority), developing terms of reference for the GS1 and pharmaceutical traceability TWG (pending approval by Rwanda Food and Drugs Authority), and RMS and *Bureau des Formations Médicales Agréées* du RWANDA using NPC codes.

5.3. Plans and Justification with FY 2024 Funding

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

PMI/Rwanda will continue to support the procurement of ITNs, ACTs and drugs for severe malaria and transmission reduction (see case management section for more details) across all districts and health system levels in Rwanda; warehousing and distribution of malaria commodities; human resource capacity strengthening; supply chain system strengthening; and quality control for ACTs, as described in the recent progress section.

PMI Rwanda will continue to explore the potential of further support to RMS Limited for procurement, warehousing, and distribution of additional malaria commodities beyond ACTs, such as nets.

6. Social and Behavior Change

6.1. PMI Goal and Strategic Approach

PMI's support to MOPDD's Malaria SBC strategy fully aligns with and contributes to the attainment of the goal set in the Rwanda MSP 2020–2024 to reach 85 percent of the population with correct and consistent malaria prevention practices and behaviors by 2024.

PMI supports MOPDD at the national and local level to expand mass media and community-level interpersonal communication activities to increase uptake of vector control interventions, such as correct and consistent ITN use and care, the benefits of and preparation for IRS, and prompt care seeking for fever. At the national level, PMI works with the health promotion TWG and contributes to the development of malaria SBC activities, including malaria messages. PMI also supports the use of radio with national coverage to disseminate malaria messages. PMI supported the update of the Rwanda Social and Behavior Change Strategy for Malaria Control and Prevention, 2022–2024 in 2022.

At the local level, PMI supports SBC implementation in 20 districts, working with health care providers to conduct facility-based education sessions on the importance of consistent ITN use and prompt malaria care seeking and supporting more than 10,000 CHWs to conduct malaria SBC activities on the consistent use of ITNs, ITN care, and the importance of early care seeking in the communities they serve.

6.2. Recent Progress (May 2022–May 2023)

In the last year, PMI supported the updating of the national malaria SBC strategy to align with the MSP 2020–2024. In addition, PMI supported a range of mass media, interpersonal communication, and community mobilization activities focused on malaria prevention and prompt care seeking by emphasizing: (1) the importance of consistent ITN use, hanging, and care as well as mitigating misuse; (2) the importance of early ANC attendance; and (3) prompt care seeking for fever. Specific PMI-supported activities include:

- Disseminating two educational videos (354 flash drives) on prompt care seeking and ITN use to health facilities. Videos are displayed on TV screens in patient waiting areas at health facilities. The videos emphasize the importance of reaching the most vulnerable people (e.g., pregnant women and children under five years of age) and were produced in sign language to increase accessibility and promote health equity.
- Broadcasting of 12 Urunana radio soap opera episodes, conducting 7 radio talk shows, and producing and broadcasting 9 new radio sketches.
- Conducted 56 community outreach events targeting communities with high malaria burdens, reaching 21,945 people.
- Conducted 4,547 health education sessions that reached 119,949 people.
- Coordinated with the Maternal, Child Health and Community Division of the RBC to lead the development and implementation of SBC activities to promote uptake of ANC services and supportive supervision for CHWs to improve community-level care and referral of pregnant women to health facilities for care.

In addition, PMI supports training and capacity strengthening for Rwanda Health Communication Center staff to develop SBC activities at the district and community level.

Despite this progress, challenges remain, as outlined below.

Insecticide-treated nets

Efforts to encourage the correct and consistent use of ITNs at all times is still hampered by several factors, including:

- The perception that it is difficult to sleep under a net when the weather is warm;
- The perception that malaria in older children poses a low risk, leading to caregivers providing more attention to younger children;
- Older children resist sleeping under the nets; and
- Many prefer the conical ITNs over the rectangular ones.

Prompt care seeking

According to a formative assessment conducted in 2019, factors that influence prompt care seeking include:

- A lack of insurance;
- The belief that malaria is not a serious life-threatening disease;
- The belief that people do not need to go to health facilities to seek treatment because that would show that one doesn't believe or trust enough in the healing power of God; and
- Consulting with a traditional healer before seeking care from the formal health system.

Malaria in pregnancy

In the Demographic and Health Survey 2019–2020, approximately 47 percent of women during their last pregnancy reported attending four or more ANC clinic visits. Approximately 30 percent of pregnant women had their first ANC visit after the first trimester. Factors that influence early ANC attendance include:

- Pregnant women being required to be accompanied by their partner to go to first ANC;
- Lack of partner support;
- Stigma to being young or unmarried and pregnant; and
- Embarrassment of having yet another pregnancy.

6.3. 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 Rwanda in FY 2024.

Priorities

While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, the following two behaviors will be prioritized with FY 2024 funds: correct and consistent use of ITNs and prompt care seeking for fever.

Table 4. Priority Behaviors to Address

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Correct and consistent use of ITNs	General population	National and targeted districts and populations	Although ITN use is closely linked to ownership, indicating that there is a strong culture of net use in Rwanda, PMI will continue to support MOPDD to increase ITN use by targeting identified barriers. The 2017 Malaria Indicator Survey showed geographic variations in ITN use among pregnant women (86 percent in North Province compared with 47 percent in East Province). There is a need to continue and strengthen SBC activities countrywide with a special focus on the regions and populations with low ITN use. Specific activities include health education by CHWs and health care providers, community events, and radio dramas and sketches designed to address the factors that influence correct and consistent use of ITN.
Prompt care seeking for fever	General population	National with emphasis on endemic districts	Although care seeking for children with fever slightly increased between the time of the 2017 Malaria Indicator Survey and the 2020 Demographic and Health Survey, it still remains low, especially for prompt care seeking. SBC interventions will continue to emphasize the importance of prompt diagnosis and treatment of malaria to sustain the gains already made and to improve health outcomes. Specific activities include health education by CHWs and health care providers, community events, and radio drama and radio sketches designed to address the factors that influence prompt care seeking for fever.

Additional Support Activities

MOPDD is planning to conduct a Malaria Indicator Survey in late CY 2023, and findings will be used to inform SBC activities.

PMI will continue to provide support for SBC as the program considers the implementation of alternative ACTs as multiple first-line therapy or single low-dose primaquine in select districts.

7. Surveillance, Monitoring, and Evaluation

7.1. PMI Goal and Strategic Approach

The Planning, Monitoring, and Evaluation Unit under the MoH, as well as MOPDD, districts, and health centers use evidence to refine and target malaria control interventions. Consistent with the current Rwanda MSP 2020–2024, PMI supports strengthening surveillance and reporting to provide complete, timely, and accurate information for appropriate decision making at all levels.

Some specific goals include:

- Strengthening reporting systems of routine HMIS and *Système d'information sanitaire des communautés*, or SISCom;
- Strengthening capacity for data quality, analysis, and use;
- Conducting a Malaria Indicator Survey in 2023; and
- Improving reporting by the private sector.

PMI does not directly support the HMIS in Rwanda but does support data collection and reporting through in-service training, supervision, and mentorship of health care workers and data quality assessments. The focus for FY 2024 is to continue increasing community involvement and engagement in malaria control. In addition, MOPDD is working toward obtaining subdistrict-level (sector- or even village-level) data to accurately inform the malaria incidence and deploy more targeted interventions.

Despite the substantial decrease of malaria incidence in several high endemic districts, isolated malaria hotspots remain in districts with lower burdens. CHWs report malaria cases using the SISCom system, but reporting is monthly and therefore is not timely enough when there is an acute increase in cases; MOPDD does not currently use the Integrated Disease Surveillance and Response framework. MOPDD remains interested in enhanced surveillance that will engage CHWs in monitoring and directly reporting suspected acute increases in malaria cases to the district health office for investigation and potential targeted control measures; the enhanced surveillance approach is still in development.

7.2. Recent Progress (April 2022–April 2023)

Rwanda maintained and strengthened reporting of routine malaria data from all levels of health facilities through HMIS and CHWs through SISCom, including:

- Providing technical support to MOPDD to conduct a mid-term review of the MSP 2020–2024, which showed tremendous and steady progress toward epidemiological impact where malaria parasite incidence declined by 76 percent from 2018–2019 to 2021–2022—a reduction exceeding the MSP 2020–2024 goal of reducing malaria morbidity and mortality by 50 percent from 2018–2019 levels;
- Training 28 national trainers on malaria data triangulation, analysis, and use for decision making;
- Supporting coaching of 21 hospital supervisors and 72 community environmental health officers on malaria data quality assurance;
- Conducting data quality assessments in 64 health centers and auditing 709 CHW reports from 347 villages in 63 sectors;
- Piloting a community electronic medical record system and conducting readiness assessment in seven districts; and
- Supporting death audits in 13 hospitals.

7.3. Plans and Justification with FY 2024 Funding

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

PMI supports supervision by MOPDD senior staff of the regional and district levels to spot-check data and work with staff to improve quality and examine local disease burden trends. Supervisory visits are conducted monthly to districts needing extra assistance, and quarterly to all other districts.

PMI will continue supporting data review and quality assessment activities and will continue to support and enhance the following activities:

- Training health facility staff, including surveillance, monitoring, and evaluation officers and data managers on data review, reporting, and quality assessment activities;
- Providing supportive supervision and mentoring at all health levels to improve reporting and overall performance, including enhanced surveillance at the community level by engaging CHWs to monitor and report malaria cases and any increases in incidence, with the data informing and allowing for targeted control measures;
- Conducting data quality assessments and strengthening data reporting to inform programming;
- Conducting malaria death audits;
- Digitalizing the community program in select districts once the MoH rolls out the digitization of the health system; and
- Supporting the pilot, implementation, and scale up of the community electronic medical record system.

Table 5. Available Malaria Surveillance Sources

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

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System						
Malaria Surveillance and Routine System Support	Support to HMIS	*	*	*	*	*	*
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response						
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System	*	*	*	*	*	*
Other	End-user Verification						
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

*Non-PMI funded activities; X: completed activities; P: planned activities.

8. Operational Research and Program Evaluation

8.1. PMI Goal and Strategic Approach

The Rwanda MSP 2020–2024 notes that, although research studies, including program monitoring evaluations, are conducted, the country currently lacks a guiding malaria-specific research agenda. However, the RBC and MOPDD remain actively engaged in the design and implementation of program evaluation and operational research activities, as needed. PMI works with MOPDD, implementing partners, and other donors and research institutions to support relevant program evaluation and operational research designed to provide data to inform RBC and MOPDD programs and policy.

8.2. Recent Progress (July 2022–May 2023)

No PMI-supported operational research or program evaluation is ongoing or has been recently completed.

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

Source of Funding	Implementing institution	Research Question/Topic	Current Status/Timeline
UK Foreign Commonwealth and Development Office	MORU Tropical Health Network	Developing Triple Artemisinin-based Combination Therapies (DeTACT) is a large, 14-site trial in eight African and five Asian countries to study the efficacy, safety, and tolerability of two triple ACT combinations using existing antimalarial drugs	Ongoing/estimated primary completion date December 2023
Bill & Melinda Gates Foundation	MOPDD/Jhpiego	Health facility survey	Health facility survey completed December 2022, data analysis in process
Jhpiego (catalyst funds)	Jhpiego in collaboration with Audere (App developer)	Evaluation of usability and feasibility of a digitally enhanced malaria testing and artificial intelligence tool for quality control of malaria rapid diagnostic testing by CHWs in Rwanda	Completed: study is in the dissemination phase

8.3. Plans and Justification with FY 2024 Funding

No operational research/program evaluation activities are proposed with FY 2024 funding.

9. Capacity Strengthening

9.1. PMI Goal and Strategic Approach

PMI supports a broad array of capacity strengthening activities that cut across intervention areas, such as training of health workers, supply chain management, health information systems strengthening, drug quality monitoring, and heath provider capacity strengthening. PMI also supports laboratory capacity strengthening of MOPDD staff to enable the processing of samples in the country for molecular markers of antimalarial resistance and hrp2/3 deletion activities, and facilitates workshops, training, and conference attendance. PMI will continue to support the MoH and other partners and stakeholders, including the United Nations Children's Fund (UNICEF), to improve digitization of the community health system.

9.2. Recent Progress (July 2022–June 2023)

- PMI trained two malaria specialists as part of the Advanced Field Epidemiology Training Program, including projects on quality assurance of RDTs in Ngoma district, an evaluation of an upsurge in malaria cases, and hospital-based death audits.
- PMI provided TA for the development of abstracts and presentations and support for MOPDD staff to attend the American Society of Tropical Medicine and Hygiene Conference in 2022.
- PMI supported molecular laboratory capacity strengthening via a four-day workshop and hands-on training.

9.3. 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 Rwanda in FY 2024.

PMI will continue to support MOPDD capacity strengthening by attending conferences and workshops, by providing logistical and operational support for TWG meetings, and by strengthening the capacity of RBC laboratories. PMI will also continue its support for the Advanced Field Epidemiology Training Program residents working on malaria projects as well as Peace Corps Response. PMI will continue to support the MoH to digitize the community health system.

10. Staffing and Administration

A minimum of three health professionals oversee PMI in Rwanda. The single interagency team led by the USAID Mission Director or their designee consists of a resident advisor representing USAID, a resident advisor representing the U.S. Centers for Disease Control and Prevention, and one or more locally hired experts known as foreign service nationals. The PMI interagency team works together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

ANNEX: GAP ANALYSIS TABLES

Table A-1. ITN Gap Analysis Table

Calendar Year	2023	2024	2025
Rwandan Government Fiscal Year	**July 2022–June 2023**	**July 2023–June 2024**	**July 2024–June 2025**
Total country population	13,498,800	13,797,269	14,102,202
Total population at risk for malaria	13,498,800	13,797,269	14,102,202
PMI-targeted at-risk population	13,498,800	13,797,269	14,102,202
Population targeted for ITNs	8,022,072	8,199,447	8,380,662
Continuous distribution needs			
Channel 1: ANC	350,969	358,729	366,657
Channel 1: ANC type of ITN	PBO and Single Pyrethroid	Dual AI and PBO	Dual AI and PBO
Channel 2: EPI	350,969	358,729	366,657
Channel 2: EPI type of ITN	PBO and Single Pyrethroid	Dual AI and PBO	Dual AI and PBO
Minimum stock levels for routine ITN	350,969	358,729	366,657
Estimated total need for continuous channels	1,052,906	1,076,187	1,099,972
Mass campaign distribution needs			
Mass distribution campaigns	0	0	4,655,924
Mass distribution ITN type	PBO and Single Pyrethroid	Dual AI and PBO	Dual AI and PBO
Estimated total need for campaigns	0	0	4,655,924
Total ITN need: Continuous and campaign	1,052,906	1,076,187	5,755,895
Partner contributions			
ITNs carried over from previous year	701,700	518,794	1,028,321
ITNs from Global Fund			2,500,000
Type of ITNs from Global Fund	Dual AI and PBO	Dual AI and PBO	Dual AI and PBO
ITNs planned with PMI funding	870,000	1,585,714	1,004,935
Type of ITNs with PMI funding			
Total ITNs contribution per calendar year	1,571,700	2,104,508	4,533,256
Total ITN surplus (gap)	518,794	1,028,321	(1,222,640)

Table A-2. RDT Gap Analysis Table

Calendar Year	2023	2024	2025
Rwandan Government Fiscal year	**July 2022–June 2023**	**July 2023–June 2024**	**July 2024–June 2025**
Total country population	13,498,800	13,797,269	14,102,202
Population at risk for malaria	13,498,800	13,797,269	14,102,202
PMI-targeted at-risk population	13,498,800	13,797,269	14,102,202
RDT needs			
Total number of projected suspected malaria cases	4,462,753	4,016,478	3,815,654
Suspected malaria cases tested with an RDT (%)	50	50	50
RDT needs (tests)	2,231,377	2,008,239	1,907,827
Needs estimated based on HMIS data			
Partner contributions (tests)			
RDTs from government	0	0	0
RDTs from Global Fund	0	6,348,510	
RDTs from other donors	0	0	0
RDTs planned with PMI funding	0	0	0
Total RDT contributions per calendar year	**0**	**6,348,510**	**0**
Stock balance (tests)			
Beginning balance	2,900,789	669,413	5,009,684
- Product need	2,231,377	2,008,239	1,907,827
+ Total contributions (received/expected)	0	6,348,510	0
Ending balance	**669,413**	**5,009,684**	**3,101,857**
Desired end of year stock (months of stock)	14	14	14
Desired end of year stock (quantities)	2,603,273	2,342,945	2,225,798
Total surplus (gap)	**-1,933,860**	**2,666,738**	**876,059**

Table A-3. ACT Gap Analysis Table

Calendar Year	2023	2024	2025
Rwandan Government Fiscal year	**July 2022–June 2023**	**July 2023–June 2024**	**July 2024–June 2025**
Total country population	13,498,800	13,797,269	14,102,202
Population at risk for malaria	13,498,800	13,797,269	14,102,202
PMI-targeted at-risk population	13,498,800	13,797,269	14,102,202
ACT needs			
Total projected number of malaria cases	778,948	701,053	666,000
Total ACT needs (treatments)	767,299	690,569	656,041
Needs estimated based on HMIS data			
Partner contributions (treatments)			
ACTs from government	0	0	0
ACTs from Global Fund	0	0	0
ACTs from other donors	0	0	0
ACTs planned with PMI funding	2,172,240	500,000	1,000,000
Total ACTs contributions per calendar year	**2,172,240**	**500,000**	**1,000,000**
Stock balance (treatments)			
Beginning balance	1,361,572	2,766,513	2,575,944
- Product need	767,299	690,569	656,041
+ Total contributions (received/expected)	2,172,240	500,000	300,000
Ending balance	**2,766,513**	**2,575,944**	**2,219,903**
Desired end of year stock (months of stock)	14	14	14
Desired end of year stock (quantities)	895,182	805,664	765,381
Total surplus (gap)	**1,871,330**	**1,770,279**	**1,454,522**

Table A-4. Injectable Artesunate Gap Table

Calendar Year	2023	2024	2025
Rwandan Government Fiscal Year	**July 2022–June 2023**	**July 2023–June 2024**	**July 2024–June 2025**
Injectable artesunate needs			
Projected number of severe cases	5,998	5,398	5,128
Projected number of severe cases among children	2,399	2,159	2,051
Average number of vials required for severe cases among children	4	4	4
Projected number of severe cases among adults	3,599	3,239	3,077
Average number of vials required for severe cases among adults	12	12	12
Total injectable artesunate needs (vials)	**52,781**	**47,503**	**45,128**
Needs estimated based on HMIS data			
Partner contributions (vials)			
Injectable artesunate from government	0	0	0
Injectable artesunate from Global Fund	0	0	0
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding		145,000	50,000
Total injectable artesunate contributions per calendar year	**0**	**145,000**	**50,000**
Stock balance (vials)			
Beginning balance	97,190	44,409	141,905
- Product need	52,781	47,503	45,128
+ Total contributions (received/expected)	0	145,000	50,000
Ending balance	**44,409**	**141,905**	**146,777**
Desired end of year stock (months of stock)	14	14	14
Desired end of year stock (quantities)	61,578	55,421	52,650
Total surplus (gap)	**-17,170**	**86,485**	**94,127**