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Rwanda

Malaria Operational Plan FY 2023

Suggested Citation: U.S. President's Malaria Initiative Rwanda Malaria Operational Plan FY 2023. Retrieved from www.pmi.gov

This FY 2023 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 2023 appropriation from the U.S. Congress. Any updates will be reflected in revised postings.

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

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based Combination Therapy
AI	Active Ingredient
AL	Artemether-lumefantrine
ANC	Antenatal Care
CHW	Community Health Worker
DDT	Dichlorodiphenyltrichloroethane
DP	Dihydroartemisinin-piperaquine
EPI	Expanded Program on Immunization
FY	Fiscal Year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GOR	Government of Rwanda
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 Mosquito 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
QAT	Quality Analytics Tool
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
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

To review specific country context for Rwanda, please refer to the Rwanda Country Malaria Profile, which provides an overview of the country 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 24 countries in sub-Saharan Africa and three programs across the Greater Mekong Subregion 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.[2] PMI's support is closely aligned with the Rwanda Malaria Strategic Plan (MSP) 2020–2024, which is based on risk stratification to target malaria control interventions and a multi-sectoral collaboration for malaria response. Malaria incidence in Rwanda has declined from a recent high of 403 cases per 1,000 persons per year in 2016/2017 to 114 cases per 1,000 persons per year in 2020/2021, a decline of more than 70 percent. PMI's new five-year strategy, "End Malaria Faster," 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 2023 PMI funding for Rwanda is $19 million. PMI will support the national malaria control program, which is called the Malaria and Other Parasitic Diseases Division (MOPDD), through the following intervention areas with these funds:

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[1] Rwanda Ministry of Health (2020). Rwanda Malaria and Neglected Tropical Diseases Annual Report 2020–2021.

[2] Rwanda Ministry of Health (2020). Rwanda Malaria Strategic Plan 2020–2024.

1. Vector Monitoring and Control

PMI, along with other partners, supports the MOPDD's integrated vector management approach including entomological monitoring, indoor residual spraying (IRS), procurement and distribution of insecticide-treated mosquito nets (ITNs) through mass campaigns and continuous distribution at first antenatal care (ANC) and first Expanded Program on Immunization (EPI) clinic visits, and ITN durability monitoring. With FY 2023 funding, PMI will continue to support entomological monitoring with the collection of vector bionomics and insecticide resistance monitoring in 12 sites in 12 districts; IRS in three districts; quality control and assessment of IRS in three districts; and procurement, warehousing, and distribution of ITNs for mass campaigns and continuous distribution. PMI will also continue to provide technical support to Global Fund to Fight AIDS, Tuberculosis and Malaria and Government of Rwanda vector monitoring and control activities, including biological resistance monitoring in 30 sites in 23 districts.

2. Malaria in Pregnancy

Rwanda's malaria in pregnancy (MIP) strategy follows World Health Organization recommendations to prevent, promptly detect, and treat malaria in pregnant women. The MOPDD does not support intermittent preventive treatment for pregnant women (IPTp) because of continued evidence of resistance to sulfadoxine-pyrimethamine. With FY 2023 funding, PMI will continue to support the MOPDD through assistance with national coordination of MIP activities, procurement and distribution of ITNs to all pregnant women at first ANC and caregivers at first EPI visits (see Vector Monitoring and Control Section), and ensuring training, supervision, and capacity building of health care providers at ANC and for 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 Rwanda MSP 2020–2024 objective to maintain 100 percent prompt testing and treatment of all suspected malaria cases and in line with the national treatment guidelines (2020), PMI supports funding for national-level policy and programmatic activities, commodity procurement, and improvement of facility and community-level health worker performance. With FY 2023 funds, PMI will continue to support the national-level case management activities; capacity building at the national reference laboratory; procurement of artemisinin-based combination therapies (ACTs) and injectable artesunate; training, supervision, and mentoring among facility-based and community health workers; and monitoring ACT efficacy through a therapeutic efficacy study. Additionally, PMI will support the MOPDD to pilot implementation of single low-dose

primaquine and multiple first-line therapies in select districts in an attempt to mitigate the spread and impact of documented artemisinin partial resistance in Rwanda (see Case Management section for more details).

5. Health Supply Chain and Pharmaceutical Management
PMI supports the Rwanda Medical Supply and the 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 2023 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. 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 dissemination of the messages through various channels, including radio and interpersonal communication. With Malaria Operational Plan (MOP) 2023 funds, PMI will continue to support SBC activities focused on ITN use and prompt care-seeking at the community level using community health workers (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.

7. 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 the 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 2023 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 selected districts.

8. Operational Research and Program Evaluation

PMI works together with the MOPDD, implementing partners, and other donors and research institutions to support relevant program evaluation and operational research that is 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 proposed with FY 2023 funding.

9. Capacity Strengthening

PMI supports an array of capacity strengthening activities which cut across intervention areas, such as training of health workers, supply chain management, health information systems strengthening, drug quality monitoring, and health provider capacity building. PMI also supports laboratory capacity building of MOPDD staff to enable the processing of samples in the country for molecular markers of antimalarial resistance and hrp2/3 deletion activities and facilitate workshops, training, and conference attendance. With FY 2023 funds, PMI will continue its support for MOPDD capacity building via conferences and workshop attendance, country level coordination through TWGs, and strengthening the laboratory capacity building at the RBC. PMI will also continue its support for the Field Epidemiology Training Program residents working on malaria-specific projects and the Peace Corps Response. Lastly, PMI will continue to support the Ministry of Health and other partners and stakeholders to digitize the community health platform.

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 2023 Malaria Operational Plan (MOP) presents a detailed implementation plan for Rwanda, based on the strategies of PMI and the national malaria control program, which is called the Malaria and Other Parasitic Diseases Division (MOPDD). This MOP was developed in consultation with the MOPDD and with the participation of national and international partners. PMI is proposing activities that build on partner investments to improve and expand malaria-related services, including investments by 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 2023 funding. For more detailed information on the country context, please refer to the Rwanda Country Malaria Profile, which provides an overview of Rwanda's malaria situation, key indicators, the MOPDD strategic plan, and the partner landscape.

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

The U.S. President's Malaria Initiative is led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention. Launched in 2005, PMI supports implementation of malaria prevention and treatment measures—insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs), intermittent preventive treatment of pregnant women (IPTp), and drug-based prevention—as well as cross-cutting interventions such as surveillance, monitoring and evaluation; social and behavior change (SBC); and capacity strengthening. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 24 countries in sub-Saharan Africa and three programs in the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Over the next five years, PMI aims to save lives, reduce health inequities, and improve disease surveillance and global health security.

Under the strategy, and building upon the progress to date in PMI-supported countries, PMI will work with 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 12.9 million people is at risk for malaria, with pregnant women, children under five years of age, and refugees among the most vulnerable groups.[5] Between 2005 and 2011, Rwanda's scale-up of interventions successfully reduced malaria 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 during the period 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

[3] Rwanda Ministry of Health (2020). Rwanda Malaria and Neglected Tropical Diseases Annual Report 2020-2021.
[4] Rwanda Ministry of Health (2020). Rwanda Malaria Strategic Plan 2020-2024
[5] Ibid.
[6] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7539391/pdf/12936_2020_Article_3407.pdf

persons per year (2012) to 403 per 1,000 (2016), and an increase in malaria mortality by 41 percent during this period.[7] The MOPDD identified several potential factors leading to the upsurge in malaria cases. These included increased rainfall, increased water bodies and irrigation with 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.[2] In response, the MOPDD developed and implemented a Malaria Contingency Plan in 2016 based on mapping and risk stratification. The plan included universal coverage of ITNs, IRS in 12 high burden districts, 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 a multi-sectoral collaboration for malaria response.[3] Malaria incidence subsequently has declined to 114 cases per 1,000 persons per year in Rwanda fiscal year (FY) 2021 (July 2020 to June 2021), with a concomitant reduction in the national slide positivity rate from 44 percent in FY 2018/2019 to 27 percent in FY 2020/2021.[8] The MOPDD continues to utilize routine data, population-based surveys, and special studies (e.g., entomological monitoring, therapeutic efficacy studies) to inform quarterly multisectoral review meetings at national and regional levels and annual national joint assessments, and develops annual malaria action plans and implementation reports in collaboration with partners and stakeholders. The current Malaria Strategic Plan (MSP) continues through calendar year 2024, and an end term review will help guide the next MSP.

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 the 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 Government of Rwanda (GOR) and the Global Fund. The three areas of programmatic difference are that PMI

[7] Rwanda Ministry of Health (2017). Revised National Malaria Contingency Plan 2016–2020.
[8] Rwanda Ministry of Health (2020). Rwanda Malaria and Neglected Tropical Diseases Annual Report 2020–2021.

does not support larval source management nor the procurement of dual antigen rapid diagnostic tests (RDTs), and the MOPDD does not support IPTp because of continued evidence of resistance to 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 PMI-supported Antimalarial Resistance Monitoring in Africa initiative to conduct therapeutic efficacy studies (TES) and build national laboratory capacity. In geographically targeted areas, PMI supports IRS implementation in three districts, while the GOR and the Global Fund support nine districts. PMI, along with the Global Fund, supports the procurement and distribution of ITNs for mass campaigns and continuous distribution nationwide with subnational targeting of net type based on risk stratification (see Rwanda Country Malaria Profile for more detail). PMI supports case management activities at the health facility and community level in 22 of 30 districts.

PMI's new five year strategy, "End Malaria Faster" 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 GOR changed its policy to open 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 2021, and malaria deaths decreased by approximately 65 percent in the same period. Currently, Rwanda has an estimated 58,000 community health workers (CHWs) but only half of the CHWs, called *binômes*, are eligible to be trained and able 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 Sante Maternelle,* who are in charge of maternal health. The MOH, however, has proposed new changes 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, as if one CHW is unavailable, community members can seek care from other colleagues. PMI, through the PMI-supported Antimalarial Resistance Monitoring in Africa Network, supports the strengthening of the National Reference Laboratory capacity for molecular testing and onsite TA and mentorship for necessary techniques such as drug sensitivities studies. The GOR and the 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 2023 Rwanda MOP remain consistent with the prior year's strategies and activities. A few notable changes include increased procurement of ITNs in concert with the 2023/2024 ITN mass campaign, support to two pilot interventions designed to help address partial artemisinin resistance, and increased support to routine surveillance activities, especially enhanced surveillance in lower burden districts as malaria incidence continues to markedly decline. The two pilot interventions being developed are: 1) single low-dose primaquine (SLDPQ) treatment in addition to routine ACT for confirmed malaria cases. This will be conducted in three to five districts with documented parasite resistance or low malaria transmission to help mitigate forward transmission of resistant parasites and further reduce transmission; and 2) the use of a different first-line therapy (dihydroartemisinin-piperaquine, or DP) as a multiple first-line treatment approach to protect and preserve the efficacy of ACT partner drugs in Rwanda. Both of these pilots are in development with plans to implement them using earlier year PMI funding through reprogramming.

II. OPERATIONAL PLAN FOR FY 2023

1. Vector Monitoring and Control

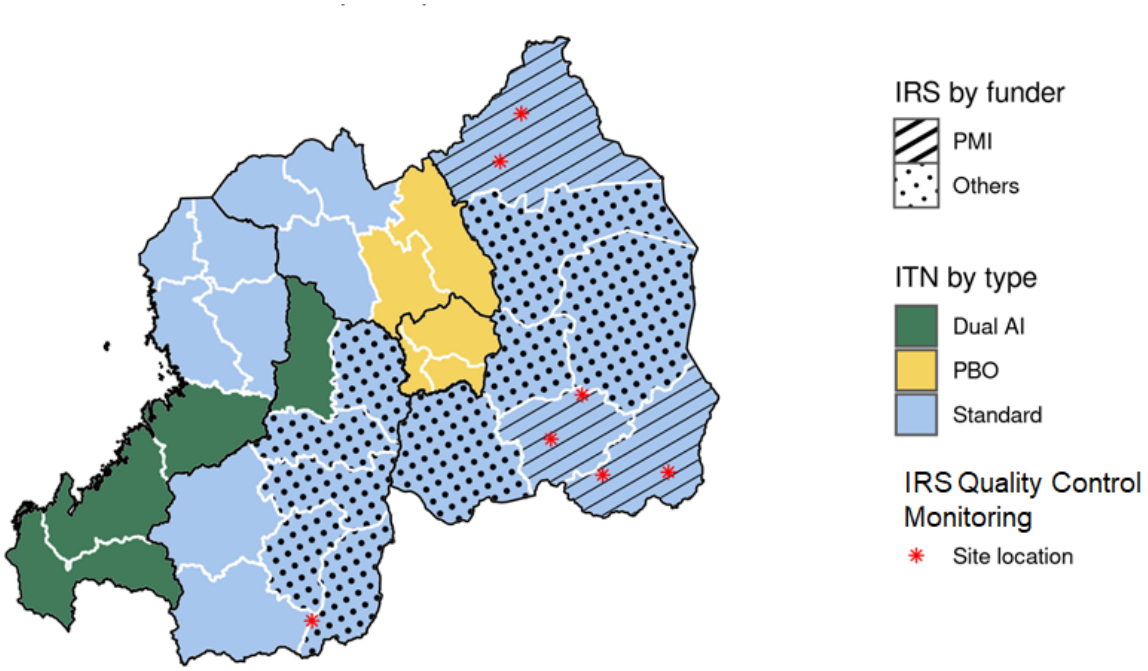
1.1. PMI Goal and Strategic Approach

The Rwanda MSP 2020–2024 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. The MOPDD objective is to ensure that at least 85 percent of the population is protected by preventive interventions by 2024.

PMI supports the 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 national with quantification and distribution based on one net per 1.8 people, and 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. The MOPDD, PMI, and the Global Fund work closely together to coordinate ITN procurement and distribution.

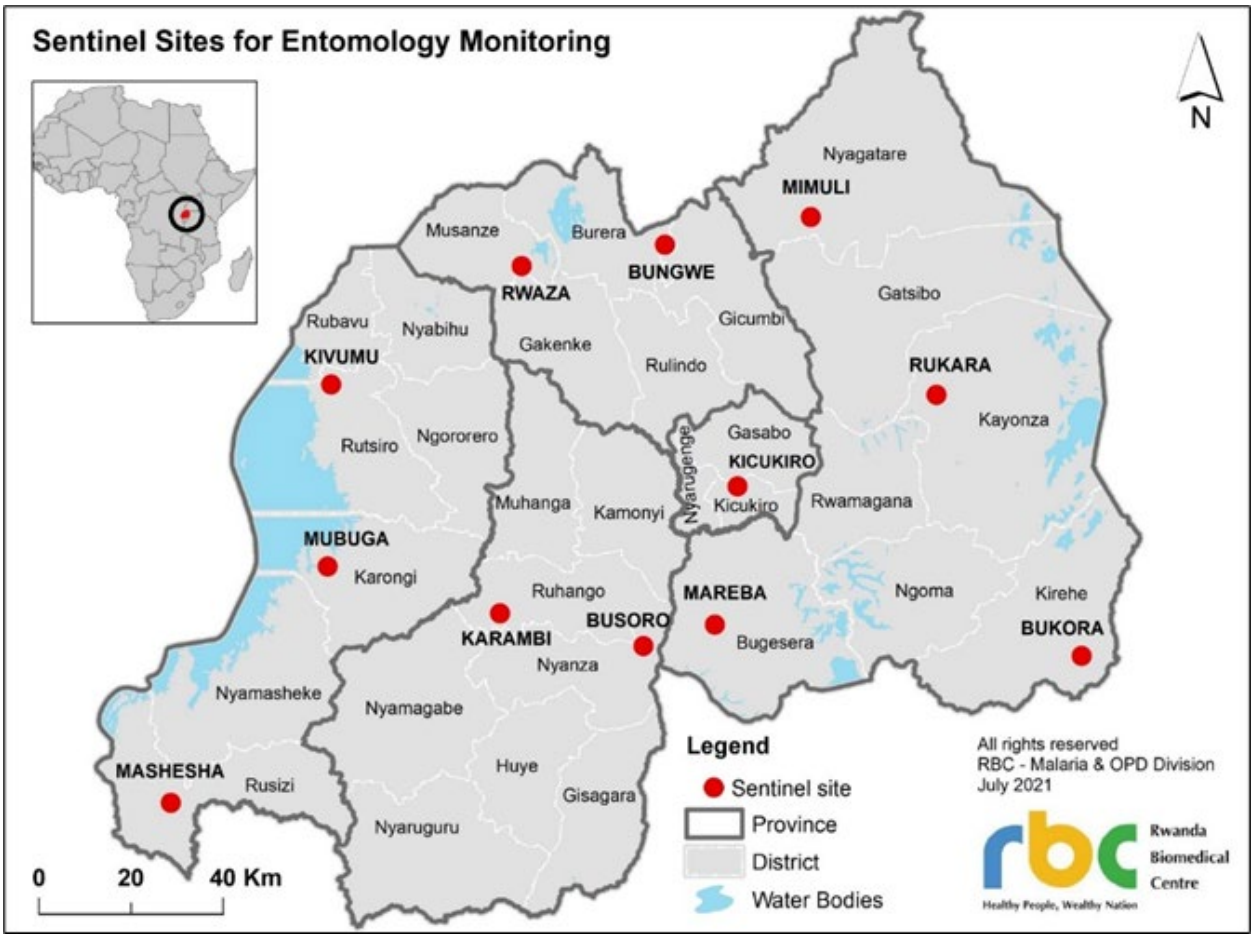
PMI also supports the MOPDD with IRS operations within the context of an insecticide resistance program and in a complementary way with other partners. IRS is conducted as funding permits, with an emphasis on prioritizing those districts with the highest burden of malaria and those that have previously received IRS. In the last few years, the 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 GOR and Global Fund support nine districts. To maintain and promote community acceptance, the MOPDD employs an insecticide resistance mitigation plan, community mobilization, and SBC activities with all IRS implementation.

Figure 1a. Map of IRS Sites, IRS Quality Control Monitoring, and ITN Types (Mass Campaign) in Rwanda in 2021



ITN by type: dual AI is dual active ingredient, and PBO is piperonyl butoxide

Figure 1b. Map of Entomological Monitoring Sites in Rwanda



1.2. Recent Progress (between July 2021 and June 2022)

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 3,374,200 standard and piperonyl butoxide (PBO) ITNs that were delivered in the country between July 2021 and June 2022. These nets are being distributed in 18 districts through the continuous distribution system to pregnant women at first ANC and children under one year of age at first EPI visit, and through mass campaigns.

- 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®, PermaNet® 3.0) from 3,353 cohort nets distributed in 2020 in support of 24-months ITN durability monitoring.
- SBC activities in target districts and also 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 346,277 structures and protecting 1,340,280 people from malaria, including training 3,080 community members and other cadres for IRS mobilization and spray activities.
- TA to the MOPDD, the Global Fund Principal Recipient, and district health offices to plan, train, supervise, and implement IRS in nine districts.

1.3. Plans and Justification for FY 2023 Funding

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

1.3.1. Entomological Monitoring

PMI, in collaboration with the Global Fund and the GOR, will continue to support routine entomological monitoring as described in the Recent Progress section (1.2) in 12 sentinel sites, including districts that have received dual active ingredient (AI) and piperonyl butoxide (PBO) ITNs. PMI also will continue to support quality control of IRS in selected districts.

Summary of Distribution and Bionomics of Malaria Vectors in Rwanda

In 2021, the primary vector in the IRS districts was *Anopheles arabiensis,* which comprised 96 percent of *Anopheles* mosquitoes collected, while the primary vector in non-IRS districts was *An. gambiae* s.s., which comprised 59 percent of *Anopheles* mosquitoes collected. Secondary vectors included *An. pharoensis, An. ziemanni*, and *An. rufipes*. Peak transmission season was from May–June and November–December. The preferred biting location of the primary vector was outdoors in IRS districts (69 percent) and in non-IRS districts (51 percent). The preferred resting location was indoors. In the IRS districts, the preferred hosts were bovine (46.7 percent) and 26.7 percent human, while in the non-IRS districts 62.5 percent of bloodfed mosquitoes had fed on humans.

Status of Insecticide Resistance in Rwanda

Resistance monitoring was carried out in 30 sites across Rwanda from September 2020 to May 2021. *An. gambiae* s.l. were tested against eight standard doses of insecticides: deltamethrin (0.05 percent), permethrin (0.75 percent), alpha-cypermethrin (0.05 percent),

pyrimiphos methyl (0.25 percent), bendiocarb (0.1 percent), fenitrothion (1 percent), dichlorodiphenyltrichloroethane (DDT) (4 percent), and chlorfenapyr (200µg). Confirmed resistance was found for deltamethrin in 11 of the sites, permethrin in 25 of the sites, alpha-cypermethrin in 15, and DDT in six of the tested sites. Resistance was also confirmed in one of the sites for pyrimiphos methyl and two sites for bendiocarb. Full susceptibility was observed for fenitrothion and chlorfenapyr. PBO restored susceptibility in 50 percent of the sites for deltamethrin, 55 percent of sites for permethrin, and 67 percent for alpha-cypermethrin.

Resistance intensity was also tested in 25 sites where resistance at diagnostic doses was confirmed. The intensity assays were performed at 5x and 10x times the diagnostic dose, except for deltamethrin where only 10x was used. The intensity of resistance to deltamethrin was found to be high in three sites and moderate in eight sites (at 10x ≥ 98 percent mortality = moderate intensity, < 98 percent mortality = high intensity). Permethrin resistance intensity was low in 14 sites and moderate in 11 sites. Resistance to alpha-cypermethrin was high in 1 site, low in 11 sites, and moderate in 3 sites.

1.3.2. Insecticide-treated Mosquito Nets

PMI will continue to support the MOPDD to conduct ITN activities as described in the Recent Progress section (1.2).

Please see the Social and Behavior Change 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 at last EPI visit. Multiple types of ITNs are distributed during mass campaigns and through continuous distribution channels based on disease endemicity and IRS implementation. In 2020, five districts received PBO nets during the mass campaign, while four districts received dual AI nets as part of the ongoing new nets projects study. All the remaining districts received standard nets. There are plans to distribute PBO nets in 15 districts during the 2023/2024 mass campaign and standard nets in three low burden districts with low or no resistance to pyrethroids. The specific districts will be determined in 2023.

For FY 2023, the country will need an estimated 4,083,060 ITNs. The MOH and MOPDD are aware of a potential gap between supply and demand and will work to identify additional resources to procure 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 2023/2024 mass campaign and the continuous distribution channel. Based on available

PMI funding, PMI plans to procure 1,150,000 ITNs in FY 2023, which is an increase from prior years, primarily to support the mass campaign. PMI will continue to coordinate with the MOH, MOPDD, and the Global Fund to ensure that ITN gaps are addressed through GOR 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, the 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	Sites	Brand	Baseline	12-month	24-month	36-month
Feb. 2020	Burera (Northern Province)	Olyset® Net Standard ITN	Sept. 2020	May – June 2021	March 2022	Planned
June 2020	Karongi (Western Province)	Interceptor® G2	Sept. 2020	May–June 2021	March 2022	Planned
Feb. 2020	Kicukiro (Kigali City)	PermaNet® 3.0 PBO ITN	Sept. 2020	May–June 2021	March 2022	Planned
Feb 2020	Ruhango (Southern Province)	Yahe® LN Standard ITN	Sept. 2020	March 2022	June 2022	Planned

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 districts).

Table 2. PMI-supported IRS Coverage

Calendar Year	District	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide
2021	Kirehe, Ngoma, Nyagatare districts	346,277	99 percent	1,340,280	Fludora® Fusion (clothianidin and deltamethrin)
2022	Kirehe, Ngoma, Nyagatare districts (planned)	346,277 (target)	TBD	TBD	Organophosphate currently planned
2023*	Kirehe, Ngoma, Nyagatare districts (planned)	TBD	TBD	TBD	TBD
2024*	Kirehe, Ngoma, Nyagatare districts (planned)	TBD	TBD	TBD	TBD

* Planned

IRS Insecticide Residual Efficacy in Rwanda

Wall bioassays were conducted monthly following the 2021 IRS campaign at seven sites. Test results indicated that Fludora® Fusion (clothianidin and deltamethrin) maintained residual efficacy for at least 10 months.

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, except that the MOPDD does not support IPTp because of continued evidence of resistance to sulfadoxine-pyrimethamine. The MOPDD 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 (47 percent).[9] 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 first ANC, lack of partner support, stigma with being young or unmarried and pregnant, and

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

embarrassment of having yet another pregnancy (formative research report 2019). Additionally, COVID-19 contributed to the decline in the first ANC attendance, especially in early 2020.[10] The Maternal, Child Health and Community Division of the RBC is focusing activities to promote early initiation and uptake of ANC services and, in collaboration with the 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 first ANC and caregivers at their child's first EPI visit, and capacity building of health care providers at ANC and in management of clinical malaria during pregnancy (see Case Management section for additional details).

2.2. Recent Progress (between July 2021 and June 2022)

Between July 2021 and May 2022, PMI supported the following activities:

- Development and dissemination of an MIP training manual and supportive supervision tool.
- Three national malaria TWG meetings; TWG meetings are not technical topic-specific and MIP was included in each of the three TWG meetings.
- Procurement and distribution of 3,374,200 standard and PBO ITNs through ANC and EPI nationwide (see ITN section).
- 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 during every ANC visit.
- Supportive supervision and mentorship by 650 mentors to 9,233 Agents de Sante Maternelle, who are CHWs in charge of maternal health, to sensitize pregnant women in their respective villages on the benefits of sleeping under ITNs, refer pregnant women to the facility during first ANC contact and seek care early in case of fever.
- Training 587 health care providers in malaria treatment including MIP, and quarterly supportive supervision and mentorship for case management of malaria in pregnant women for 2,304 facility-based health workers in 330 health facilities.
- MOPDD led two rounds of MIP specific supportive supervision in 10 districts using MIP supervision tools and checklists. Assessed competencies remained high compared to the prior year assessment with 85 percent and 72 percent of observed

[10] Wanyana D, Wong R, and Hakizimana D. Rapid assessment on the utilization of maternal and child health services during COVID-19 in Rwanda. Public Health Action. 2021 Mar 21; 11(1): 12–21.

health workers demonstrating competencies in the prevention of MIP and treatment of malaria in pregnancy, respectively.

2.3. Plans and Justification for FY2023 Funding

The FY 2023 funding tables contain a full list of malaria in pregnancy activities that PMI proposes to support in Rwanda with FY 2023 funding. Please visit www.pmi.gov/resources/malaria-operational-plans-mops for these FY 2023 funding tables.

With FY 2023 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.

Please see the Social and Behavior Change section for details on challenges and opportunities to improve MIP intervention uptake or maintenance, including ITN use and ANC attendance.

3. Drug-based Prevention

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

4. Case Management

4.1. PMI Goal and Strategic Approach

The MSP 2020–2024 objective for case management is to maintain 100 percent prompt testing and treatment of all suspected malaria cases in line with the National Malaria Treatment Guidelines (2020). The MSP and National Malaria 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 an ACT for all confirmed cases of uncomplicated malaria, and pre-referral 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 Rwanda National Malaria 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 GOR 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 in health facilities in 22 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 more 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 57 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 GOR have a national policy to pay CHWs. However, the MOH utilizes a strategy of performance-based incentives for CHWs who meet outlined goals. The biggest current challenge faced by the community health system is the paper-based system used by the CHWs. To address this, PMI and other partners are working with the MOH to support the digitalization of community health.

Although not included in the MSP 2020–2024 or National Malaria Treatment Guidelines, the MOPDD has been discussing with PMI, WHO, and other global stakeholders the implications of and strategies to address the TES findings of increasing prevalence of the *k13* 561H mutation associated with delayed parasite clearance.[11,12] The MOPDD is planning to pilot the use of SLDPQ in three to five districts which have a documented presence of parasites with the *k13* 561H mutation or with documented low to very low malaria transmission. Additionally, the 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 DP, the current second-line treatment option, will be used in a number of the remaining districts (yet to be determined).

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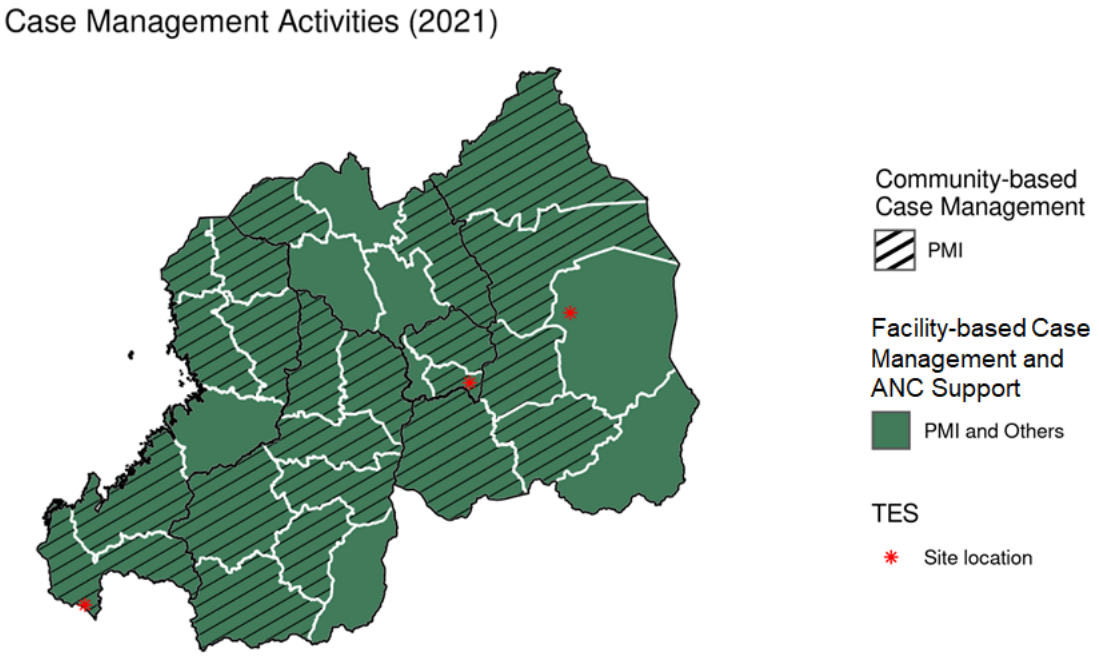
[11] Uwimana A, Legrand E, Stokes BH et al. Emergence and clonal expansion of in vitro artemisinin-resistant Plasmodium falciparum kelch13 R561H mutant parasites in Rwanda. Nat Med. 2020 Oct;26(10):1602-1608. doi: 10.1038/s41591-020-1005-2.

[12] Uwimana A, Umulisa N, Venkatesan M et al. 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. 2021 Aug;21(8):1120-1128. doi: 10.1016/S1473-3099(21)00142-0.

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



Map shows districts in Rwanda where PMI supports case management and malaria in pregnancy, which is in all 30 districts, and community health (iCCM, HBM) which is in 22 districts across the country except for two districts in the southeast, three in the north-central region, one central, one southern and one western, the remaining eight districts are supported by GOR and the Global Fund. Map also shows the three TES sites.

4.2. Recent Progress (between July 2021 and June 2022)

National-Level Case Management Activities

- Supported hree national-level technical working group (TWG) meetings. Case management was included in each of the three TWG meetings, which were held virtually.
- Developed malaria case management training materials.
- Trained 86 laboratory technicians from seven districts 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 pre-training to 83 percent post-training.
- Supported MOPDD-led quarterly reporting and planning workshops with malaria stakeholders.
- The GOR and MOPDD reviewed CHW retention policies.

- Assisted the MOPDD to design and conduct a nationwide health facility survey funded by the Bill and Melinda Gates Foundation.

Commodities

- Supported the procurement of 1,684,020 ACTs, of which 983,040 were delivered between June 2021 and July 2022. This accounts for 100 percent of MOPDD needs.
- Supported the procurement of 85,593 doses of injectable artesunate.
- 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

- Supported the case management refresher training for 5,064 health care providers in 20 districts, necessitated by the fact that in November 2020, the malaria treatment guidelines were revised and new guidelines released (National Malaria Treatment Guidelines, 2020, 4th version). Briefly, the revised treatment guidelines introduced the use of rectal artesunate during pre-referral for severe malaria cases in children from 6 months to 6 years of age at the community level and recommended revised dose of parenteral artesunate in young children weighing <20kg.
- Trained 587 health care providers in malaria treatment and additional 299 providers through on-the-job training.
- Trained 95 providers as trainers on the 4th version of the National Malaria Treatment Guidelines.
- Distributed 779 updated National Malaria Treatment Guidelines in 325 health centers and 26 hospitals.
- Supported the development of five malaria-specific training manuals: basic facts about malaria; case management, including MIP; malaria prevention and vector control; supply chain management of malaria drugs and commodities; and M&E and surveillance.
- Conducted supportive supervision and data quality assessment in 140 health posts, which included 17 private health posts.
- Conducted 26 data quality assessments: 3 at hospitals, 5 at health centers, and 18 at the community level.

Community Level

- Trained 650 mentors/supervisors in on-site training and supportive supervision for CHWs.
- Conducted on-site training and supportive supervision, reaching 15,452 CHWs.

- Mentored and reached 19,617 CHWs through coordination meetings.
- Reviewed and distributed 325 iCCM/HBM mentorship tools and printed and distributed 13,945 reporting tools for CHWs.
- Supported the design, training, and piloting of an eLearning platform for CHWs with iCCM and HBM course content; 64 CHWs in two pilot districts (Ngoma and Rutsiro) were trained.

Please note that recent progress with monitoring antimalarial efficacy and the TES approach is presented in the Plans and Justification for FY 2023 Funding section below.

4.3. Plans and Justification for FY 2023 Funding

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

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 (4.2). PMI will also support molecular analysis of TES 2022 samples and the preparations of a TES in sentinel sites to monitor emergence of antimalarial drug resistance. In addition, as noted in the "PMI Goal and Strategic Approach" section above (4.1), PMI plans to continue support two pilot interventions: SLDPQ and multiple first-line therapies. Both of these pilots are still in development with plans to be implemented using earlier year PMI funding through reprogramming. PMI support will likely focus on commodity procurement (e.g., primaquine, DP) and training, supervision, and monitoring of the implementation in the selected districts.

Commodities

PMI will continue procurement to meet the national need of ACTs, including AL and DP as determined by the pilot implementation, and injectable artesunate, and primaquine as determined by the second pilot implementation for the selected districts. Because of prior year support and marked reduction in malaria cases, PMI does not plan to procure diagnostic commodities with FY 2023 funds, but PMI will coordinate with the MOPDD to reassess diagnostic commodity supplies and reprogram funds if necessary. The GOR and Global Fund will continue to procure RDTs.

Please refer to the **ACT, RDT, injectable artesunate, and artesunate suppository Gap Analysis Tables** in annex for more detail on planned quantities and distribution channels.

Facility Level

PMI will continue to provide support for training, tools and job aids, SBC, and supportive supervision to health facilities nationwide as described in the Recent Progress section (4.2). PMI will also support any augmented health worker training and supervision to maintain and possibly scale up implementation of single low dose primaquine and DP as an alternate first-line treatment in health facilities building upon pilot implementation (FY 2022 planned reprogramming) in selected districts.

Community Level

Rwanda will continue to support the activities described in the Recent Progress section: provide support for training, tools and job aids, and supportive supervision to CHWs. PMI also will support any augmented CHW training and supervision to maintain and possibly scale up implementation of single low dose primaquine and DP as an alternate first-line treatment through iCCM and HBM, building upon pilot implementation (FY 2022 planned reprogramming) in selected districts.

Monitoring Antimalarial Efficacy

Table 3. Ongoing and Planned Therapeutic Efficacy Studies

Year	Site name	Treatment arm(s)	Plan for laboratory testing of samples
2021–2022	Bugarama, Masaka, Ngoma*	AL, DP	MOPDD/ Rwanda Biomedical Center
2022–2023	TBD	Artesunate-pyronaridine	MOPDD/ Rwanda Biomedical Center

AL = artemether-lumefantrine; DP = dihydroartemisinin-piperaquine

*Ngoma replaced Rukara in early 2022 due to reduced malaria cases in Rukara that led to no recruitment of patients.

Other Planned Case Management Activities

In FY 2022, the MOPDD is planning to evaluate the efficacy, safety, and tolerability of artesunate-pyronaridine as a potential future alternative first-line treatment option. The study will be supported by other stakeholders, but PMI will provide TA for the implementation and data analysis. For additional details, please see Table 6 below: Non-PMI-funded Operational Research/Program Evaluation Studies Planned/Ongoing in Rwanda.

5. Health Supply Chain and Pharmaceutical Management

5.1. PMI Goal and Strategic Approach

The GOR, through the MOPDD, emphasizes the development and regular use of comprehensive malaria commodity needs assessments and timely procurement plans to avoid stockouts, expiries, or delays in implementation of key malaria interventions. The

GOR also regularly triangulates data between the health management information system (HMIS) and the electronic Logistics Management Information System to help with forecasting, understanding unmet need, and comparing services data and consumption data, which all help to build efficient procurement strategies to the supply chain. PMI supports the MOPDD in the procurement of key malaria commodities across all districts and health system levels in Rwanda, namely ACTs, drugs for severe malaria, and ITNs. PMI also supports net distribution and capacity building 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 commodities stockout reduction strategy.

PMI supports the Rwanda Medical Supply (RMS) through assisting with operationalization of RMS Limited and supporting RMS to improve efficiencies and storage capacity via TA. PMI supports the MOH with quality management improvement approaches at all levels of the supply chain. Finally, the RMS is supported in management information systems initiatives to strengthen the MOH's oversight of the supply chain and ability to plan for and respond to changes in demand.

5.2. Recent Progress (between May 2021 and May 2022)

PMI's principal supply chain investments aimed at improving malaria commodity availability at service delivery sites included the procurement of malaria commodities (i.e., AL, drugs for severe malaria, ITNs), 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 great visibility into the performance of the supply chain. In conjunction with these interventions, the annual average stockout rate for antimalarials at service delivery points decreased from 1.15 percent in 2020 to 0.70 percent in 2021, demonstrating high likelihood of availability of needed commodities at health facilities.

Between July 2021 and June 2022, PMI supported the following activities:

- The procurement of 1,684,020 ACTs, of which 983,040 were delivered in this time period.
- Collection of samples from all health system levels for ACT quality control
- Rescheduling of deliveries of AL 6x1 (120,000 blisters), AL 6x2 (185,000 blisters), AL 6x3 (95,880 blisters), and AL 6x4 (300,000 blisters) to respond to larger than anticipated reductions in malaria cases, and to avoid overstocking and potential expiry.

- MOPDD-led capacity strengthening of health facility staff in the supply chain management of malaria commodities, including:
    - Trained 17 members of the Coordinated Procurement and Quantification System, including three staff from the MOPDD, in the use of the Quantification Analytics Tool (QAT).
    - Provided regular capacity building support to RMS and MOPDD team in malaria order validation and expiry tracking at all supply chain levels.
    - Led monthly HMIS and electronic Logistics Management Information System data triangulation exercises for informed decision-making.
- Onboarding of malaria supply plan data into QAT pipeline databases for public sector and social marketing.
- Development of annual procurement plans for malaria commodities to inform the Resources Management Committee funding allocation meetings as well as funding negotiations between the GOR and funding partners.

5.3. Plans and Justification with FY 2023 Funding

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

PMI Rwanda will continue to support the procurement of ACTs and drugs for severe malaria and transmission reduction (see Case Management section for more details), and ITNs across all districts and health system levels in Rwanda; warehousing and distribution of malaria commodities; human resource capacity building; supply chain system strengthening; and quality control for ACTs, as described in the Recent Progress section (5.2).

In collaboration with other USAID health programs, PMI Rwanda will explore the possibility of supporting an independent commercial parastatal for procurement, warehousing, and distribution to enhance capacity and self-reliance. This is a strategic evolution toward supporting the GOR to develop a more self-sufficient and sustainable supply chain operation, complemented with expert, external technical assistance and partnership with the Global Fund and other national supply chain stakeholders.

6. Social and Behavior Change

6.1. PMI Goal and Strategic Approach

PMI's support to the MOPDD's Malaria SBC Strategy fully aligns with and contributes to the attainment of the goal set in the Rwanda MSP 2020–2024 for SBC reaching 85

percent of the population with correct and consistent malaria prevention practices and behaviors by 2024.

PMI supports the 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 messages. PMI also supports the use of radio broadcasts with national coverage to provide malaria-related prevention promotion messages. PMI is currently supporting an ongoing update of the malaria SBC strategy.

At the local level, PMI supports SBC implementation in 20 districts, working with health care providers to provide education sessions that include malaria messages on the importance of consistent LLIN use and prompt malaria care-seeking and supporting more than 10,000 CHWs to provide malaria messages to the communities they serve. CHWs share messages on consistent use of ITNs, how to care for ITNs, and the need for early care-seeking.

PMI support of SBC focuses broadly on prevention and prompt diagnosis and treatment of malaria.

6.2. Recent Progress (between April 2021 and April 2022)

PMI supported the following SBC activities:

- Messaging via mass media
- Interpersonal communication
- Community mobilization
- Training and capacity strengthening of Rwanda Health Communication Center staff to develop and deliver health messages at district and community levels

In the last year, PMI has supported nationwide SBC at all levels through the updating of the malaria SBC strategy to align with the MSP 2020–2024. Operationalization of the draft SBC strategy is pending the malaria TWG review and approval by RBC leadership. In addition, PMI has supported the development and dissemination of health messages promoting malaria prevention and prompt care-seeking around two thematic areas: 1) importance of consistent use of ITNs; how to hang them; proper net care; and mitigating misuse, and 2) prompt malaria care-seeking. PMI also supported the production of two educational videos on prompt care-seeking and ITN use. The messages emphasized reaching the most vulnerable people (e.g., pregnant women and children under five years

of age). The messages were also produced in sign language to promote health equity. These messages are displayed on TV screens in patient waiting areas at health facilities.

Using multiple media channels that include radio drama, sketches, talk shows, and community outreach, PMI supported the dissemination of key malaria prevention messages for the household, including the benefits of sleeping under an ITN, early ANC attendance messages for young women, and early care-seeking behavior messages particularly targeting pregnant women and caregivers of children under five years of age. In total, 26 Urunana radio soap opera episodes on malaria prevention were broadcast, two radio talk shows were conducted, nine new radio sketches were produced and broadcast, and 10 radio magazines and four radio talk shows were produced and broadcast on nine community radio stations. Over 4,884 people provided feedback after listening to radio productions with malaria messages. Lastly, 5,075 health education sessions were conducted on ITNs and early care-seeking, reaching 12,832 people.

Despite this progress, challenges per technical area remain:

Insecticide-treated nets
The correct and consistent use of ITNs at all times is still hampered by several misconceptions. These include: 1) the perception that it is difficult to sleep under a net when the weather is warm, 2) the perception that malaria in older children is low risk, which leads to caregiver attention being greater for young children than older children, 3) older children being resistant to sleeping under the nets, 4) the preference for conical ITNs as opposed to rectangular ones, and 5) the belief that bedbugs can “hide” in ITNs in the day and fall down from them at night.

Prompt care-seeking
According to the formative report (2019), barriers to 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
- Consulting 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. Barriers to pregnant women attending ANC at health facilities include: pregnant

women being required to be accompanied by their partner to go to first ANC, lack of partner support, stigma with being young or unmarried and pregnant, and embarrassment of having yet another pregnancy (formative research report 2019).

The Maternal, Child Health and Community Division of the RBC currently is leading 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.

6.3. Plans and Justification with FY 2023 Funding

The FY 2023 funding tables contain a full list of SBC activities that PMI proposes to support in Rwanda with FY 2023 funding. Please visit www.pmi.gov/resources/malaria-operational-plans-mops for these FY 2023 funding tables.

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 2023 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 the MOPDD to increase ITN use by targeting identified barriers. The Malaria Indicator Survey 2017 showed geographic variations in ITN use among pregnant women (86 percent in North province vs. 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.
Prompt care-seeking for fever	General population	National with emphasis on endemic districts	Although care-seeking for children with fever slightly increased between 2017 Malaria Indicator Survey and 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.

Additional Support Activities

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

7. Surveillance, Monitoring, and Evaluation

7.1. PMI Goal and Strategic Approach

The Planning, Monitoring, and Evaluation Unit under the MOH as well as the MOPDD, districts, and health centers use evidence to refine and target malaria control interventions. The MSP 2020–2024 core objective for M&E is: “By 2024, strengthen surveillance and reporting in order to provide complete, timely, and accurate information for decision-making at all levels.”

Consistent with the current Rwanda MSP, 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 routine HMIS and *Système d’information sanitaire des communautés*/CHW information system (SISCom) reporting systems
- Capacity building in data quality, analysis and use
- Conducting a Malaria Indicator Survey in 2023
- Improving reporting from the private sector

PMI does not directly support the HMIS in Rwanda but does support data collection and reporting through health care worker in-service training, supervision and mentorship, and data quality assessments. In addition, PMI has supported an assessment of connected diagnostics. The focus for FY 2023 is to increase community involvement and engagement in malaria control.

Despite the substantial decrease of malaria incidence in several high endemic districts, isolated malaria hotspots remain. Although CHWs report malaria cases using the SISCom system, reporting is on a monthly basis and is not timely enough when there is an acute increase in cases; the MOPDD currently does not use the Integrated Disease Surveillance and Response framework. The proposed enhanced surveillance at the community level will engage CHWs to monitor and directly report suspected acute increases in malaria cases to the District Health Office for investigation and potential targeted control measures. The proposed enhanced surveillance is in development.

7.2. Recent Progress (between April 2021 and April 2022)

Rwanda maintained and strengthened reporting of routine malaria data from all levels of health facilities through HMIS and CHWs through SISCom. These activities included:

- Documented substantial decline in reported cases of uncomplicated malaria (-74 percent from 2017 to 2021), severe malaria (-83 percent), and malaria deaths (-82 percent).
- Trained 95 health workers as trainers.
- Trained 779 staff with update guidelines in 325 health centers and 26 hospitals.
- Supported MOPDD's Rapid Response Team in validating and verifying the accuracy of facility and community-based malaria data in five districts that had reported substantial increase (~ five-fold) in malaria cases. This verification enabled the Rapid Response Team to further investigate the root cause of increased incidence and provide support to resolve the issues accordingly.
- Supported malaria data duality audit in five districts with focus on new malaria indicators.
- Conducted data quality assessments in 170 villages in high burden sectors.
- Supported death audits in 12 hospitals.
- Supported MOPDD to digitize malaria supportive supervision tools including the integrated supportive supervision and malaria data quality audit tool.

7.3. Plans and Justification with FY 2023 Funding

The FY 2023 funding tables contain a full list of surveillance, monitoring, and evaluation activities that PMI proposes to support in Rwanda with FY 2023 funding. Please visit www.pmi.gov/resources/malaria-operational-plans-mops for these FY 2023 funding tables.

PMI supports supervision by the MOPDD senior staff to the regional and district levels where they spot check data and work with staff on improving quality and examining local trends in disease burden. Supervisory visits are conducted monthly to districts needing extra assistance, and quarterly to all other districts. PMI collaborates with the MOH in participating in the annual Global Fund on-site data verification process.

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

- Training health facility staff including surveillance, monitoring, and evaluation officers and data managers.
- 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. These data will inform and allow for targeted control measures.
- Conducting data quality assessments and strengthening data reporting to inform programming as well as death audits.
- Digitalization of the community program in selected districts.

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			*		P	
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies		P	P		P	P
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System		X		P		
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	P	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	P	P	P	P

*Non-PMI funded activities
X denotes completed activities and P denotes 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, currently the country has no guiding malaria-specific research agenda. However, the RBC and the MOPDD remain actively engaged in the design and implementation of program evaluation and operational research activities

as needed. PMI works together with the MOPDD, implementing partners, and other donors and research institutions to support relevant program evaluation and operational research that is designed to provide data to inform RBC and MOPDD programs and policy.

8.2. Recent Progress (between July 2021 and May 2022)

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 (FCDO)	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 October 30, 2022
BMGF	MOPDD/Jhpiego	Health facility survey	Ongoing/2022–2023
Shin Poong	MOPDD/Jhpiego	Determine the efficacy, safety, and tolerability of artesunate-pyronaridine in Rwanda	Protocol development/ 2022–2023

8.3. Plans and Justification with FY 2023 Funding

No operational research/program evaluation activities are proposed with FY 2023 funding.

9. Capacity Strengthening

9.1. PMI Goal and Strategic Approach

PMI supports a broad array of capacity strengthening activities which cut across intervention areas, such as training of health workers, supply chain management, health information systems strengthening, drug quality monitoring, and provider capacity building. PMI also supports laboratory capacity building of MOPDD staff to enable the processing of samples in the country for molecular markers of antimalarial resistance and hrp2/3 deletion activities and facilitate 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 (between July 2021 and May 2022)

PMI supported the following activities:

- 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.
- Provided TA for the development of abstracts and presentations and support for MOPDD staff to attend the virtual American Society of Tropical Medicine and Hygiene Conference in 2021.
- Supported two MOPDD staff to attend the Monitoring and Evaluation of Malaria Programs Training in Burkina Faso, November-December 2021.
- Between January and May 2021, supported the assessment of the role of digital tools in malaria prevention and control efforts at the community level in Rwanda:
    - The assessment found a robust HMIS system and serviceable platform, but also found opportunities for improvement in data triangulation and use via system integration and interoperability.
    - The assessment recommended strengthening the digital health governance structure to improve coordination of digital health interventions, incorporation of more digital tools, and training of CHWs on use of digital health tools and integrated community health packages.
    - The MOH and partners, including PMI, are using results of the assessment to support the digitization of the CHW program, including improving integration and interoperability, incorporation of digital tools, and CHW training. The next step will be a pilot implementation in four districts during the second half of calendar year 2022. PMI will continue to coordinate with other partners who are committed to support this effort, including the Global Fund, World Bank, UNICEF, and the Rockefeller Foundation.

  More details on the assessment can be found in the Rwanda digital community health profile.

9.3. Plans and Justification with FY 2023 Funding

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

PMI will continue to support MOPDD capacity building via attendance of conferences and workshops, logistical and operational support for TWG meetings, and laboratory capacity building at RBC. PMI will also continue its support for the Advanced Field Epidemiology Training Program residents working on malaria projects and the Peace Corps Response. PMI also 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	2022	2023	2024
Rwanda GOR Fiscal Year	**July 2021–June 2022**	**July 2022–June 2023**	**July 2023–June 2024**
Total country population	13,402,154	13,791,203	14,112,018
Total population at risk for malaria	13,402,154	13,791,203	14,112,018
PMI-targeted at-risk population	13,402,154	13,791,203	14,112,018
Population targeted for ITNs	8,347,509	8,566,898	8,764,793
Continuous Distribution Needs			
Channel 1: ANC	388,662	399,945	409,249
Channel 1: ANC Type of ITN	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO and Single Pyrethroid
Channel 2: EPI	388,662	399,945	409,249
Channel 2: EPI Type of ITN	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO and Single Pyrethroid
Channel 3: School			
Channel 3: School Type of ITN			
Channel 4: Community			
Channel 4: Community Type of ITN			
Channel 5:			
Channel 5: Type of ITN			
Minimum stock levels for routine ITN	388,662	399,945	409,249
Estimated Total Need for Continuous Channels	1,165,987	1,199,835	1,227,746
Mass Campaign Distribution Needs			
Mass distribution campaigns	4,637,505		4,869,330
Mass distribution ITN type	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO and Single Pyrethroid
Estimated Total Need for Campaigns	4,637,505	0	4,869,330
Total ITN Need: Continuous and Campaign	**5,803,492**	**1,199,835**	**6,097,075**
Partner Contributions			
ITNs carried over from previous year	0	277,002	864,015
ITNs from Government	0		
Type of ITNs from Government			
ITNs from Global Fund	2,706,294	0	
Type of ITNs from Global Fund	PBO and Single Pyrethroid		
ITNs from other donors			
Type of ITNs from other donors			
ITNs planned with PMI funding	3,374,200	1,786,848	1,150,000

Calendar Year	2022	2023	2024
Type of ITNs with PMI funding	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO and Single Pyrethroid
Total ITNs Contribution Per GOR Fiscal Year	**6,080,494**	**2,063,850**	**2,014,015**
Total ITN Surplus (Gap)	**277,002**	**864,015**	**(4,083,060)**

Table A-2. RDT Gap Analysis Table

Calendar Year	2022	2023	2024
Rwanda GOR Fiscal year	**2021-2022**	**2022-2023**	**2023-2024**
Total country population	13,402,154	13,791,203	14,112,018
Population at risk for malaria	13,402,154	13,791,203	14,112,018
PMI-targeted at-risk population	13,402,154	13,791,203	14,112,018
RDT Needs			
Total number of projected suspected malaria cases	5,739,151	5,259,164	4,411,666
Percent of suspected malaria cases tested with an RDT	2,777,927	2,677,077	2,355,966
RDT Needs (tests)	2,777,927	2,677,077	2,355,966
Needs Estimated based on HMIS Data			
Partner Contributions (tests)			
RDTs from Government			
RDTs from Global Fund	2,305,800	6,348,510	3,983,310
RDTs from other donors			
RDTs planned with PMI funding			
Total RDT Contributions per Calendar Year	**2,305,800**	**6,348,510**	**3,983,310**
Stock Balance (tests)			
Beginning Balance	2,665,110	2,192,983	5,864,416
- Product Need	2,777,927	2,677,077	2,355,966
+ Total Contributions (received/expected)	2,305,800	6,348,510	3,983,310
Ending Balance	**2,192,983**	**5,864,416**	**7,491,760**
Desired End of Year Stock (months of stock)	14	14	14
Desired End of Year Stock (quantities)	3,240,915	3,123,257	2,748,627
Total Surplus (Gap)	**(1,047,932)**	**2,741,160**	**4,743,133**

Table A-3. ACT Gap Analysis Table

Calendar Year	2022	2023	2024
Rwanda GOR Fiscal year	**July 2021–June 2022**	**July 2022–June 2023**	**July 2023–June 2024**
Total country population	13,402,154	13,791,203	14,112,018
Population at risk for malaria	13,402,154	13,791,203	14,112,018
PMI-targeted at-risk population	13,402,154	13,791,203	14,112,018
ACT Needs			
Total projected number of malaria cases	1,178,868	1,147,063	1,089,710
Total ACT Needs (treatments)	1,164,486	1,133,069	1,076,416
Needs Estimated based on HMIS Data			
Partner Contributions (treatments)			
ACTs from Government			
ACTs from Global Fund			
ACTs from other donors			
ACTs planned with PMI funding	983,040	2,000,000	500,000
Total ACTs Contributions per GOR fiscal year	**983,040**	**2,000,000**	**500,000**
Stock Balance (treatments)			
Beginning Balance	889,630	708,184	1,575,115
- Product Need	1,164,486	1,133,069	1,076,416
+ Total Contributions (received/expected)	983,040	2,000,000	500,000
Ending Balance	**708,184**	**1,575,115**	**998,699**
Desired End of Year Stock (months of stock)	14	14	14
Desired End of Year Stock (quantities)	1,358,567	1,321,914	1,255,819
Total Surplus (Gap)	**(650,383)**	**253,201**	**(257,120)**

Table A-4. Inj. Artesunate Gap Analysis Table

Calendar Year	2022	2023	2024
Rwanda GOR Fiscal year	**2021-2022**	**2022-2023**	**2023-2024**
Injectable Artesunate Needs			
Projected number of severe cases	7,073	6,882	6,538
Projected number of severe cases among children	2,829	2,753	2,615
Average number of vials required for severe cases among children	4	4	4
Projected number of severe cases among adults	4,244	4,129	3,923
Average number of vials required for severe cases among adults	12	12	12
Total Injectable Artesunate Needs (vials)	**62,242**	**60,562**	**57,534**
Needs Estimated based on HMIS Data			
Partner Contributions (vials)			
Injectable artesunate from Government			
Injectable artesunate from Global Fund			
Injectable artesunate from other donors			
Injectable artesunate planned with PMI funding	85,593	15,000	130,000
Total Injectable Artesunate Contributions per Calendar Year	**85,593**	**15,000**	**130,000**
Stock Balance (vials)			
Beginning Balance	42,121	65,472	19,910
- Product Need	62,242	60,562	57,534
+ Total Contributions (received/expected)	85,593	15,000	130,000
Ending Balance	**65,472**	**19,910**	**92,376**
Desired End of Year Stock (months of stock)	14	14	14
Desired End of Year Stock (quantities)	72,616	70,655	67,123
Total Surplus (Gap)	**(7,145)**	**(50,745)**	**25,252**