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MALARIA INITIATIVE**

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U.S. PRESIDENT'S MALARIA INITIATIVE

Rwanda

Malaria Operational Plan FY 2022

This FY 2022 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 2022 appropriation from U.S. Congress. Any updates will be reflected in revised postings.

This document was prepared in the early months of 2021 as the COVID-19 pandemic continued to evolve worldwide, including in PMI-focus countries. The effects of the pandemic on malaria control and elimination work in 2022 are difficult to predict. However, because U.S. Congressional appropriations for PMI are specific to work against malaria and any appropriations for work against the COVID-19 are specific for that purpose and planned through separate future U.S. Government planning processes, this FY 2022 MOP will not specifically address the malaria-COVID-19 interface and will reassess any complementary work through timely reprogramming in countries.

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ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AI	Active ingredient
AL	Artemether-lumefantrine
ANC	Antenatal care
BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
CEHO	Community and environmental health officers
CHW	Community health worker
CY	Calendar year
DHIS2	District Health Information Software 2
DHS	Demographic and Health Survey
EIR	Entomological inoculation rate
eLMIS	Electronic logistics management information system
EPI	Expanded Program on Immunization
FETP	Field Epidemiology Training Program
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GOR	Government of Rwanda
HBM	Home-based management
HMIS	Health management information system
HRP2	Histidine-rich protein 2 antigen
HSS	Health system strengthening
iCCM	Integrated community case management
IEC	Information, education, and communication
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
KAP	Knowledge, attitudes and practices
LMIS	Logistics management information system
M&E	Monitoring and evaluation
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MNCH	Maternal, newborn, and child health
MOH	Ministry of Health
MOP	Malaria Operational Plan
MOPDD	Malaria and Other Parasitic Diseases Division
MSP	Malaria Strategic Plan
NRL	National Reference Laboratory
PARMA	PMI-supported Antimalarial Resistance Monitoring in Africa
PBO	Piperonyl butoxide
PMI	U.S. President's Malaria Initiative

QA	Quality assurance
QC	Quality control
QMIA	Quality management improvement and accountability
RBC	Rwanda Biomedical Centre
RDT	Rapid diagnostic test
RMS	Rwanda Medical Supply
SBC	Social and behavior change
SISCom	Système d'information sanitaire des communautés/CHW information system
SM&E	Surveillance, monitoring, and evaluation
SMC	Seasonal malaria chemoprevention
SMS	Short message service
SP	Sulfadoxine-pyrimethamine
TA	Technical assistance
TES	Therapeutic efficacy study
TWG	Technical working group
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Rwanda to end malaria. PMI has been a proud partner of Rwanda since 2007, helping to decrease child death rates by 70 percent through investments totaling almost \$255 million.

The proposed PMI fiscal year (FY) 2022 budget for Rwanda is \$19 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Rwanda using FY 2022 funds. Developed in consultation with the national malaria control program, which is called and henceforth referred to as the Malaria and Other Parasitic Diseases Division (MOPDD), and key malaria stakeholders, proposed activities reflect national and PMI strategies, draw on best-available data, and align with the country context and health system. Proposed PMI investments support and build on those made by the Government of Rwanda (GOR) as well as other donors and partners.

Malaria continues to be a major public health concern and priority in Rwanda because it is considered one of the leading causes of morbidity and mortality. 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. Rwanda then experienced an upsurge in malaria cases from 2012 to 2016, when malaria incidence increased close to tenfold, from 48 cases per 1,000 in 2012 to 403 per 1,000 in 2016, while mortality increased by 41 percent during this period. This upsurge has been attributed to a variety of factors including insufficient coverage of insecticide-treated mosquito nets (ITNs) and indoor residual spraying (IRS) interventions, emerging insecticide resistance, changes in rainfall and temperature, and increased irrigated agriculture. The MOPDD subsequently implemented enhanced strategies to reduce malaria that include expanding community-based treatment of malaria to children over five years of age and adults (i.e., all ages), and expanding IRS operations from 5 to 12 districts. By 2019–2020, malaria incidence was reduced by more than 50 percent (198 cases per 1,000) from 2016–2017. More than half (58 percent in 2018 and 57 percent in 2019) of the malaria cases were managed by community health workers (CHWs).

PMI will support investments in the following intervention areas with FY 2022 funds:

- **Vector Control**
 - Entomological monitoring
 - Progress in FY 2020: PMI supported entomological monitoring in seven sentinel sites in four districts, including insecticide resistance, vector bionomics, and insecticide residual efficacy monitoring, as part of a comprehensive national approach in coordination with the MOPDD and the Global Fund.
 - Proposed investments with FY 2022 funding: PMI will continue to support entomological monitoring in seven sentinel sites in four districts. PMI also will continue to provide technical assistance (TA) to maintain and strengthen the capacity of the MOPDD entomology sentinel technicians by providing refresher training and up-to-date best practices for the following activities: net durability monitoring (following mass campaign), bioefficacy of IRS treatments (including fumigant effects and wall bioassays), and support for central insectary, laboratory, and molecular work.
 - Insecticide Treated Nets (ITNs)

ITNs for each woman attending ANC and case management of malaria in pregnancy. This will include supporting the malaria program at the central level to design and produce tools to be used in ANC to update, validate, and disseminate the guidelines and job aids on malaria prevention and treatment of malaria in pregnancy, but also integration of MIP in maternal, newborn and child health (MNCH) services.

- **Cross-Cutting and Other Health Systems**

- Supply Chain (with malaria focus)

- Progress in FY 2020: Despite COVID-19 disruptions in supply chain pipelines, PMI together with the Ministry of Health (MOH), MOPDD, and other stakeholders delivered the needed malaria commodities that included approximately 1.6 million ACTs and 78,700 vials of injectable artesunate. PMI also supported Rwanda in maintaining stockout levels below 2.5 percent for all ACTs (March 2019–March 2020) as well as in setting up strategies and baselines to reduce stockouts. In support of transitioning the supply chain management to in-country, PMI contributed to activities aimed at operationalizing the Rwanda Medical Supply.
- Proposed investments with FY 2022 funding: PMI is planning to continue procuring malaria commodities (ACTs, injectable artesunate, ITNs, and facility-based case management commodities), supporting supply chain and pharmaceutical management systems strengthening as well as supporting quality control of ACTs products at national university laboratories.

- Surveillance Monitoring and Evaluation (SM&E)

- Progress in FY 2020: Rwanda maintained and strengthened 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). These activities include supporting 10 hospitals and communities to improve use of rapid short message service (SMS), malaria data management training to improve surveillance and reporting, and quarterly supervisory visits at the district level for data review aimed at improving reporting and data quality. PMI supported a landscaping of digital technologies to better understand and enable increased impact of malaria programming down to the community level, and participated with the United Nations Children's Fund (UNICEF) and other partners and stakeholders in a workshop to ensure consistent discussions and recommendations for digitization of health services in Rwanda.
- Proposed investments with FY 2022 funding: PMI will continue supporting data review and quality assessments activities. In addition, a Malaria Indicator Survey (MIS) will be conducted toward the end of calendar year 2022 and PMI is supporting this survey through funding from FY 2021 and FY 2022. PMI will continue to support the MOH in digitalization of the community health workers program to improve the continuum of care and reporting. Lastly, PMI will be supporting surveillance for community involvement and engagement in malaria control.

- Program Evaluation (PE) & Operational Research (OR)

- Progress in FY 2020: The current PE and OR activity is supported by Unitaid and Global Fund. The activity, which runs from 2019 to 2022, focuses on evaluating the impact of next-generation insecticide-treated bed nets.

- Proposed investments with FY 2022 funding: There is no specific activity planned with FY 2022 funding. However, PMI will continue to work with the MOPDD to consider additional PE or opportunities.
- Social and Behavior Change
 - Progress in FY 2020: PMI supported SBC activities focusing on promoting ITN use and improving malaria case management at the national and district levels using interpersonal communication to reach 100,000 people with malaria messages and radio broadcasts (10 messages on malaria prevention were aired nationally) with 98 percent geographic coverage countrywide. In addition, with PMI support, the Rwanda Health Communication Centre is in the process of producing a video focusing on malaria prevention and prompt care-seeking,
 - Proposed investments with FY 2022 funding: PMI will continue support to SBC activities focused on ITN use and prompt care-seeking but with more emphasis on SBC at the community level using CHWs and other existing community structures, such as parent forums and community meetings, to actively engage community members in malaria prevention and control. PMI will also continue support of SBC at national level through the Health Promotion Technical Working Group (TWG) and the Rwanda Health Communication Centre.
- Other Health System Strengthening (HSS)
 - Progress in FY 2020: PMI supported the Field Epidemiology Training Program (FETP) fellows as well as capacity-building through conferences and workshops. Through PMI support, the MOPDD case management director traveled to the CDC laboratories as part of the PMI-supported Antimalarial Resistance Monitoring in Africa (PARMA) collaboration to collaborate on the 2018 TES data analysis.
 - Proposed investments with FY 2022 funding: PMI will continue to support FETP fellows and provide TA and support to the MOPDD.

Through these proposed activities for FY 2022 and in collaboration with the GOR and other donors and partners, PMI is supporting the overall objective of Rwanda's MSP for 2020–2024 to reduce malaria morbidity and mortality by at least 50 percent from the 2019 levels. The majority of the planned support for FY 2022 contains elements of capacity-building and system strengthening, which are critical in promoting sustainable development.

I. INTRODUCTION

The U.S. President’s Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Rwanda to end malaria. PMI has been a proud partner of Rwanda since 2007, helping to decrease child death rates by 70 percent through investments totaling almost \$255 million.

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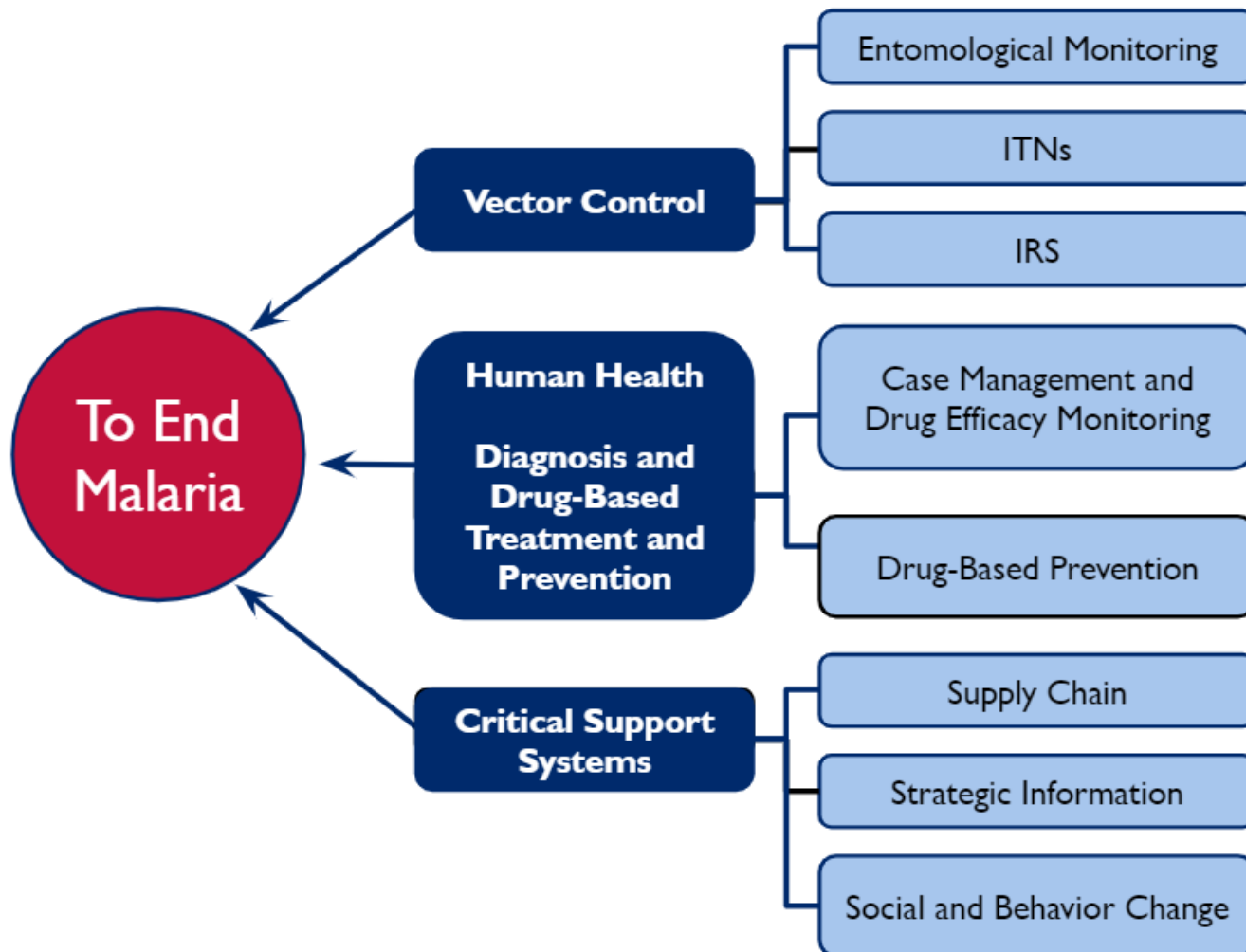
Rwanda at a Glance

- **Geography:** Landlocked country in central East Africa located a few degrees south of the equator with relatively high altitude (ranging from 3,117 to 14,787 feet above sea level)
- **Climate and Malaria Transmission Seasonality:** Temperate tropical highland; malaria transmission occurs throughout the year primarily during/after the rainy seasons with peaks in May/June and November/December each year
- **Population in 2021:** 12,955,736 (source: Rwanda National Institute of Statistics, 2021 projection from 2012 census)
- **Population at Risk of Malaria:** 12,955,736 (Rwanda Malaria Strategic Plan 2020–2024)
- **Principal Malaria Parasites:** *Plasmodium falciparum* (97 percent), *P. malariae* (1–2 percent), *P. ovale* (1–2 percent). (Source: Rwanda Malaria Strategic Plan 2020–2024)
- **Principal Malaria Vectors:** *Anopheles gambiae* s.l. is the primary vector. Other vectors include *An. pharoensis* and *An. Ziemanni*. (Source: Rwanda 2019 Entomological Monitoring Report)
- **Malaria Case Incidence per 1000 Population:** 198 per 1,000 population (Source: Rwanda Malaria and Neglected Tropical Diseases Annual Report 2019–2020)
- **Under-Five Mortality Rate:** 45 per 1,000 live births (Source: Demographic and Health Survey [DHS] 2019–2020 Key Indicators)
- **World Bank Income Classification and Gross Domestic Product (GDP):** Low-income with US\$10.354 billion GDP in 2019 (World Bank. Retrieved from <https://data.worldbank.org/country/rwanda>)
- **Government Health Budget:** US \$979 million for Rwanda’s FY 2020–2021
- **Trafficking in Persons Designations, 2018–2020:** Tier 2 (U.S. Department of State, 2020 Trafficking in Persons Report. Retrieved from <https://www.state.gov/reports/2020-trafficking-in-persons-report/>)
- **Malaria Funding and Program Support Partners Include:**
 - U.S. President’s Malaria Initiative (PMI)

- Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund)
- World Health Organization (WHO)
- **PMI Support of National Malaria Control Strategy:** PMI supports all elements of the National Malaria Control Strategy except for larval source management. (See III. Overview of PMI's support of Rwanda's Malaria Control Strategy for additional details.)
- **PMI Investments:** Rwanda began implementation as a PMI-focus country in FY 2007. The proposed FY 2022 PMI budget for Rwanda is \$19 million; this brings the total PMI investment to nearly \$274 million.

PMI organizes its investments around the activities below, in line with the Rwanda National Malaria Strategy 2020–2024.

Figure 1. PMI's approach to end malaria¹



Building and strengthening the capacity of Rwanda's people and institutions—from the central level to communities—to effectively lead and implement evidence-based malaria control and elimination activities is paramount to PMI. The majority of PMI's planned support for FY 2022, across the areas of vector control, human health, and critical support systems such as supply chain, contains elements of capacity-building and system strengthening. PMI/Rwanda will continue to work closely with civil society organizations being supported by the Global Fund to implement SBC activities such as Urunana, Caritas Rwanda, and the Rwanda Interfaith Council on Health.

¹A number of actions are cross-cutting in nature. For example, social and behavioral change (SBC) is embedded in all vector control and human health work; program evaluation (PE) and operational research (OR) are relevant in all of the fieldwork; finance and management support and the introduction of new tools/interventions are critical for all programs; and elimination requires work across the full spectrum of transmission.

The activities proposed in this MOP are tailored to draw on these strengths and address weaknesses; activities will be monitored to evaluate the effectiveness of capacity-building efforts. In addition, while PMI understands it will take time for Rwanda to fully finance its development priorities, PMI will work with other partners (e.g., the Global Fund) to jointly track Rwanda's funding commitments across the malaria portfolio.

II. MALARIA SITUATION AND PROGRESS

Malaria continues to be a major public health concern and priority in Rwanda because it is considered one of the leading causes of morbidity and mortality.² The entire 12.9 million population in Rwanda is at risk for malaria³ and pregnant women, children under five years of age, and refugees are among the most vulnerable groups.⁴ Between 2005 and 2011, Rwanda's scale-up of interventions successfully reduced malaria incidence by 86 percent and inpatient malaria deaths by 74 percent, with at least 8 districts achieving pre-elimination.³ Rwanda then experienced an upsurge in malaria cases during 2012 to 2017. In children under five years of age, parasitemia prevalence increased from 1 percent in 2010 to 7 percent in 2017 (Figure 2 and Table 1). Malaria incidence increased from 48 cases per 1,000 in 2012 to 403 per 1,000 in 2016, while mortality increased by 41 percent during this period.⁴ In response to the malaria upsurge, the MOPDD conducted an in-depth data analysis and identified changes in rainfall and temperature, increased agricultural irrigation that led to increased water bodies, resistance to insecticides (pyrethroids) that resulted in ineffective preventive measures such as insecticide-treated mosquito nets (ITNs) and indoor residual spraying (IRS), shifts in mosquito behavior to early and outdoor biting, insufficient coverage of interventions including ITNs (Table 1) and IRS, and increased case detection and reporting rate from health facilities and community into the system as potential contributing factors.⁴ The MOPDD subsequently developed and implemented a Malaria Contingency Plan in 2016 for enhanced strategies to reduce malaria burden, which were revised in 2017 based on extensive consultations involving international stakeholders and data analysis on impacts of implemented interventions. By 2019–2020, malaria incidence was reduced to 198 cases per 1,000, a 51 percent reduction from 2016 to 2017²; 58 percent of the malaria cases were managed by community health workers (CHWs).⁴ Routine surveillance data indicated that the decreasing trend in malaria burden steadily continues into 2020 (Table 2) when cases were down to 1.8 million (from 4.8 million in 2016), severe cases were less than 3,500 (from 18,000 cases in 2016), and deaths were reduced to 148 (from 715 in 2016). The higher malaria incidence was observed in the southern districts (Figure 3) with concentrated pockets showing incidences greater than 450 cases per 1,000 people.

² Rwanda Ministry of Health (2019). Rwanda Malaria and Neglected Tropical Diseases Annual Report 2019–2020.

³ Rwanda Ministry of Health (2017). Revised National Malaria Contingency Plan 2016–2020.

⁴ Rwanda Ministry of Health (2020). Rwanda Malaria Strategic Plan 2020–2024

Figure 2. Trends in malaria prevalence

Children 6 to 59 months of age who tested positive for malaria by microscopy and malaria rapid diagnostic test (RDT) 2008–2017

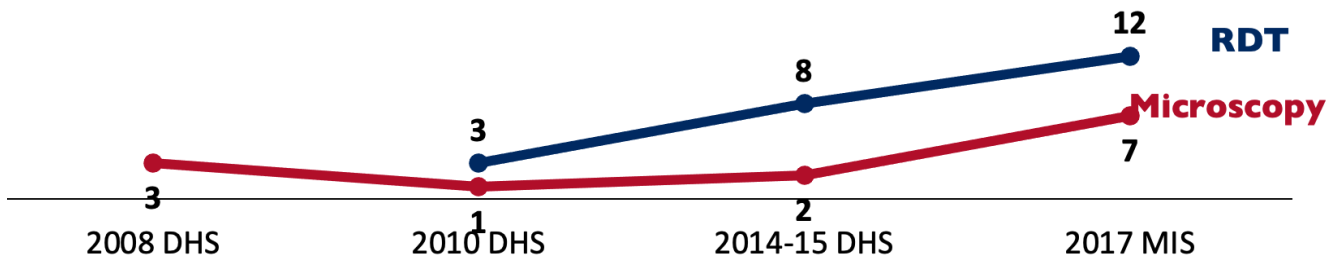
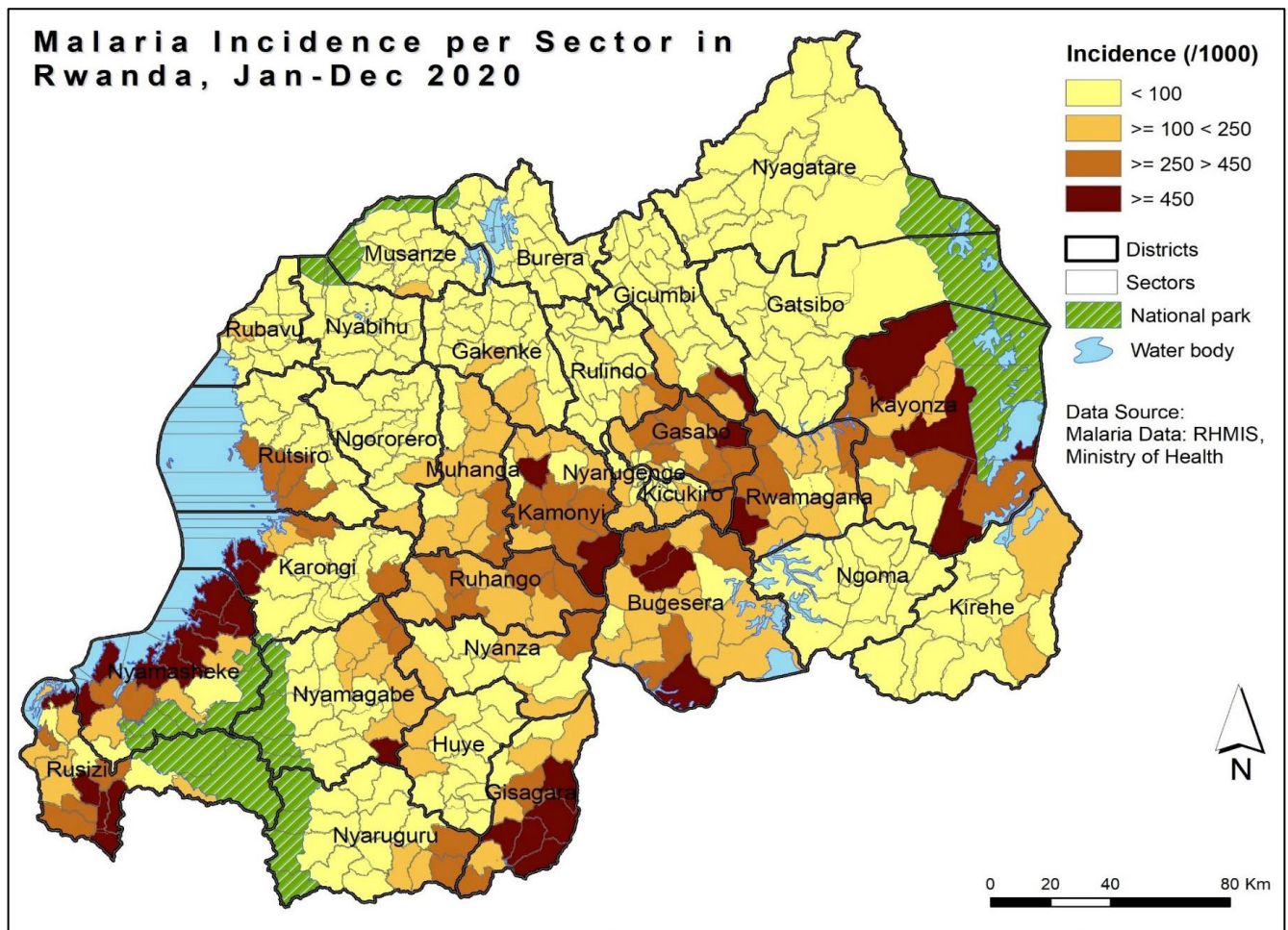


Figure 3. Malaria incidence by geographic area in 2020

Malaria incidence by sector among all ages, 2020*



*In Rwanda, a sector is the third largest of the five administrative divisions, which includes provinces, districts, sectors, cells, and villages.

Table I. Key indicators from demographic health surveys (DHS) and malaria indicator surveys (MIS)

Indicator	2008 DHS	2010 DHS	2013 MIS	2014–2015 DHS	2017 MIS	2019–2020 DHS
% Households with at least one ITN	56	82	83	81	84	66
% Households with at least one ITN for every two people	16	40	43	43	55	34
% Population with access to an ITN	38	64	66	64	72	51
% Population that slept under an ITN the previous night	40	58	61	61	64	N/A
% Children under five years of age who slept under an ITN the previous night	57	70	74	68	68	56
% Pregnant women who slept under an ITN the previous night	60	72	74	73	69	57
% Children under five years of age with a fever in the last two weeks for whom advice or treatment was sought	44	50	68	57	56	62
% Children under five years of age with a fever in the last two weeks who had a finger or heel stick	N/A	21	30	36	38	41
% Children receiving an ACT among children under five years of age with a fever in the last two weeks who received any antimalarial drug	N/A	37	92	99	99	92
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	N/A	N/A	N/A	N/A	N/A	N/A
% Women who received three or more doses of IPTp during their last pregnancy in the last two years	N/A	N/A	N/A	N/A	N/A	N/A
<5 mortality rate per 1,000 live births	103	76	N/A	50	N/A	45
% Children under five years of age with parasitemia by microscopy	3	1	N/A	2	7	N/A
% Children under five years of age with parasitemia by RDT	N/A	3	N/A	2	7	N/A
% Children under five years of age with severe anemia (Hb<8gm/dl)	2	1	N/A	2	N/A	<1

Table 2. Evolution of key malaria indicators reported through routine surveillance systems

Indicator	2016	2017	2018	2019	2020
# Suspect malaria cases ¹	9,510,898	9,808,473	9,389,458	8,809,464	6,879,911
# Patients receiving diagnostic test for malaria ²	9,510,898	9,808,473	9,389,458	8,809,464	6,879,911
Total # malaria cases ³	4,794,778	4,746,958	4,222,768	3,609,323	1,866,421
# Confirmed cases ⁴	4,794,778	4,746,958	4,222,768	3,609,323	1,866,421
# Presumed cases ⁵	0	0	0	0	0
% Malaria cases confirmed ⁶	100%	100%	100%	100%	100%
Test positivity rate (TPR) ⁷	42%	50%	45%	41%	27%
Total # <5 malaria cases ⁸	310,905	444,198	653,501	475,784	275,230
% Cases in children under five years of age ⁹	6%	9%	15%	13%	15%
Total # severe cases ¹⁰	18,219	11,303	8,293	6,249	3,423
Total # malaria deaths ¹¹	715	376	336	218	148
# Facilities reporting ¹²	n/a	545	561	550	551
% Data completeness ¹³	n/a	97%	96%	99%	99%

1. Number of patients presenting with signs or symptoms possibly due to malaria (e.g., fever). 2. Number of patients receiving a diagnostic test for malaria (RDT or microscopy), all ages, outpatient and inpatient. 3. Total reported malaria cases; all ages, outpatient and inpatient, confirmed and presumed cases. 4. Diagnostically confirmed (RDT or microscopy), all ages, outpatient and inpatient. 5. Total clinical/presumed/unconfirmed; all ages, outpatient and inpatient. 6. Number of confirmed cases divided by total number of malaria cases. 7. Number of confirmed cases divided by number of patients receiving a diagnostic test for malaria (RDT or microscopy). 8. Total number of cases occurring in children under five years of age, outpatient and inpatient, confirmed and unconfirmed. 9. Total number of cases occurring in children under five years of age divided by total number of malaria cases. 10. Severe malaria is defined as positive *Plasmodium* parasitemia accompanied by one or more signs of vital signs distress, and is reported as “severe malaria” in HMIS. 11. Total number of malaria deaths reported, all ages, outpatient, inpatient, confirmed, and unconfirmed. 12. Total # of health facilities reporting data into the HMIS/District Health Information Survey 2 [DHIS2] system that year. 13. # monthly reports from health facilities divided by # health facility reports expected.

III. OVERVIEW OF PMI’S SUPPORT OF RWANDA’S MALARIA STRATEGY

To accelerate progress toward malaria reduction in Rwanda, the MOPDD—a division within the Rwanda Biomedical Centre (RBC) under the Ministry of Health (MOH)—developed the Rwanda Malaria Strategic Plan (MSP) covering the 2020–2024 period. The plan was built upon the previous Malaria Strategic Plan (2013–2020), the end-term Malaria Programme Review (October 2019), and an intensive process of analysis and planning involving global and local stakeholders. The MSP 2020–2024 guides the implementation of key malaria interventions aimed at achieving the overall goal of reducing malaria morbidity and mortality by at least 50 percent of the 2019 levels, and outlines the following five objectives:

1. Effectively protect at least 85 percent of the population at risk with preventive interventions.
2. Promptly test and treat all suspected malaria cases in line with the national guidelines.

3. Strengthen surveillance and reporting to provide complete, timely, and accurate information for appropriate decision-making at all levels.
4. Strengthen coordination, collaboration, procurement and supply management, and effective program management at all levels.
5. Ensure that 85 percent of the population at risk has correct and consistent practices and behaviors toward malaria control interventions.

The MOPDD has identified a number of key strategic interventions for each objective above. In summary, the interventions encompass the following:

- **Vector control** such as ITNs, IRS in 12 out of 15 endemic districts (total of 30 districts in Rwanda), and larval source management
- **Case management** with prompt diagnosis and effective treatment of malaria as a primary component of control strategy
- **Surveillance, monitoring, and evaluations (SM&E)** by strengthening routine health management information system (HMIS) and Système d'information sanitaire des communautés/CHW information system (SISCom) reporting systems; capacity-building in data quality, analysis and use; Malaria Indicator Survey (MIS) in 2022 and Demographic Health Survey (DHS) in 2024; improving reporting from the private sector
- **Social behavior change (SBC):** Promote the appropriate use of malaria prevention and control interventions
- **Malaria in pregnancy:** Early detection and treatment in pregnant women and distribution of ITNs at first antenatal care (ANC) visit
- **Operational research** aimed at generating evidence to inform policies, interventions, and programmatic decisions
- **Program management** to maintain the achievements and ensure the program advances further to reduce the malaria burden.

PMI's support is closely aligned with MOPDD's key strategic plans, except for two notable differences, and builds on investments contributed by the Global Fund and the GOR. The two areas of programmatic difference are that PMI does not support larval source management and the MOPDD does not support intermittent preventive treatment for pregnant women (IPTp) because of continued evidence of resistance to sulfadoxine-pyrimethamine (SP). PMI supports some technical assistance (TA) at the central level while other investments occur in geographically targeted areas. At the central level, PMI supports supportive supervision to districts by central level staff and participation in the PMI-supported Antimalarial Resistance Monitoring in Africa (PARMA) initiative to conduct therapeutic efficacy studies (TES) and build national laboratory capacity. In geographically targeted areas, PMI supported IRS implementation in three districts in calendar year (CY) 2020 while the Global Fund and GOR supported nine districts (Figure 4a). PMI supported the procurement and distribution of ITNs in 10 districts, five of these districts received piperonyl butoxide (PBO) nets while the other five received standard ITNs (Figure 4a). The Global Fund supported procurement and distribution of ITNs in 20 districts, with PBO nets in four districts and standard ITNs in 16 districts. PMI supported case management activities nationwide and CHW in 22 districts (Figure 4b).

Figure 4a. Supported IRS and ITN activities at the district level in Rwanda

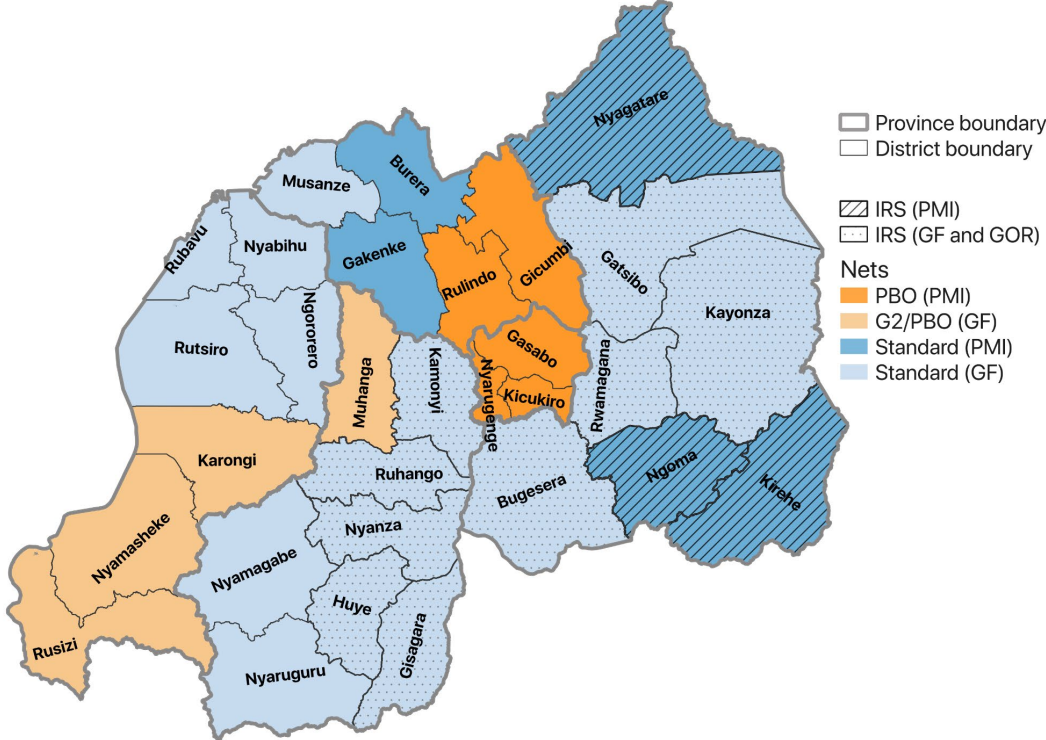
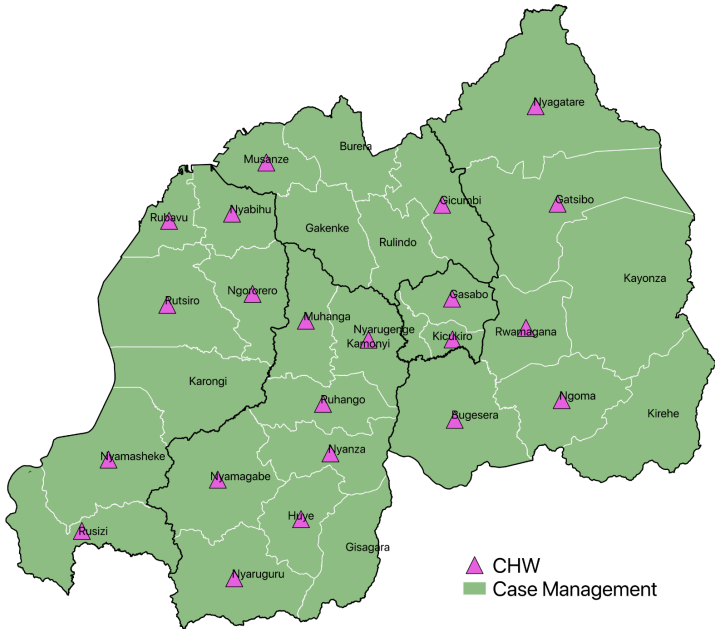


Figure 4b. PMI-supported case management and CHW



IV. PARTNER FUNDING LANDSCAPE

PMI emphasizes the importance of partner alignment for malaria control, recognizing that different partners bring complementary expertise and resources. In recent years, PMI, the Global Fund, and the Bill & Melinda Gates Foundation (BMGF) have harmonized financial, supply chain, and programmatic data. In particular, PMI and the Global Fund agreed to a harmonized financial taxonomy to aid comparison of our investments to better identify potential overlap or gaps.

Due to the U.S. Government fiscal year budget cycle and approximate timing of annual appropriations, PMI MOP resources fund activities that largely occur during the following fiscal year. For example, this FY 2022 MOP is anticipated to largely fund implementation of activities starting in 2023. Global Fund resources are based on the calendar year and planned for a three-year grant cycle. Most partner country governments and other partners also budget based on the calendar year.

The tables below summarize contributions by key external partners and partner country governments in calendar years 2020–2022, providing insight into total country investments. Because new grants funded through the Global Fund 2021–2023 grant cycle are just beginning, or will begin later in 2021, Global Fund country investments may still evolve in some countries. The partner country government invests substantial funding into the national-to-local infrastructure and service delivery that benefits malaria programs and many others. However, it is not always possible to attribute funding for malaria specifically from the partner country government without a standardized method. There may be similar challenges for attributing other partner funds.

In 2014, the Global Fund and the GOR entered into an agreement to pilot a results-based financing model for the Global Fund’s three grants in the country named “National Strategy Financing.” This agreement established a more flexible approach by transferring grant management responsibility from the Global Fund to the GOR, with an increased reliance on national financial systems and controls and greater reprogramming flexibility for the Rwanda Country Coordinating Mechanism and principal recipients. The pilot process in Rwanda has generally shown promise, and is being continued into Rwanda’s current grant cycle.

Table 3a. Annual budget by Level I category for FY 2019/CY 2020

Funder	Vector Control	Case Management	Drug-Based Prevention ¹	Supply Chain ²	Monitoring, Evaluation & Research	Cross-cutting and HSS ³	Total Per Funder
PMI	\$10.1M	\$4.7M	\$0.1M	\$0.9M	\$0.7M	\$1.5M	\$18.0M
Global Fund	\$11.4M					\$8.0M	\$19.4M
Gov ⁴							\$25.4M
Total Per Category	\$21.5M	\$4.7M	\$0.1M	\$0.9M	\$0.7M	\$9.5M	\$62.8M

Table 3b. Annual budget by Level I category for FY 2020/CY 2021*

Funder	Vector Control	Case Management	Drug-Based Prevention ¹	Supply Chain ²	Monitoring, Evaluation & Research	Cross-cutting and HSS ³	Total Per Funder
PMI	\$10.3M	\$5.3M	\$0.1M	\$0.4M	\$0.5M	\$1.4M	\$20.0M
Global Fund	\$1.9M					\$2.8M	\$4.7M
Total Per Category	\$12.2M	\$5.3M	\$0.9M	\$0.4M	\$0.5M	\$4.2M	\$22.7M

*The original FY 2020 MOP planning level was \$18 million, while the final FY 2020 enacted budget was \$20 million.

Table 3c. Annual budget by Level I category for FY 2021/CY 2022*

Funder	Vector Control	Case Management	Drug-Based Prevention ¹	Supply Chain ²	Monitoring, Evaluation & Research	Cross-cutting and HSS ³	Total Per Funder
PMI	\$10.1M	\$4.2M	\$0.1M	\$0.9M	\$0.8M	\$1.9M	\$19.5M
Global Fund							\$0.0M
Total Per Category	\$10.1M	\$4.2M	\$0.1M	\$0.9M	\$0.8M	\$1.9M	\$18.0M

*The original FY 2021 MOP planning level was \$18 million, while the final FY 2021 enacted budget was \$19.5 million.

1. Drug-based prevention, including seasonal malaria chemoprevention (SMC) and MIP where applicable. The Rwanda MOPDD does not implement SMC or IPTp, but does support MIP through ANC activities. 2. Covers management of in-country warehousing and distribution of malaria commodities, except for ITNs, which are separately captured under Vector Control. 3. HSS = health systems strengthening. 4. Total budget for GOR July 2018 to June 2019 (Rwanda Malaria and Neglected Tropical Diseases Annual Report 2018–2019); budget for the following years are not yet published.

Table 4a. Annual budget, breakdown by commodity, FY 2019/CY 2020

Funder	ITNs <i>Continuous Distribution</i>	ITNs <i>Mass Distribution</i>	IRS ¹ <i>Insecticide</i>	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI ²	\$2.8M		\$7.0M	\$2.3M	\$0.5M	\$0.3M			\$12.9M
Global Fund ³			\$11.1M						\$11.1M
Total	\$2.8M	\$0.0M	\$18.1M	\$2.3M	\$0.5M	\$0.3M	\$0.0M	\$0.0M	\$24.0M

Table 4b. Annual budget, breakdown by commodity, FY 2020/CY 2021

Funder	ITNs <i>Continuous Distribu- tion</i>	ITNs <i>Mass Distribu- tion</i>	IRS ¹ <i>Insecticide</i>	ACTs	RDTs	Severe Malaria	SMC- Related	IPTp- Related	Total
PMI ²	\$2.3M		\$2.8M	\$2.8M	\$0.0M	\$0.1M			\$8.0M
Global Fund ³			\$1.9M						\$1.9M
Total	\$2.3M	\$0.0M	\$4.7M	\$2.8M	\$0.0M	\$0.1M	\$0.0M	\$0.0M	\$1.9M

Table 4c. Annual budget, breakdown by commodity, FY 2021/CY 2022

Funder	ITNs <i>Continuous Distribu- tion</i>	ITNs <i>Mass Distribu- tion</i>	IRS ¹ <i>Insecticide</i>	ACTs	RDTs	Severe Malaria	SMC- Related	IPTp- Related	Total
PMI ²	\$0.8M	\$2.1M	\$2.9M	\$1.3M	\$0.0M	\$0.1M			\$7.1M
Global Fund ³									\$0.0M
Total	\$0.8M	\$2.1M	\$2.9M	\$1.3M	\$0.0M	\$0.1M	\$0.0M	\$0.0M	\$7.1M

Note: Categories reflect the harmonized financial taxonomy (Levels 1-3) developed by BMGF, Global Fund, and PMI in 2019, as part of a broader data harmonization initiative but may continue to evolve. 1. IRS insecticide: for PMI, commodity costs may be inextricable from IRS implementation costs in historical data – field identified as ND where this is the case. 2. PMI and Global Fund (excluding IRS) commodity costs are fully loaded, including costs for the ex-works price of the commodity, quality control, freight, insurance, and customs. 3. For IRS, Global Fund commodity costs in the table above only include ex-works commodity value.

V. ACTIVITIES TO BE SUPPORTED WITH FY 2022 FUNDING

The FY 2022 budget tables contain a full list of activities that PMI proposes to support in Rwanda with FY 2022 funding. Please visit www.pmi.gov/resource-library/mops for these FY 2022 budget tables. Key data used for decision-making for this MOP planned investments is provided in Annex A of this document.

ANNEX A: INTERVENTION-SPECIFIC DATA

This section outlines key data that helped inform decision-making around FY 2022 MOP funding allocations to PMI-supported activities.

I. VECTOR CONTROL

MOPDD Objective

The Rwanda MSP 2020–2024 promotes an integrated vector management strategy, including vector surveillance, insecticide resistance management, continuous and mass distribution of ITNs, geographically targeted IRS, and larval source management to maintain universal ITN coverage and IRS targeted in high-burden districts in accordance with WHO guidelines and as part of a comprehensive insecticide resistance mitigation strategy. The MOPDD objective is to ensure that at least 85 percent of the population is protected by preventive interventions by 2024.

MOPDD Approach

The MOPDD uses various approaches for ITN distribution, including mass campaigns and routine distribution. Mass campaigns are national, free ITN distribution campaigns 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 ANC and Expanded Program on Immunization (EPI) clinic visits. Recent policy changes include distributing ITNs to all pregnant women at first ANC visit (as opposed to primigravida only). The MOPDD also supports distribution of ITNs in the private sector through social mobilization.

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 past few years, the MOPDD has focused on maintaining IRS in 12 districts that have already been sprayed to ensure that malaria does not rebound, as has been the case in the past. There is an insecticide resistance mitigation plan and community mobilization and SBC accompanies all IRS activities to ensure acceptance of IRS.

The MOPDD is also implementing larviciding in line with WHO guidelines with the support of other partners on a pilot basis.

PMI Objective in Support of MOPDD

PMI works with and supports the MOPDD to ensure that the country achieves high coverage and usage of effective ITNs with consistent distribution (via campaigns and/or continuous channels in a combination that is most effective given country context) and to conduct IRS in collaboration with other partners and in the context of the current insecticide resistance. All the vector control activities are implemented by the various partners in a complementary way (integrated vector management) with the aim of reducing malaria burden and in line with the national strategic plan. For example, although PMI does not support larval source management or larviciding, other partners have supported this activity in Rwanda.

PMI-Supported Recent Progress (FY 2020)

- Procured 2,700,000 ITNs, including approximately 1,500,000 PBO nets, which were distributed in five districts, as part of the 2020 mass campaign and through routine distribution.
- Supported net durability monitoring activities in four districts.
- Conducted IRS activities in three districts (Ngoma, Kirehe, and Nyagatare) spraying 327,704 structures and protecting approximately 1,295,240 people.

- Conducted entomological monitoring in seven sentinel sites, to include vector bionomics, feeding behavior, sporozoite rates, blood meal sources, entomological inoculation rates, and impact of IRS operations.

PMI-Supported Planned Activities (FY 2021 with currently available funds)

- Procure approximately 3,800,000 ITNs from previous years' funding for routine distribution through ANC and EPI clinics and to contribute to the mass campaign planned for 2022–2023.
- Conduct IRS in three districts (Ngoma, Kirehe, and Nyagatare) in September 2021, which is anticipated to maintain or exceed prior coverage of 327,704 structures and protection of 1,295,240 people with the use of a long-lasting organophosphate insecticide.
- Maintain and increase capacity of MOPDD entomology sentinel site technicians by providing refresher training and best practices.
- Provide TA for the following:
 - Net durability monitoring following mass net distribution.
 - Post-IRS entomological monitoring, to include fumigant effects and wall bioassays measuring residual life.
 - Support for the central insectary, laboratory, and molecular work.
- Conduct insecticide resistance and entomological monitoring in seven sites.
- Conduct community mobilization activities in conjunction with IRS and ITN campaigns.

I.1. ENTOMOLOGICAL MONITORING

Key Goal

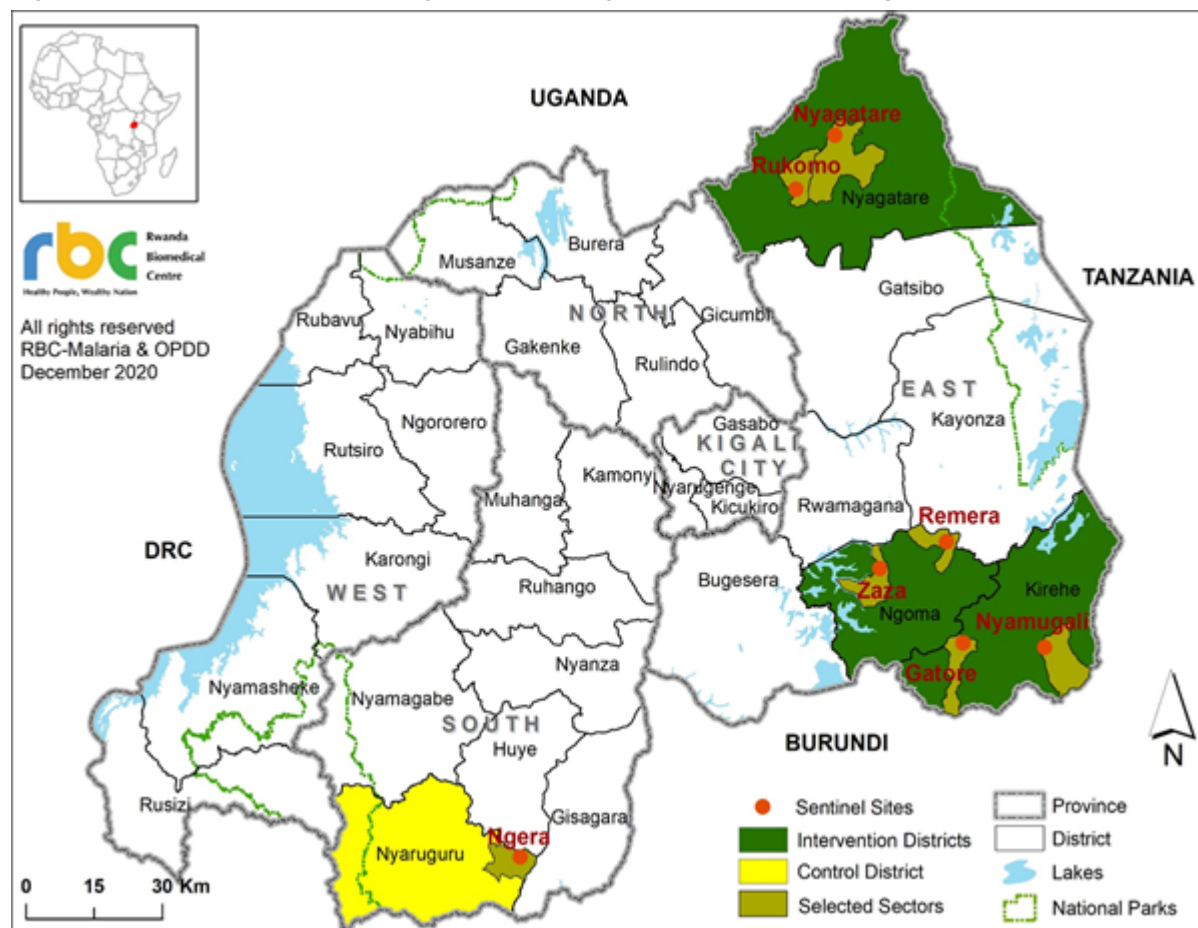
Determine the geographic distribution, bionomics, and insecticide resistance profiles of the main malaria vectors in the country to inform vector control decision-making.

Key Question 1

Where is entomological monitoring taking place, what types of activities are occurring, and what is the source of funding?

Comprehensive entomological monitoring is conducted countrywide. The primary partners in coordination with the MOPDD are PMI and the Global Fund. PMI is supporting entomological monitoring in seven sites across four districts, including three districts that were covered by IRS in August–September 2020 and one control district (Figure A-1). The Global Fund is also supporting 11 sites across 11 districts. PMI supported human landing catches, pyrethrum spray catches, and wall bioassays activities in all seven sites; insecticide resistance monitoring is supported by PMI in three sites (Table A-1).

Figure A-1. Location of entomological monitoring activities supported by PMI in Rwanda, 2020



Note: During 2020, the control sentinel site changed from Kamonyi to Nyaruguru District after Kamonyi received IRS for the first time in October 2019.

Table A-I. Funded entomological monitoring activities by PMI and external partners in Rwanda, 2020

Site	District	Activities	Supported by
Gatore	Kirehe	Human landing catches, pyrethrum spray catches, and wall bioassays	PMI
Nyamugali	Kirehe	Human landing catches, pyrethrum spray catches, wall bioassays, and insecticide resistance	PMI
Rukomo	Nyagatare	Human landing catches, pyrethrum spray catches, and wall bioassays	PMI
Nyagatare	Nyagatare	Human landing catches, pyrethrum spray catches, wall bioassays, and insecticide resistance	PMI
Ngera	Nyaruguru (Control)	Human landing catches, pyrethrum spray catches	PMI
Zaza	Ngoma	Human landing catches, pyrethrum spray catches, and wall bioassays	PMI
Remera	Ngoma	Human landing catches, pyrethrum spray catches, wall bioassays, and insecticide resistance	PMI
Kicukiro	Kigali	Entomological monitoring, insecticide resistance	Global Fund
Mimuli	Nyagatare	Entomological monitoring, insecticide resistance	Global Fund
Mashesha	Rusizi	Entomological monitoring, insecticide resistance	Global Fund
Karambi	Ruhango	Entomological monitoring, insecticide resistance	Global Fund
Busoro	Nyanza	Entomological monitoring, insecticide resistance	Global Fund
Bungwe	Burera	Entomological monitoring, insecticide resistance	Global Fund
Bukora	Kirehe	Entomological monitoring, insecticide resistance	Global Fund
Rwaza	Musanze	Entomological monitoring, insecticide resistance	Global Fund
Kivumu	Rutsiro	Entomological monitoring, insecticide resistance	Global Fund
Rukara	Kayonza	Entomological monitoring, insecticide resistance	Global Fund
Mubuga	Karongi	Entomological monitoring, insecticide resistance	Global Fund

Table A-2. Distribution and bionomics of malaria vectors in Rwanda, 2020

Site/District*	Vector**	Season (month)	Indoor Resting Density per house/day	Preferred Resting Location	Preferred Host	Annual EIR†
Nyagatare/Nyagatare	<i>An. arabiensis</i>	Feb–Mar Sep–Oct	0.07	Outdoors	Bovine	0
Rukomo/Nyagatare	<i>An. arabiensis</i>	Feb–Mar Sep–Oct	0.07	Outdoors	Bovine	0
Nyamugali/Kirehe	<i>An. arabiensis</i> / <i>A. n. gambiae</i> s.s.	Sep–Oct	0.15	Outdoors	Bovine	0
Gatore/Kirehe	<i>An. arabiensis</i> / <i>A. n. gambiae</i> s.s.	Sep–Oct	0.15	Outdoors	Bovine	0
Zaza/Ngoma	<i>An. arabiensis</i> / <i>A. n. gambiae</i> s.s.	Mar–May Sep–Oct	0.05	Outdoors	Bovine	0
Remera/Ngoma	<i>An. arabiensis</i> / <i>A. n. gambiae</i> s.s.	Mar–May Sep–Oct	0.05	Outdoors	Bovine	0
Ngera/Nyaruguru	<i>An. arabiensis</i> / <i>A. n. gambiae</i> s.s.	Jun–Dec	0.25	Outdoors	Human	0

* Bugesera and Kamonyi were dropped as a sentinel sites in August 2019, and Kamonyi served as the control site for two months (July–August 2019) but was replaced by Nyaruguru, Ngera site as Kamonyi received IRS for the first time in October 2019.

** Primary vector listed first, in bold, followed by secondary vector.

†EIR = Entomological inoculation rate.

Key Question 2

What is the current insecticide resistance profile of the primary malaria vectors?

Supporting Data

Table A-3. Insecticide resistance monitoring sites in Rwanda by confirmed and suspected resistance with and without the addition of PBO synergist

Insecticide:	Deltamethrin 25 Sites n (%)	Permethrin 25 Sites n (%)	Lambda- cyhalothrin 25 Sites n (%)	Pirimiphos methyl 25 Sites n (%)	Bendiocarb 25 Sites n (%)	Clothianidin 13 Sites n (%)
Confirmed Resistance	16 (64)	18 (72)	15 (60)	0 (0)	2 (8)	0 (0)
Suspected Resistance	3 (12)	4 (16)	5 (20)	0 (0)	4 (16)	1 (8)
Susceptible	6 (24)	3 (12)	5 (20)	25 (100)	19 (76)	12 (92)
Insecticide + PBO:	Deltamethrin 10 Sites n (%)	Permethrin 10 Sites n (%)	Lambda- cyhalothrin 9 Sites n (%)			
PBO Confirmed Resistant	0 (0)	0 (0)	0 (0)			
PBO Suspected Resistant	0 (0)	0 (0)	0 (0)			
PBO Susceptible	10 (100)	10 (100)	9 (100)			

Source: Rwanda Malaria Annual Report 2019–2020.

Conclusions for Entomologic Monitoring Investments

- *An. arabiensis* was the most prevalent vector captured, and displayed an affinity for outdoor biting and bovine and human hosts as based on blood-meal analysis. This is particularly evident in Nyagatare and Kirehe districts where IRS has been consistently sprayed. However, the sporozoite infection rates and entomological inoculation rates (EIRs) were observed to be zero during the monitoring period from July 2019 to June 2020. This indicates a drastic reduction of *Plasmodium* infections within mosquitoes, which supports the reduction of malaria cases in human populations in IRS districts. There is also the need to consider potential interventions that address the outdoor biting behavior of the vector to sustain the reduction of malaria parasites within mosquitoes.
- PMI will continue to conduct entomological monitoring in districts that received IRS and in one control site; these data will be used along with the durability monitoring and evaluation results to help inform decisions about future vector control interventions.
- Based on the results of insecticide resistance monitoring, pyrethroid resistance is largely suspected or confirmed (>80 percent of sites) throughout Rwanda. Mosquito vectors are fully susceptible to pirimiphos methyl; however, there is suspected resistance to clothianidin in one site. As such, ITNs with PBO or other dual active ingredient (AI) ITNs will continue to be recommended.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

1.2. INSECTICIDE-TREATED NETS (ITNs)

Key Goal

Achieve and maintain high ITN ownership and use with effective nets (based on insecticide resistance data) via campaigns and continuous channels.

Key Question 1

How has net ownership evolved since the start of PMI in the country?

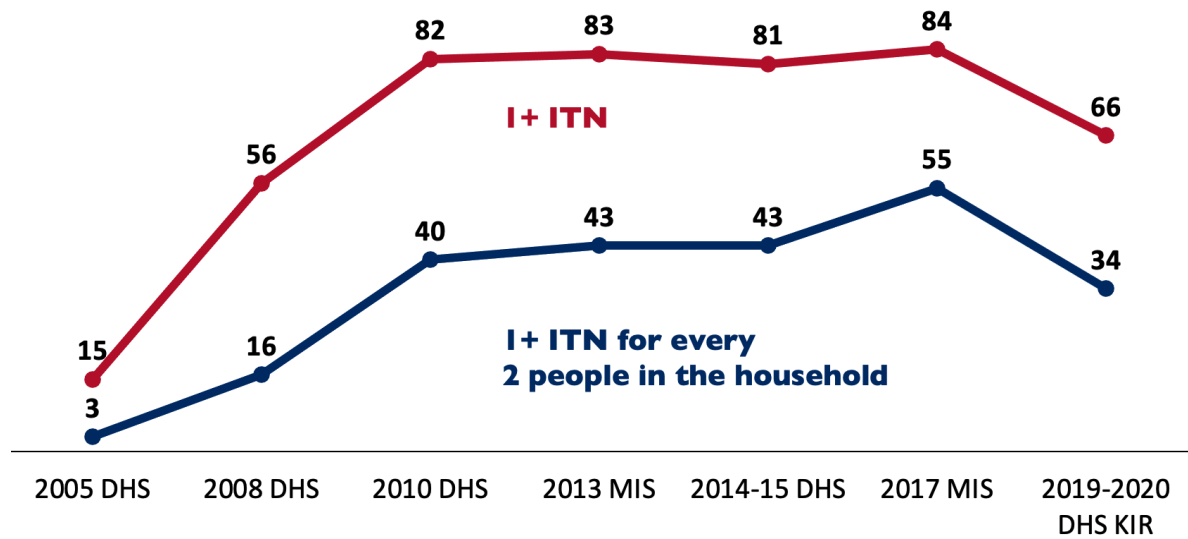
Rwanda has been distributing ITNs since 2006 with a view to reaching universal coverage. The ITN campaign in 2006 targeted children aged under five years of age. The first mass campaign was planned for 2009 but, due to delays in the ITNs arriving, the actual ITN distribution occurred in 2010–2011. Following this campaign, ITN ownership increased (Figure A-2) and Rwanda documented reductions in malaria cases in 2011. After initial rapid gains in ITN ownership from 2005 to 2010, incremental progress slowed through 2015 from a lack of national mass distributions. In 2013, the MOPDD conducted a targeted universal coverage campaign in high-burden districts. An additional distribution campaign in March 2015 replaced some of these ITNs.

As part of the Extended Malaria Strategic Plan 2013–2020, the MOPDD conducted a mass campaign in 2016–2017, which targeted all districts in the country including a top-up among the population that had not received ITNs from the 2015 distribution, to markedly increase ITN ownership. The subsequent MIS 2017 showed some gains in ITN ownership with one ITN per household up to 84 percent and universal coverage (i.e., one ITN for every two persons) at 55 percent (Figure A-2). Based on these findings, the MOPDD revised its policy on ITN distribution which previously had focused on sleeping spaces to be in line with WHO guidance (i.e., one net per 1.8 people). During the most recent mass campaign in 2020, the country distributed standard and PBO nets, which was supported in part by PMI, and distributed dual AI ITNs as part of the New Nets Project with a view of collecting data to inform on the effectiveness of these next generation nets. Because the mass campaign took place after the DHS, the survey did not capture any increase in ITN ownership.

Supporting Data

Figure A-2. Trends in ITN ownership

Percentage of households that own ITNs



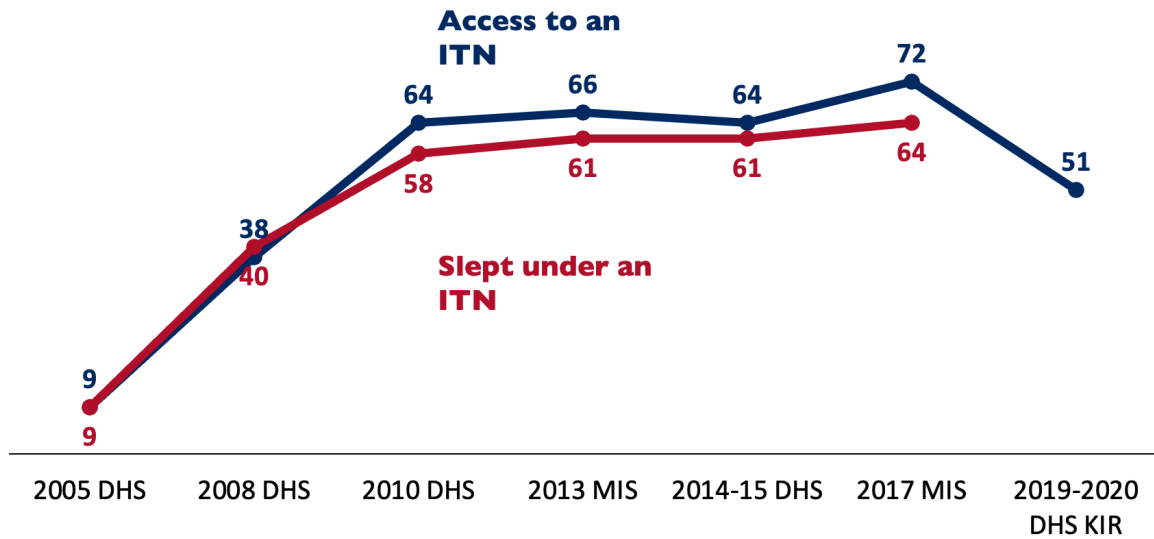
Key Question 2a

What proportion of the population has access to an ITN? Of those who have access, what proportion of the population reports using an ITN?

Supporting Data

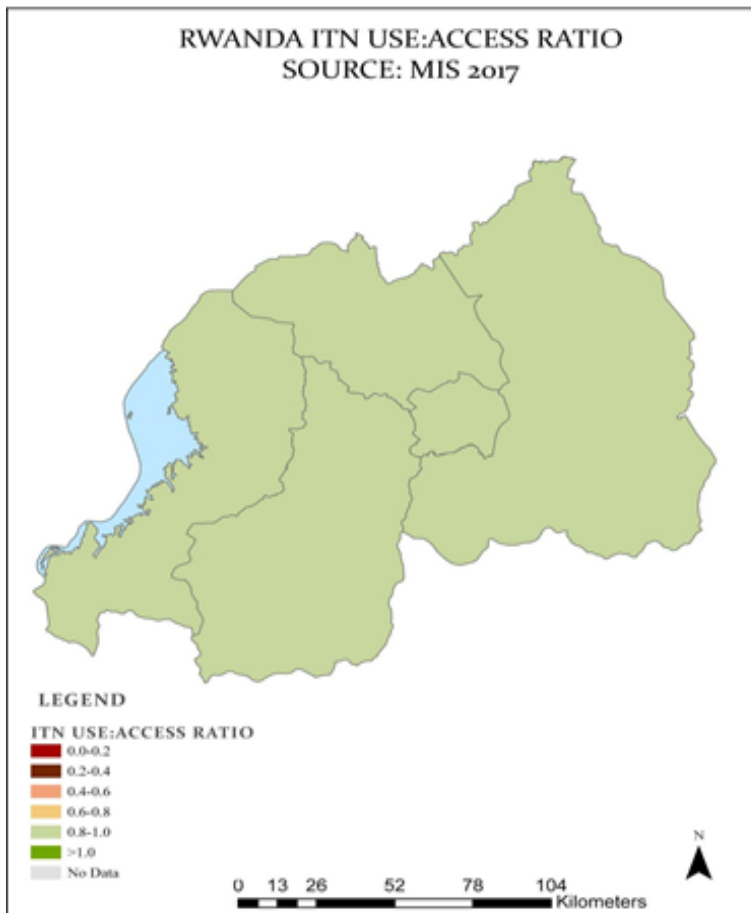
Figure A-3. Trends in ITN access and use

Percentage of household population with access to an ITN and percentage of those who slept under an ITN the night before the survey



As seen in Figure A-3, access to an ITN is closely linked with use. Although data for ITN use among the household population is not available from the DHS 2019–2020, the percentage of children under five years of age and pregnant women with access to an ITN who slept under an ITN the night before the survey was 77 percent and 82 percent, respectively. With the mass campaign in 2020, and the fact that data shows net usage generally follows trends in net ownership, it is expected that increased coverage led to more people sleeping under an ITN.

Figure A-4. Rwanda ITN use:access ratio map



Figures A-3 and A-4 indicate that there is a strong culture of net use. Although there still is room for improvement, all five provinces in the country have a ratio of ITN use to access of 0.8–1.0. Because the 2020 DHS occurred just prior to the 2020 mass campaign, the 2020 DHS data likely does not accurately reflect current ownership. The next ITN mass campaign is planned for 2022 with an MIS (to assess ITN ownership and use) to follow.

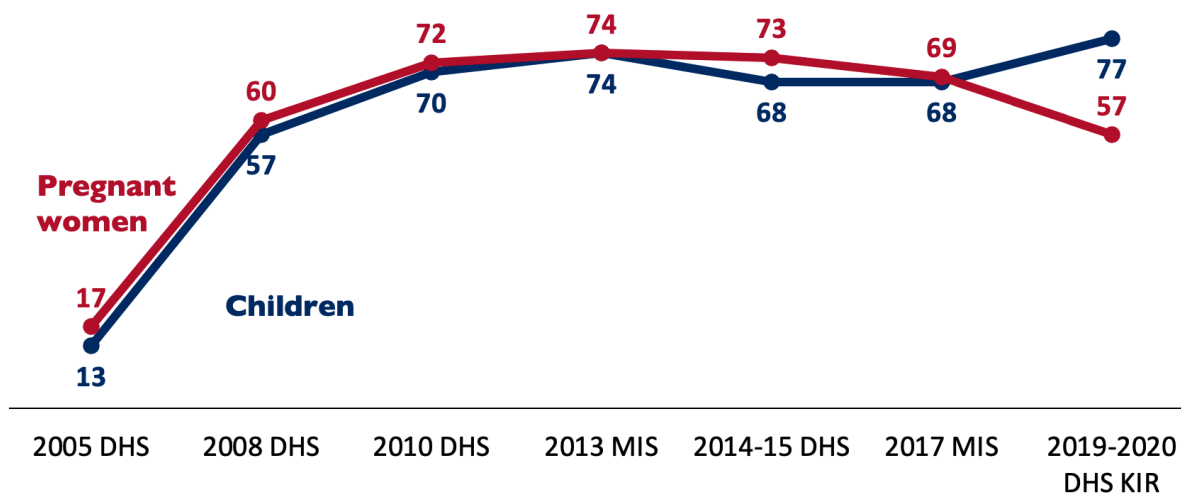
Key Question 2b

What percent of pregnant women and children under five years of age report sleeping under an ITN?

Supporting Data

Figure A-5. Trends in ITN use among children and pregnant women

Children under five years of age and pregnant women 15 to 49 years of age who slept under an ITN the night before the survey



The line graph shows that ITN use among pregnant women and children increased markedly between 2005 and 2010 as a result of the initial ITN distribution campaigns but plateaued between 2010 and 2017 in the absence of a full mass campaign. The use of ITNs by pregnant women decreased between the 2017 MIS and the 2019–2020 DHS in part due reported stockouts of ITNs at ANC clinics prior to the 2020 mass campaign and the fact that the 2020 mass campaign primarily occurred after the 2019–2020 DHS. Though not shown in Figure A-5, additional data from the MIS 2017 showed that in households that had at least one ITN 78 percent of children under five years of age and 82 percent of pregnant women reported to have slept under an ITN the night before the survey.

Key Question 3

If ITN access is high but use is low, what significant structural and/or behavioral challenges affect the adoption and maintenance of ITN use and care behaviors?

Supporting Data

As noted earlier, ITN use is closely linked to ownership indicating that there is a strong culture of net use in Rwanda. These findings are further supported with evidence from:

- A knowledge, attitudes, and practices (KAP) survey in 2017 that found 97 percent of respondents reported that sleeping under a bed net every night is the best way to avoid getting malaria.
- A formative research report in 2019 that found that the practice of prioritizing ITN use by pregnant women in the household was clearly seen as normative and expected in both urban and rural areas, and very much enforced and enabled by CHWs and nurses, respectively.

Nevertheless, there have been some factors that have been identified that can affect ITN use.

- The KAP survey in 2017 also found that 42 percent of respondents indicated that it was difficult to sleep well under a bed net when the weather is warm.
- The formative report found that respondents had a low risk perception for malaria in older children, which led to caregiver attention being greater for young children than older children and older children resistant to sleeping under nets.

The MOPDD plans to continue the use of integrated SBC messaging to ensure that the population continues to consistently and appropriately sleep under an ITN each night. The MOPDD is also planning to put systems in place to ensure timely procurement and distribution of ITNs to reach and maintain universal coverage.

Key Question 4

What type of nets are being distributed via which channels?

Rwanda has been using entomological monitoring data to inform the types of ITNs procured and where they are distributed. During the 2020 mass campaign, three types of ITNs were distributed (Table A-4), including standard pyrethroid ITNs in all districts implementing IRS and low burden districts, PBO nets in districts with high and medium malaria burden and reported insecticide resistance to pyrethroids, and dual AI ITNs through the New Nets Project. Table A-4 summarizes the number and types of nets that are distributed through each channel.

Supporting Data

Table A-4. Insecticide-treated net (ITN) distribution in 2020

Level Nationwide/Region/ State/Province	Mass Campaign 2020	ANC	EPI	School	Community	Other
Districts: Ruhango, Nyamagabe, Nyaruguru, Nyanza, Kamonyi, Rubavu, Rutsiro, Ngororero, Nyabihu, Musanze, Gakenke, Nyagatare, Ngoma, Kirehe, Butaro, Gakenke	2,852,800	273,650	270,878			
Districts: Gasabo, Rulindo, Gichubi, Nyarugege	996,850	203,438	199,240			
Districts: Karogi, Nyamasheke, Rusizi, Muhaga	769,150	-	-			

Key Question 5

What is the estimated need for ITNs during calendar years 2021–2023? How many, and what types, of ITNs will be procured, and by what partners? Through what channels will ITNs be distributed? Are there any projected ITN gaps?

The estimated need for routine distribution in 2021–2022 is over 1 million ITNs while the mass campaign for 2022–2023 estimated need is 4.9 million ITNs. The Global Fund is expected to procure about 2.6 million ITNs while PMI is planning to procure 684,819 PBO ITNs in 2022 and 650,000 PBO ITNs in 2023. The ITNs will include pyrethroid only, PBO, and dual AI. The decision of whether to procure dual AI ITNs will be based on the findings from the current ongoing implementation study and also market cost unless there is a subsidy for the MOPDD to procure the dual AI at a lower cost. All the ITNs procured will be distributed as part of the mass campaign and also routine distribution to ensure that over 85 percent of the population is protected with an ITN.

Supporting Data

Table A-5. ITN Gap Analysis Table

Calendar Year	2021	2022	2023
Rwanda GOR Fiscal year	2020-2021	2021-2022	2022-2023
Total country population	12,955,768	13,402,154	13,791,203
Total population at risk for malaria	12,955,768	13,402,154	13,791,203
PMI-targeted at-risk population	12,955,768	13,402,154	13,791,203
Population targeted for ITNs	8,129,783	8,347,509	8,566,898
<i>Continuous Distribution Needs</i>			
Channel 1: ANC	375,717	388,662	399,945
Channel 2: EPI	375,717	388,662	399,945
Channel 3: School	0	0	0
Channel 4:	0	0	0
Additional ITNs required to avoid ITN stockouts	375,717	388,662	399,945
<i>Estimated Total Need for Continuous Channels</i>	1,127,152	1,165,987	1,199,835
<i>Mass Campaign Distribution Needs</i>			
Mass distribution campaigns	0	4,464,605	0
<i>Estimated Total Need for Campaigns</i>	0	4,911,066	0
<i>Total ITN Need: Continuous and Campaign</i>	<i>1,127,152</i>	<i>6,077,053</i>	<i>1,199,835</i>
<i>Partner Contributions</i>			
ITNs carried over from previous year	0	2,682,196	0
ITNs from Government	0	0	0
ITNs from Global Fund	0	2,639,483	610,647
ITNs from other donors	0	0	0
ITNs planned with PMI funding	3,809,348	684,819	650,000
<i>Total ITNs Contribution Per Calendar Year</i>	<i>3,809,348</i>	<i>6,006,498</i>	<i>1,260,647</i>
<i>Total ITN Surplus (Gap)</i>	<i>2,682,196</i>	<i>(70,555)</i>	<i>60,812</i>

Key Question 6

What is the current status of durability monitoring?

Net durability monitoring is ongoing and conclusions will be presented in 2023 at the end of the 36-month monitoring period.

Net durability monitoring started in 2020 following the mass campaign ITN distribution. In coordination with PMI and aligned with internationally recognized guidelines, the MOPDD developed a net durability monitoring protocol that was approved by the Rwanda National Ethics Committee to monitor four ITN brands in four districts for 36 months post-distribution. Brands being monitored include two next generation net types (PBO-containing ITNs and Interceptor G2 ITNs) and two standard pyrethroid net types with different active ingredients (deltamethrin and permethrin).

Supporting Data

Table A-6. Planned durability monitoring (2020 cohort)

Campaign Date	Sites	Brands	Baseline	12-month	24-month	36-month
Feb 2020	Burera (Northern Province)	Olyset Net Standard ITN	6	15		
June 2020	Karongi (Western Province)	Interceptor G2	3	11		
Feb 2020	Kicukiro (Kigali City)	PermaNet 3.0 PBO ITN	6	15		
Feb 2020	Ruhango (Southern Province)	Yahe LN Standard ITN	6	15		

Conclusions for ITN Investments

- PMI will continue to support the MOPDD strategy of distributing nets through mass campaign and routine (EPI and ANC) channels.
- 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 conduct SBC activities to maintain consistent net use and address the identified barriers.
- PMI will continue to support the MOPDD in the ongoing net durability study.
- PMI is also working closely with the MOPDD and the RBC to address any quality assurance/quality control (QA/QC) issues that may lead to delays in procurement and distribution of ITNs.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

I.3. INDOOR RESIDUAL SPRAYING (IRS)

Key Goal

Ensure high spray quality and coverage, with an appropriate insecticide, in targeted endemic PMI-supported areas, in alignment with the national insecticide resistance management strategy.

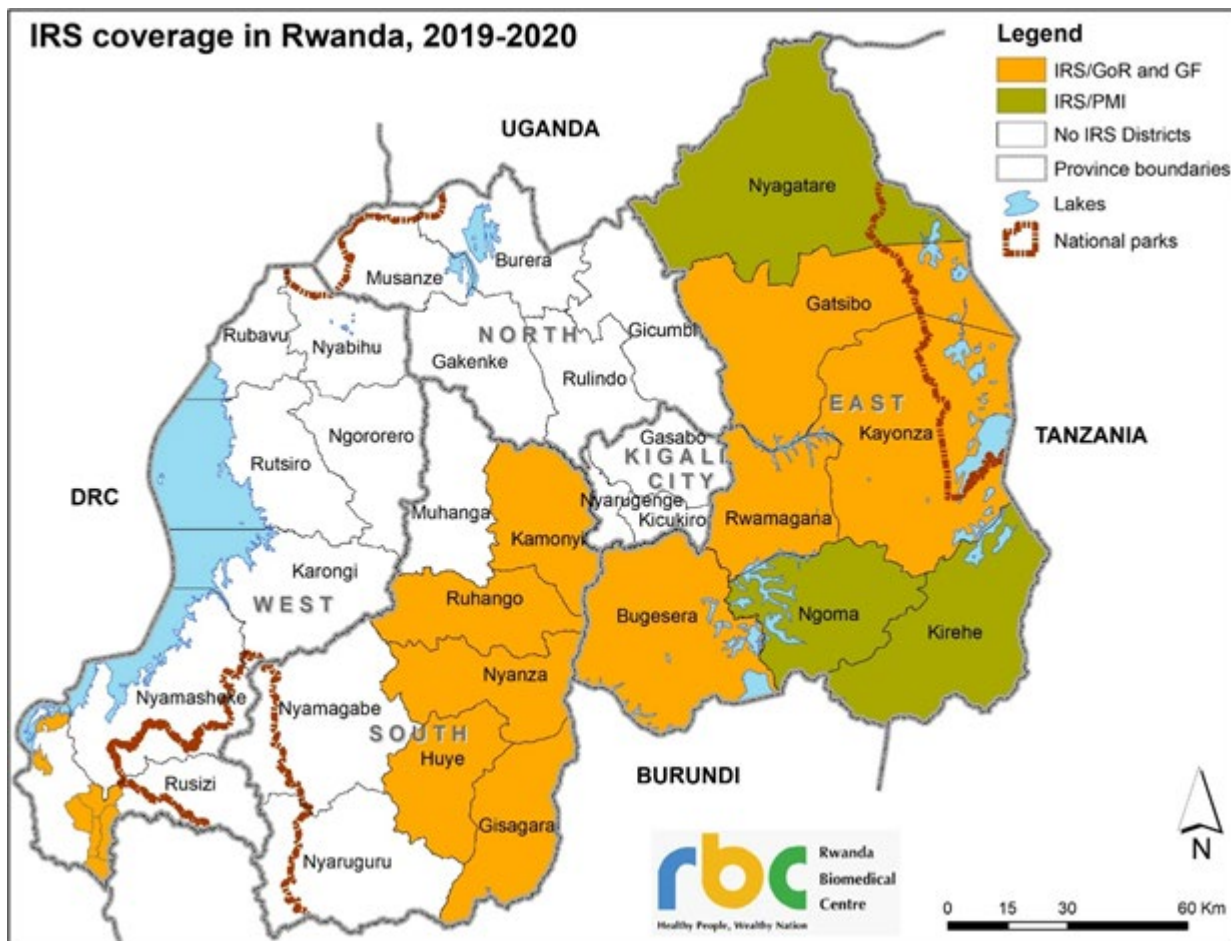
Key Question 1

What areas are targeted for IRS and why?

Indoor residual spraying is conducted in districts that have generally displayed a relatively higher malaria burden in the country (Figure A-6). Over the past several years, the MOPDD has focused on sustaining the IRS in these districts on an annual basis.

Supporting Data

Figure A-6. Indoor residual spraying districts in Rwanda, 2020



Key Question 2

In PMI-supported areas, what spray coverage rates have been achieved in the past three years and what are the plans for 2021?

Supporting Data

Table A-7. IRS coverage in PMI-supported districts in Rwanda, 2018–2021

Calendar Year	Districts Sprayed (#)	Districts	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)
2018	2	Nyagatare, Kirehe	208,026	100%	840,773
2019	2	Nyagatare, Kirehe	214,325	98%	855,752
2020	3	Nyagatare, Kirehe, Ngoma	327,704	99%	1,295,240
2021*	3	Nyagatare, Kirehe, Ngoma	TBD	TBD	TBD

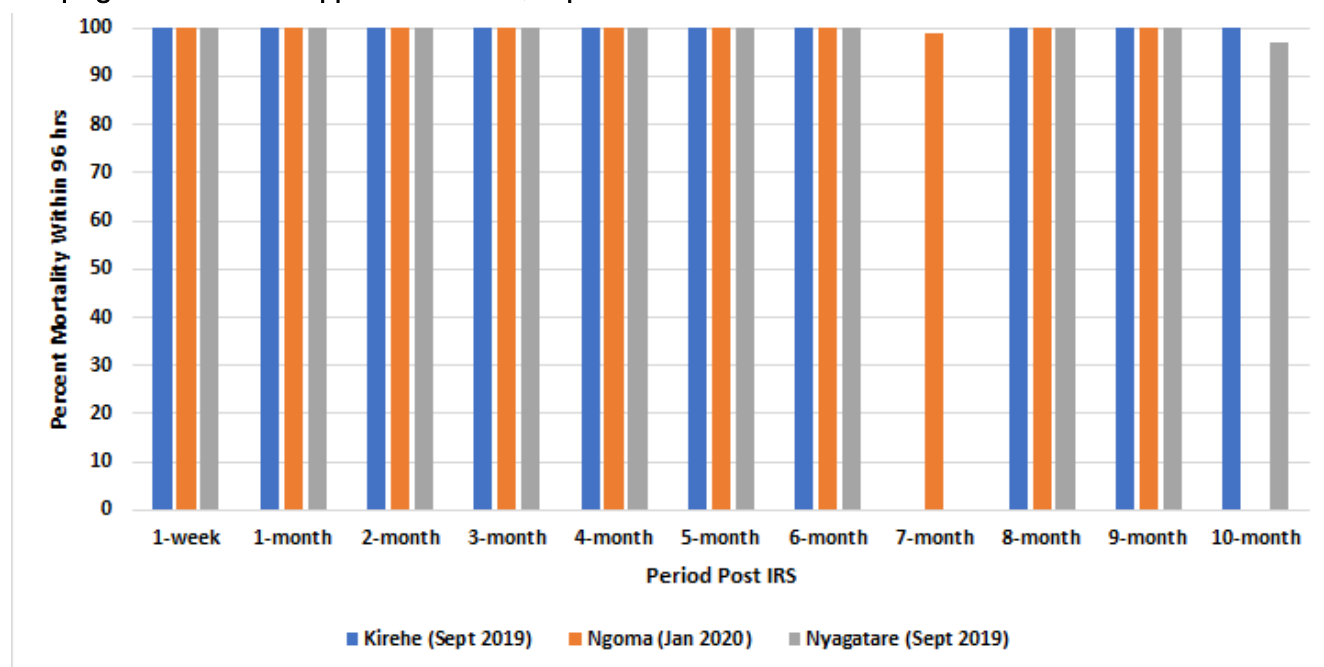
*Denotes targets for the current year.

Key Question 3

What is the residual efficacy of the insecticides used for IRS in PMI-supported areas?

Supporting Data

Figure A-7. Overall residual efficacy of Fludora® Fusion (neonicotinoid+pyrethroid) by month post-IRS campaign in three PMI-supported districts, September 2019 to November 2020



Note: Data not available for some sites at the 7-month time interval due to COVID-19 related factors that prevented performance of pertinent bioassay tests.

The residual efficacy of Fludora® Fusion (neonicotinoid+pyrethroid) observed in bioassays after the IRS campaign in September 2019 to November 2020 found near 100 percent mortality within 96 hours at all three PMI supported districts (Kirehe, Ngoma, and Nyagatare). Residual efficacy of the insecticide Fludora Fusion was observed to last for at least 10 months in Kirehe and Nyagatare districts.

Key Question 4

What is the insecticide rotation plan in PMI-supported areas?

Table A-8. Planned insecticide rotation plan for IRS in Rwanda 2019–2023

Target Spray Area	2019–2020	2020–2021	2021–2022*	2022–2023*
Nyagatare	Neonicotinoid + Pyrethroid	Neonicotinoid + Pyrethroid	Organophosphate	Organophosphate
Kirehe	Neonicotinoid + Pyrethroid	Neonicotinoid + Pyrethroid	Organophosphate	Organophosphate
Ngoma	Neonicotinoid + Pyrethroid	Neonicotinoid + Pyrethroid	Organophosphate	Organophosphate

*Denotes planned insecticide classes

Conclusions for IRS Investments

An. gambiae s.l. was the major malaria vector in all PMI surveyed districts and was the most prevalent vector throughout the data collection period in both the IRS intervention and control sites. Based on molecular identification, *An. arabiensis* made up the highest percentage (87.3 percent) of mosquitoes tested, and is known to be more inclined toward exophagic feeding. In general, the number of mosquitoes collected this year was low compared with previous years. Of the total *An. gambiae* s.l. collected indoors, 82 percent in Kirehe, 62 percent in Nyagatare, and 55 percent in Ngoma were collected in September and October. The trend was similar for the human landing catch collections in all three IRS districts, with the exception of Nyagatare, which has another peak in February–March. The data indicate that the timing of IRS in August, just before the peak in September–October, is appropriate. The insecticide used for IRS, Fludora Fusion, is still killing more than 80 percent of exposed mosquitoes nine months after spray, indicating that one round of spray can provide protection throughout the year irrespective of when the mosquito population peaks.

Given current budget constraints and the totality of data available for PMI-supported IRS in three districts, we do not propose an expansion of PMI funding for IRS. Spray targets, coverage, fumigant effects, and residual activity of the insecticide currently in use are optimal. PMI will continue to support IRS in three districts in MOP 2022 (Nyagatare, Kirehe, and Ngoma).

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2. HUMAN HEALTH

2.1. CASE MANAGEMENT

MOPDD Objective

The country's objective for case management is to maintain 100 percent prompt testing and treatment of all suspected malaria cases in line with the national treatment guidelines, revised in 2020.

MOPDD Approach

Diagnostic policies, guidelines, and practice

The MOPDD policy is universal diagnosis with either microscopy (at health facility) or malaria RDT (in community) for all suspected malaria cases (fever or history of fever in the last 24 hours in all ages). At the health facility level malaria is diagnosed using malaria microscopy by qualified laboratory technicians. Performance of RDTs is restricted to only trained CHWs. Rwanda uses a combination RDT that detects *P. falciparum* histidine-rich protein 2 antigen (HRP2) and *Plasmodium* lactate dehydrogenase (pLDH). Both RDTs and microscopy are supported by a training and quality assurance program. The National Reference Laboratory (NRL) has established the Laboratory Malaria Diagnosis External Quality Assurance program for blinded slide retesting, proficiency testing, and on-site supervision; the program includes quarterly evaluation of the quality of thick and thin smear practices, Giemsa staining, and microscopy reading in health facilities across Rwanda. Quality assurance of microscopy is by a cascade approach in which central level technicians train and monitor district-level technicians who in turn train and supervise health facility lab technicians.

Treatment policies, guidelines, and practices

The MOPDD treatment policy is to prescribe the first-line of treatment only after obtaining a positive blood smear or positive RDT. Artemether-lumefantrine (AL) is the recommended first-line treatment for uncomplicated malaria and dihydroartemisinin-piperazine is the second-line of treatment. Oral quinine plus clindamycin is recommended for pregnant women during the first trimester; AL is recommended for pregnant women in the second and third trimesters. Parenteral artesunate is the recommended treatment of severe malaria for all patients except for pregnant women during the first trimester who are recommended to receive intravenous quinine. The Rwanda national treatment guidelines were updated to include artesunate suppository indicated only as an initial (pre-referral) treatment of severe malaria, recommended for use only in children six months to six years of age given that treatment of severe malaria cases is restricted only to district, provincial and referral hospitals.

Public sector and private sector characteristics

Health services in Rwanda are provided through the public sector, government-assisted health facilities, and the private sector. The private health facilities accounted for 35,845 (1.4 percent) and 367,569 (14.7 percent) were treated by private health posts (MOPDD Annual Report, 2019–2020). The revised national malaria treatment guidelines are intended to be used at all levels of healthcare, both in the public and private sectors; private sector healthcare follows the same national guidelines, which includes RDTs and ACTs used in the public sector.

Community Health Program

Rwanda has a strong CHW program with community case management provided through complementary programs of iCCM (an integrated approach for diseases including malaria, diarrhea, and pneumonia among children under five years of age) and home-based management for malaria (HBM—management of only malaria among children at least five years of age and adults). The countrywide cadre of 58,000 CHWs has two CHWs (binomes) per village trained to deliver malaria testing using RDTs and treatment at the community level. In FY 2020, 58 percent of all diagnosis and treatment of malaria in Rwanda occurred at the community level. The MOPDD uses RapidSMS (transitioning to RapidPro) a rapid, secure short message service (SMS) system introduced in late 2018 for coordination of severe malaria case referral from CHWs to health facilities and for commodities stock management.

Community health workers training, supervision, and retention strategies

The MOPDD conducts cascade training among CHWs at community level on malaria case management in line with the revised guidelines. Community and Environmental Health Officers (CEHOs) and CHWs are mentored on malaria case management, real time notification of severe malaria and malaria commodities stock management through RapidSMS, proper drug storage, availability of community health tools, and adherence to diagnostic and treatment algorithms. Supervisory visits are made routinely and at a minimum of every six months. Quality assessment activities of CHWs are done by direct observation of CHW's competence during supervisory visits using a standardized checklist. Corrective action is taken during the visit. The GOR is considering a CHWs performance-based financing program for malaria.

Approach to health worker supervision

The MOPDD conducts cascade training among health workers at referral, provincial, and district hospitals, district pharmacies, health centers, and health posts on malaria case management in line with the revised guidelines. Integrated supportive supervision is conducted twice a year and targets all district hospitals, selected health centers, and CHWs. Routine formative supervisions and audits of all malaria deaths are conducted by MOPDD staff as part of ongoing monitoring, evaluation, and quality assurance efforts in collaboration with district hospital teams. At the health center level, providers are mentored on early malaria diagnosis and treatment, pre-transfer management of severe malaria, and functionality of and availability of integrated management of childhood illness guidelines.

PMI Objective in Support of MOPDD

PMI contributes to the country's case management malaria strategy in a variety of ways such as procuring all the ACTs required nationally in addition to injectable artesunate for the treatment of severe malaria cases; strengthening the diagnostic capacity in the country by supporting the country's cascade training strategy and supportive supervision of laboratorians for microscopy; supporting CHWs in PMI-supported districts with training, supportive supervision, and necessary tools; and supporting TES to ensure that the treatments utilized in the country are efficacious. PMI does not support the procurement of RDTs given that the country prefers combo-RDTs that are not supported by PMI; RDTs are currently procured by Global Fund.

PMI-Supported Recent Progress (FY 2020)

In FY 2020, PMI supported the following activities:

- Coordinated procurement and delivery schedules with the MOPDD to ensure that appropriate central and facility stock levels of antimalarials were maintained. During CY 2020–2021, PMI/Rwanda procured approximately 2.3 million ACTs.
- Developed a competency-based curriculum for iCCM/HBM training, finalized an iCCM/HBM e-Learning content that was uploaded on the national e-learning platform, and printed and distributed approximately 20,000 copies of the community-level tools for iCCM and HBM.
- Trained 53 CEHOs on the iCCM package in 17 of the 20 supported districts.
- Conducted integrated malaria supportive supervision in 351 supported health facilities.
- Conducted supportive supervision for 2,818 CHWs (binomes) and quarterly meetings with 5,919 CHWs to discuss malaria prevention, treatment, and reporting.
- Trained 146 hospital and health center staff (CEHOs, data managers, monitoring and evaluation (M&E) officers and community health supervisors) on malaria data management to improve surveillance and reporting in five prioritized districts; these in turn trained 3,679 CHWs from five districts.

- Supported 10 hospitals and communities, including 543 CHWS, to improve use of RapidSMS.
- Conducted malaria death audits in 35 district hospitals; a total of 167 deaths were confirmed countrywide. The findings of the death audits identified delays at initial triage and at referral as key factors leading to death; this information will be used to help inform in-service training and supportive supervision.
- Trained 82 lab technicians from six districts on performing malaria microscopy diagnosis, achieving an overall improvement in performance from 54.7 percent pre-training to 92.3 percent post-training.

The COVID-19 pandemic necessitated nationwide mitigation measures including travel restrictions, which delayed or postponed planned activities such as supportive supervision. Additionally, human resources were reallocated to address the COVID-19 pandemic, which led to inadequate supervision and technical support to the health facilities and CHWs.

PMI-Supported Planned Activities (FY 2021 with currently available funds)

- Continue to procure all ACTs and injectable artesunate, and will begin procuring commodities required for microscopy at health facility level (e.g., slides, slide boxes, Giemsa stain, immersion oil, safety boxes, alcohol, and dry swabs).
- Continue to support training and supportive supervision for facility-based health workers in case management.
- Support SBC activities to promote early care-seeking and appropriate case management.
- Continue to support CHW training, supportive supervision, and tools with further development of e-learning platform and approach.
- Support a TES in three sites to monitor the efficacy of the currently used antimalarial (AL) and the second-line treatment (dihydroartemisinin-piperaquine) and drug resistance.
- Through the PARMA network, continue collaborations to build NRL capacity for molecular testing and onsite TA and mentorship for necessary techniques such as drug sensitivities studies.
- Disseminate the updated national treatment guidelines through distribution and training of healthcare providers.
- Conduct malaria microscopy refresher training for targeted districts and continue the cascade training strategy and quality monitoring for microscopy diagnostics.
- Support malaria planning and TWG meetings.

Key Goal

Improve access to and use of timely, quality, and well-documented malaria testing and treatment by providing facility- and community-based health workers with training, supervision, and malaria commodities to provide quality, effective care.

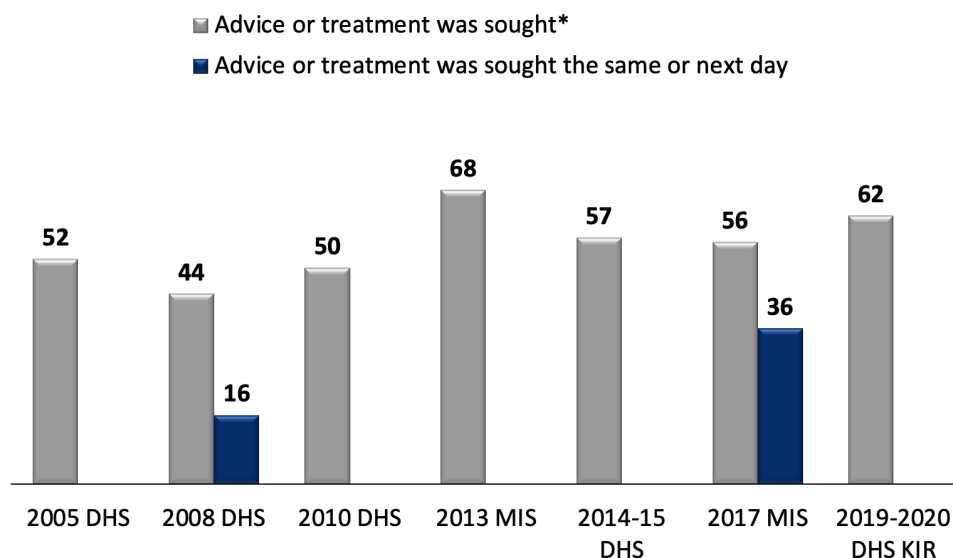
Key Question 1a

What is the status of care-seeking and/or access to care for children under five years of age with fever?

Supporting Data

Figure A-8. Trends in care-seeking for fever

Among children under five years of age with fever in the two weeks before the survey, the percentage for whom advice or treatment was sought was 62 percent in 2019–2020 DHS Key Indicators Report



*Note that this indicator has been recalculated according to the newest definition, care or treatment from any source, excluding traditional practitioners.

Key Question 1b

What significant structural and/or behavioral challenges affect prompt care-seeking?

Supporting Data

Challenges to prompt care-seeking include the following:*

- Patients or caregivers attributing illness to causes other than malaria
- Lack of community awareness on early healthcare-seeking
- Financial barriers

These were observed during the supportive supervision visits. However, availability of community-level case management nationwide via iCCM and HBM has ensured that children under five years of age and all malaria patients have access to early diagnosis and treatment of malaria as care from CHWs is perceived as accessible and straightforward for those with community-based health insurance. In addition, free malaria diagnosis and treatment to the most economically vulnerable populations (Ubudehe 1 and 2) will reduce the financial barrier to care (Rwanda Malaria Strategic Plan, 2020–2024)

*Please refer to Section 3.4 for information on how SBC interventions will be directed to address the challenges identified above.

Key Question 2a

What proportion of patients are being tested and appropriately treated for malaria?

From the Malaria and Neglected Tropical Diseases Annual Report, 2019–2020, the proportion of suspected malaria cases that received a parasitological test at public health facilities and in the community (for children under five years of age and adults) was sustained at 99.9 percent. Likewise, the proportion of confirmed malaria cases that received the first line antimalarial treatment was sustained at 100 percent in FY 2019–2020.

Supporting Data

Figure A-9. Trends in diagnosis and treatment of children with fever

Among children under five years of age with fever in the two weeks before the survey and with fever in the two weeks before the survey who received any antimalarial

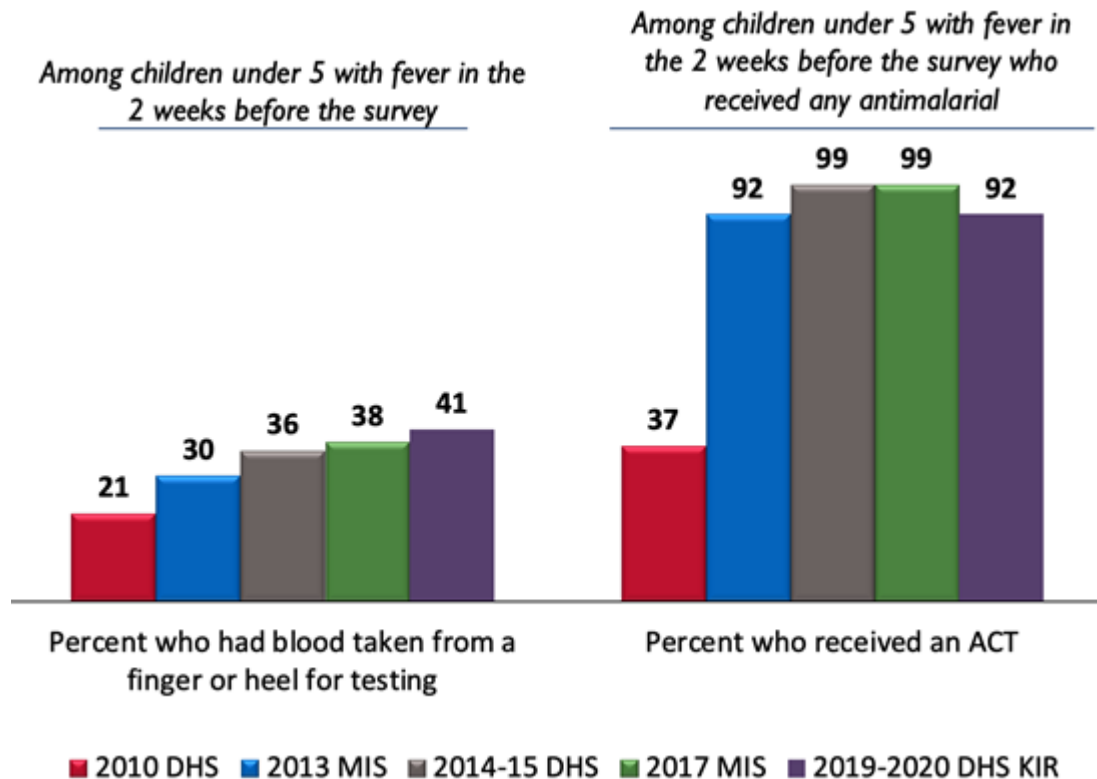
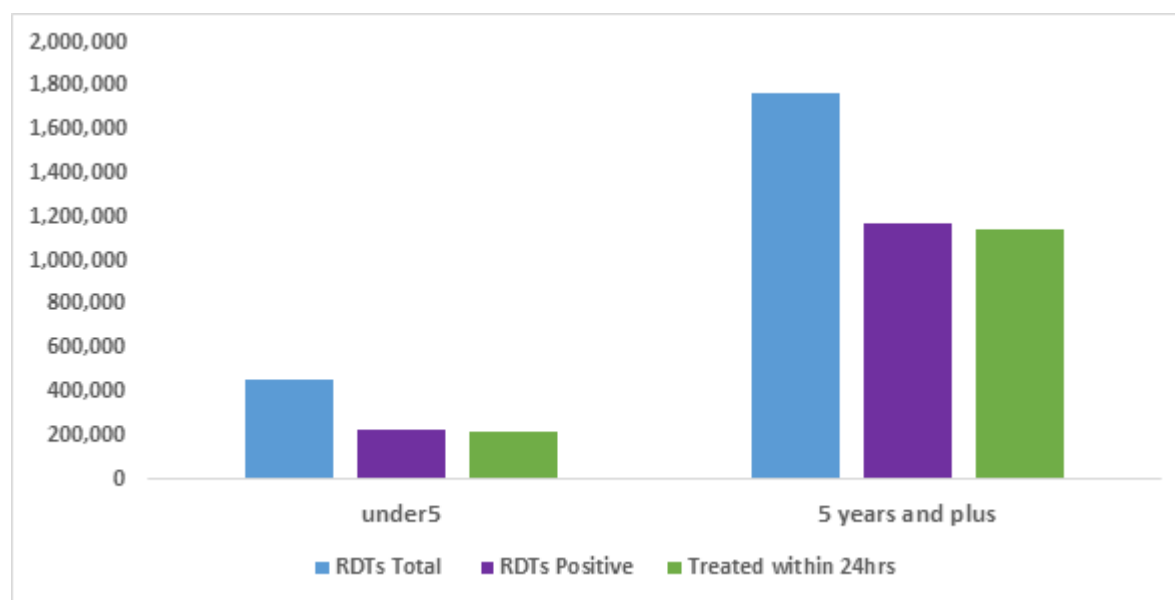


Figure A-10. Community malaria case management in children under five years of age and adults, FY 2019–2020*



*Figure from Rwanda Malaria and Neglected Tropical Diseases Annual Report 2019–2020, using HMIS data.

Key Question 2b

What significant structural and behavioral challenges affect testing and treatment practices among providers?

Supporting Data

Provider practices regarding testing and treatment generally are very good, including anecdotal information on the dedication and commitment of healthcare providers in providing quality healthcare at the health facilities and at the community level. During supervisory visits, it has been noted that health providers are dedicated and committed to their work and that the limitations sometimes are more structural (e.g., a lack of equipment) than due to the individual. Healthcare providers' workload is also a challenge in some cases.

Key Question 3

What is the current and planned support for case management at health facilities and in the communities by CHWs?

Supporting Data

PMI provides support, including training, tools and job aids, and supportive supervision, to the health system at all levels, including CHWs in 22 districts. National guidelines are reinforced in initial and refresher training for health facility providers and CHWs. Quarterly supervisory visits allow for on-the-job mentorship to follow training. PMI also supports central-level planning, policy development, and supportive supervision to districts. PMI supports case management in all districts in the country through an integrated MCH and comprehensive program. The provision of healthcare in Rwanda is not divided among donors.

Please see Figure 4b for more information on PMI-supported districts for case management and CHWs.

Key Question 4

What is the estimated need for RDTs during calendar years 2021–2023? Are there any projected RDT gaps based on anticipated partner contributions compared to estimated needs?

Supporting Data

PMI does not support the procurement of RDTs in Rwanda given that the country procures combo-RDTs not supported by PMI. There are projected RDT gaps (see gap analysis table). The MOPDD has requested support from the Global Fund for all RDT needs.

Table A-9. RDT Gap Analysis Table

Calendar Year	2021	2022	2023
Rwanda GOR Fiscal year	2020-2021	2021-2022	2022-2023
Total country population	12,955,768	13,402,154	13,791,203
Population at risk for malaria	12,955,768	13,402,154	13,791,203
PMI-targeted at-risk population	12,955,768	13,402,154	13,791,203
RDT Needs			
Total number of projected fever cases	7,210,026	5,768,022	5,191,249
Percent of fever cases tested with an RDT	55%	60%	65%
RDT Needs (tests)	3,965,514	3,460,813	3,374,312
<i>Needs Estimated based on HMIS Data</i>			
Partner Contributions (tests)			
RDTs from Government	0	0	0
RDTs from Global Fund	5,320,800	2,305,800	3,394,740
RDTs from other donors	0	0	0
RDTs planned with PMI funding	0	0	0
Total RDT Contributions per Calendar Year	5,320,800	2,305,800	3,394,740
Stock Balance (tests)			
Beginning Balance	1,144,650	2,499,936	1,344,923
- Product Need	3,965,514	3,460,813	3,374,312
+ Total Contributions (received/expected)	5,320,800	2,305,800	3,394,740
Ending Balance	2,499,936	1,344,923	1,365,351
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	2,974,136	2,595,610	2,530,734
Total Surplus (Gap)	(474,200)	(1,250,687)	(1,165,383)

Key Question 5

What is the estimated need for ACTs during calendar years 2021–2023? Are there any projected ACT gaps?

Supporting Data

Table A-10. ACT Gap Analysis Table

Calendar Year	2021	2022	2023
Rwanda GOR Fiscal year	2020-2021	2021-2022	2022-2023
Total country population	12,955,768	13,402,154	13,791,203
Population at risk for malaria	12,955,768	13,402,154	13,791,203
PMI-targeted at-risk population	12,955,768	13,402,154	13,791,203
RDT Needs			
Total number of projected fever cases	7,210,026	5,768,022	5,191,249
Percent of fever cases tested with an RDT	55%	60%	65%
RDT Needs (tests)	3,965,514	3,460,813	3,374,312
<i>Needs Estimated based on HMIS Data</i>			
Partner Contributions (tests)			
RDTs from Government	0	0	0
RDTs from Global Fund	5,320,800	2,305,800	3,394,740
RDTs from other donors	0	0	0
RDTs planned with PMI funding	0	0	0
Total RDT Contributions per Calendar Year	5,320,800	2,305,800	3,394,740
Stock Balance (tests)			
Beginning Balance	1,144,650	2,499,936	1,344,923
- Product Need	3,965,514	3,460,813	3,374,312
+ Total Contributions (received/expected)	5,320,800	2,305,800	3,394,740
Ending Balance	2,499,936	1,344,923	1,365,351
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	2,974,136	2,595,610	2,530,734
Total Surplus (Gap)	(474,200)	(1,250,687)	(1,165,383)

Key Question 6

What is the estimated need for definitive treatment and pre-referral treatment for severe malaria during calendar years 2021–2023? Are there any anticipated gaps?

Supporting Data

Injectable artesunate is used to treat severe malaria cases. There are no projected gaps in 2021–2023 years. PMI will continue to support the procurement of injectable artesunate in Rwanda. The revised national treatment guidelines recommend the use of rectal artesunate by CHWs for pre-referral treatment of severe malaria in children under six years of age. The MOPDD is working with other funders, including GOR, to procure rectal artesunate.

Table A-11. Inj. Artesunate Gap Analysis Table

Calendar Year	2021	2022	2023
Rwanda GOR Fiscal year	2020-2021	2021-2022	2022-2023
Injectable Artesunate Needs			
Projected number of severe cases	11,344	9,076	8,168
Projected number of severe cases among children	4,538	3,630	3,267
Average number of vials required for severe cases among children	4	4	4
Projected number of severe cases among adults	6,807	5,445	4,901
Average number of vials required for severe cases among adults	11	11	11
Total Injectable Artesunate Needs (vials)	89,862	71,889	64,701
<i>Needs Estimated based on HMIS Data</i>			
Partner Contributions (vials)			
Injectable artesunate from Government	0	0	0
Injectable artesunate from Global Fund	43,125	0	0
Injectable artesunate from other donors [specify donor]	0	0	0
Injectable artesunate planned with PMI funding	13,000	50,000	15,000
Total Injectable Artesunate Contributions per Calendar Year	56,125	50,000	15,000
Stock Balance (vials)			
Beginning Balance	155,643	121,906	100,017
- Product Need	89,862	71,889	64,701
+ Total Contributions (received/expected)	56,125	50,000	15,000
Ending Balance	121,906	100,017	50,316
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	67,396	53,917	48,526
Total Surplus (Gap)	54,510	46,100	1,791

Key Question 7

What is the estimated need for any other standard antimalarial drug used in the country (e.g., primaquine for *P. vivax*) during calendar years 2021–2023? Are there any anticipated gaps?

Not applicable

Key Question 8

Are first-line ACTs effective and monitored regularly?

Rwanda regularly monitors the efficacy of the first-line ACT, AL, and the current evidence demonstrates that AL continues to be effective.

Supporting Data

Table A-12. Recently completed and ongoing antimalarial therapeutic efficacy studies

Year	Sites	PMI Funded Y/N	Treatment Arms	PCR-Corrected ACPR>90% (Y/N)
2018 ¹	Masaka, Rukara, and Bugarama	Y	AL	Y

ACPR: adequate clinical and parasitological response; AL: artemether-lumefantrine

¹Uwimana, A., Umulisa, N., Venkatesan, M., Szigel, S.S., Zhou, Z., Munyaneza, T., Habimana, R.M., Rucogoza, A., Moriarty, L.F., Sandford, R., Piercefield, E., Goldman, I., Ezema, B., Talundzic, E., Pacheco, M.A., Escalante, A.A., Ngamije, D., Mangalao, J.N., Kabera, M.,... Lucchi, N.W. (2021). Association of Plasmodium falciparum kelch13 R561H genotypes with delayed parasite clearance in Rwanda: An open-label, single-arm, multicentered, therapeutic efficacy study. The Lancet Infectious Diseases. [https://doi.org/10.1016/S1473-3099\(21\)00142-0](https://doi.org/10.1016/S1473-3099(21)00142-0)

Ongoing TES: 2021–2022 (Treatment arms: AL and dihydroartemisinin-piperaquine)

Next Planned TES: TBD

Key Question 9

Are there other areas (e.g., lab strengthening, private sector support, etc.) that should be considered for PMI support?

Supporting Data

Given the 2018 TES results in Rwanda in which mutant *Pfkelch-13* parasites were identified, PMI will continue to support the MOPDD laboratory capacity to enable molecular analysis. In addition, PMI will support the procurement of diagnostic laboratory supplies currently not supported by other funders.

Conclusions for Case Management Investments

Case management support in terms of training, supportive supervision, and tools are provided at all levels of the health system. In addition, PMI supports central-level case management policy development and dissemination. No changes are proposed. Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2. DRUG-BASED PREVENTION

MOPDD Objective

The Rwanda MSP 2020–2024 does not include drug-based prevention. Intermittent preventive treatment for pregnant women was discontinued in 2008 due to evidence of high-level resistance to sulfadoxine-pyrimethamine. Seasonal malaria chemoprevention and other drug-based preventive approaches are not recommended for Rwanda.

MOPDD Approach

N/A

PMI Objective in Support of MOPDD

N/A

PMI-Supported Recent Progress (FY 2020)

N/A

PMI-Supported Planned Activities (FY 2021 with currently available funds)

N/A

2.2.1. MALARIA IN PREGNANCY (MIP)

Key Goal

Support the national strategy for MIP, which includes provision of ITNs at the first ANC visit and effective case management of malaria, in accordance with WHO guidelines.

Key Question 1a

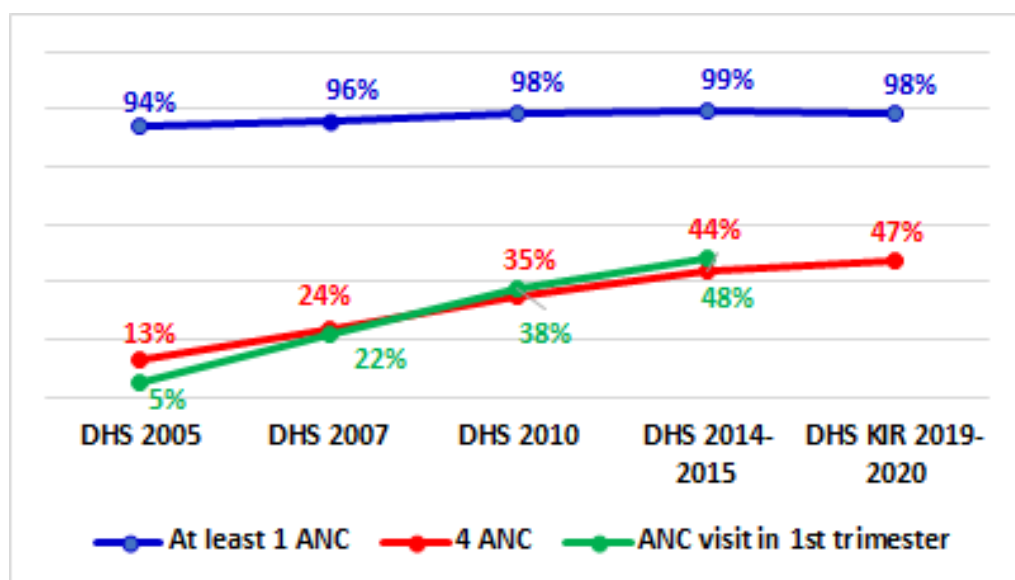
What proportion of pregnant women are accessing ANC early and frequently (as recommended by national and/or WHO strategies) during their pregnancy?

Since 2020, the MOH has adopted the new WHO recommendation of eight antenatal care visits, starting as early as when women suspect they are pregnant. The rate of attendance of at least one ANC visit at any time during pregnancy is high in Rwanda, however, the fourth or plus standard visit is still low. The proportion of women who attended the four recommended ANC visits was 47 percent (DHS Key Indicators Report 2019–2020) (Figure A-11).

Supporting Data

Figure A-11. Trends in ANC coverage

Women 15 to 49 years of age with a live birth in the five years before the survey DHS 2005, 2007, 2014–2015 and 2019–2020 (most recent birth)



Key Question 1b

Are there important health system and/or behavioral barriers to ANC attendance at health facilities?

Supporting Data

Although Rwanda has a very high proportion of pregnant women who attend at least one ANC visit, only approximately half of pregnant women attend four ANC visits, which likely is a result of the fact that many women start ANC relatively late (i.e., about 50 percent report their first ANC visit during the first trimester of pregnancy). Notably, the findings from the 2017 KAP survey indicated very high favorability of the need for ANC (92 percent) and trust in ANC providers (96 percent). Nevertheless, there are barriers to pregnant women attending ANC at health facilities, including 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). Additionally, COVID-19 contributed to the decline in the first ANC attendance, especially in early 2020. 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 are underway by the Maternal, Child Health, and Community division in RBC.

Please refer to Section 3.4 for information on how SBC interventions will be directed to address the challenges identified above.

Key Question 2

What proportion of pregnant women are receiving the recommended doses of IPTp?

N/A: Rwanda has not provided IPTp since 2008 because of documented resistance to SP.

Key Question 3a

What is the gap between ANC attendance and IPTp uptake (i.e., missed opportunities for giving IPTp at ANC)?

N/A

Key Question 3b

What significant health system and/or behavioral challenges affect provider delivery of MIP services (e.g., IPTp and ITN distribution at ANC)?

Supporting Data

Rwanda's health system is well organized and ANC guidelines are in place; they have been revised in 2020 to include eight contacts as recommended by WHO. The main challenges observed that affect provider delivery of MIP services are the shortage and lack of trained staff to provide ANC services and occasional stockout of ITNs for ANC.

Key Question 4

Does the national ANC program or health information system collect data and track the proportion of pregnant women with fever, those tested for malaria, those found to have malaria infection, and those who are treated?

No

Key Question 5

What is the estimated need for SP during 2021–2023? Are there any anticipated SP gaps? Are there gaps in other IPTp commodities?

N/A

Conclusions for MIP Investments

Since 2020, the MOH has recommended eight ANC visits and will continue to monitor four standard ANC visits, starting as early as when women suspect they are pregnant. There are no current plans for resuming IPTp in Rwanda. PMI will continue to support the MOPDD to implement effectively the two MIP interventions that are in the Rwanda guidelines (i.e., distribution of nets for each woman attending ANC and case management of malaria in pregnancy) through an integrated approach with maternal, newborn, and child health (MNCH) services. PMI support will include designing or updating and producing tools to be used in ANC, and updating, validating and disseminating guidelines and job aids on malaria prevention and treatment of malaria in pregnancy.

Please see FY 2022 MOP budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2.2. SEASONAL MALARIA CHEMOPREVENTION (SMC)

SMC is not a recommended intervention for this country.

2.2.3. ADDITIONAL DRUG-BASED PREVENTIVE STRATEGIES

This country is not a designated country for near-term pre-elimination or elimination and there is no PMI support planned for such work in Rwanda.

3. CROSS-CUTTING AND OTHER HEALTH SYSTEMS

3.1. SUPPLY CHAIN

MOPDD Objective

The objective of the MOPDD continues to be procuring and distributing malaria commodities in order to ensure quality malaria case management and prevention.

MOPDD Approach

The GOR, through the MOPDD, emphasizes the development and regular use of comprehensive malaria commodity needs assessments and timely procurement plans in order to avoid stockouts, expiries, or delays in implementation of key malaria interventions. Rwanda also regularly triangulates and enhances data between HMIS and eLMIS to build efficient procurement strategies to the supply chain. These approaches include the following:

- Annual quantification of antimalarial drugs, test kits, and ITNs as well as biannual reviews and quarterly stockout monitoring and supply reviews

- Procurement and quality assurance and quality control testing of malaria commodities
- Monitoring of district pharmacy malaria commodities, capacity-building, and quarterly meetings
- Strengthening of pharmacovigilance systems at health facilities

PMI Objective in Support of MOPDD

PMI supports the MOPDD in the procurement of key strategic malaria commodities across all districts and levels of Rwanda, namely ACTs, drugs for severe malaria, and ITNs, whereby it also supports net distribution. PMI also supports 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 more recently the commodities stockout reduction strategy.

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

PMI-Supported Recent Progress (FY 2020)

Even with the COVID-19 pandemic wreaking havoc on international shipping in CY 2020, PMI assisted malaria initiatives in Rwanda by working with the MOH, MOPDD, and other stakeholders to deliver 1,598,550 ACTs and 78,738 vials of injectable artesunate.⁵ PMI procured an additional 1,962,030 ACTs and 22,095 vials of injectable artesunate for delivery in 2021. In addition, PMI supported Rwanda in maintaining stockout levels below 2.5 percent for all ACTs from March 2019 to March 2020. In 2020, PMI's supply chain partner worked with the MOPDD to set baseline targets for the Rwanda Malaria Commodities Stockout Reduction Strategy, identify root causes and solutions, and propose investment plans to further reduce stockouts in the future.

In CY 2020, PMI supported Rwanda in operationalizing the RMS by providing TA to draft a procurement and finance manual, staff job profiles and organizational chart, and a five-year strategic plan. Additionally, PMI funded customization of the Product Catalog Management Tool to serve as the product master data for all existing health systems in Rwanda.

Other recent progress in the past year includes the following:

- Trained over 60 RMS district branch and data managers on electronic logistics management information system (eLMIS) version 3.2
- QA/QC tested 93 drug samples at various levels of the supply chain, with 100 percent compliance rate
- Generated quarterly and monthly stock status reports through the procurement planning and monitoring report
- Developed online modules for Regional Center for Excellence for Vaccines Immunization and Health Supply Chain Management platform

⁵ Data from Global Health Supply Chain – Procurement and Supply Management, Automated Requisition Tracking Management Information System. Retrieved via PMI Malaria Data Integration and Visualization for Eradication system.

- Conducted quality management improvement and accountability (QMIA) supervisory visits at 30 RMS district branches as well as health centers and referral hospitals in all districts to track supply chain performance (this data will be aggregated)

PMI-Supported Planned Activities (FY 2021 with currently available funds)

PMI plans to assist Rwanda's malaria programs through the following:

- National quantification of malaria commodities, along with other commodities, via support to the One Coordinated Procurement and Distribution System (CPDS); additionally, PMI will support the MOH in conducting quarterly supply plan and implementation reviews of malaria commodities, with monthly stock report generation
- Training CPDS staff on the new Forecasting and Supply Planning Quantification Analytics Tool to modernize country-led supply planning
- Procuring ACTs, ITNs, drugs for severe malaria, as well as supplies for community case management in 2021 and 2022
- Providing technical support to the Rwanda FDA to implement its recently developed pharmaceutical pricing policy and development process of regulations and guidelines related to mark up and price containment
- Continued support to RMS operationalization through:
 - Root-cause analyses into workforce performance gaps
 - Procurement and supplier relation management capacity-building
 - Contract management and finance capacity-building initiatives, including U.S. Government regulations such as Federal Acquisition Regulation and USAID Acquisition Regulation
 - Activity-based costing approach and volumetrics utilization in the warehouses to improve storage capacity

Key Goal

Ensure continual availability of quality products needed for malaria control and elimination (ACTs, RDTs, injectable artesunate, and ITNs) at health facilities and at the community level.

Key Question 1

Has the central level, (or subcentral level, if appropriate) been stocked according to plan for ACTs, RDTs, and injectable artesunate over the last year (2020)? If not, have they been under, over, or stocked out?

ACTs have been stocked according to plan for the majority of the last year. One specific presentation (AL 6x4) did experience a few months of under-supply that was resolved with the eventual delivery of additional stock. Because COVID-19 has caused issues in lead-times of freight, there were some occasional periods of over- or under-supply as shipments arrived before or after the anticipated lead time. Injectable artesunate has experienced over-supply in recent months as severe malaria cases have continued to fall. This will be analyzed in future quantification efforts, with the realization that severe malaria cases can increase rapidly at any time. Finally, RDTs have been slightly under-supplied at the central level but this has improved recently with additional shipments, with more pending Global Fund supported shipments expected. There were no central-level stockouts during this period and thus no distribution or supply activities from Central RMS to the districts were impacted.

Key Question 2

What are the trends in service delivery point stockout rates for ACTs (including ability to treat), RDTs, and Art. Inj. over the last year (if tracked)? Is there a seasonal or geographic difference in stockout rates?

Service delivery point stockout rates for ACTs and RDTs have remained minimal for the majority of the past year and have continued to improve. There have been no negative consequences on ability to treat.

Key Question 3

What is the difference between quantities for ACTs consumed and malaria cases, and RDTs consumed and numbers tested? What is driving any differences seen?

The majority of the RDTs in Rwanda are utilized at the community level. Data from FY 2019–2020 demonstrate that the majority of care-seeking persons (approximately 58 percent) were tested with an RDT and 99 percent of those who had a positive RDT were treated with an ACT within 24 hours. The ACT and RDT discrepancies are minimal. See Figure A-10 for additional information.

Key Question 4

To what extent does a functional LMIS provide visibility into timely and quality logistics data from various levels of the system? To what extent is commodity data visibility dependent on surveys or supervisory data rather than routine data reported by an LMIS?

Rwanda commodity data visibility is automated through eLMIS, which covers all levels of the supply chain in the country, and reporting rates have remained high in the past year. Still, recent analysis has suggested that COVID-19 has impacted accuracy of the reports. Individual site visits conducted by the QMIA discovered that individual facility reporting accuracy remains a problem. To address this, PMI will implement supportive supervision and mentorship activities to identify gaps in site-level functions and then build capacity to address those gaps. The recent transfer of oversight of the eLMIS from MOH to RBC in 2020 has created more interlinkages between eLMIS and HMIS. The eLMIS covers all storage sites and service delivery points, and is analyzed periodically to measure supply chain effectiveness by the data quality assessment.

Key Question 5

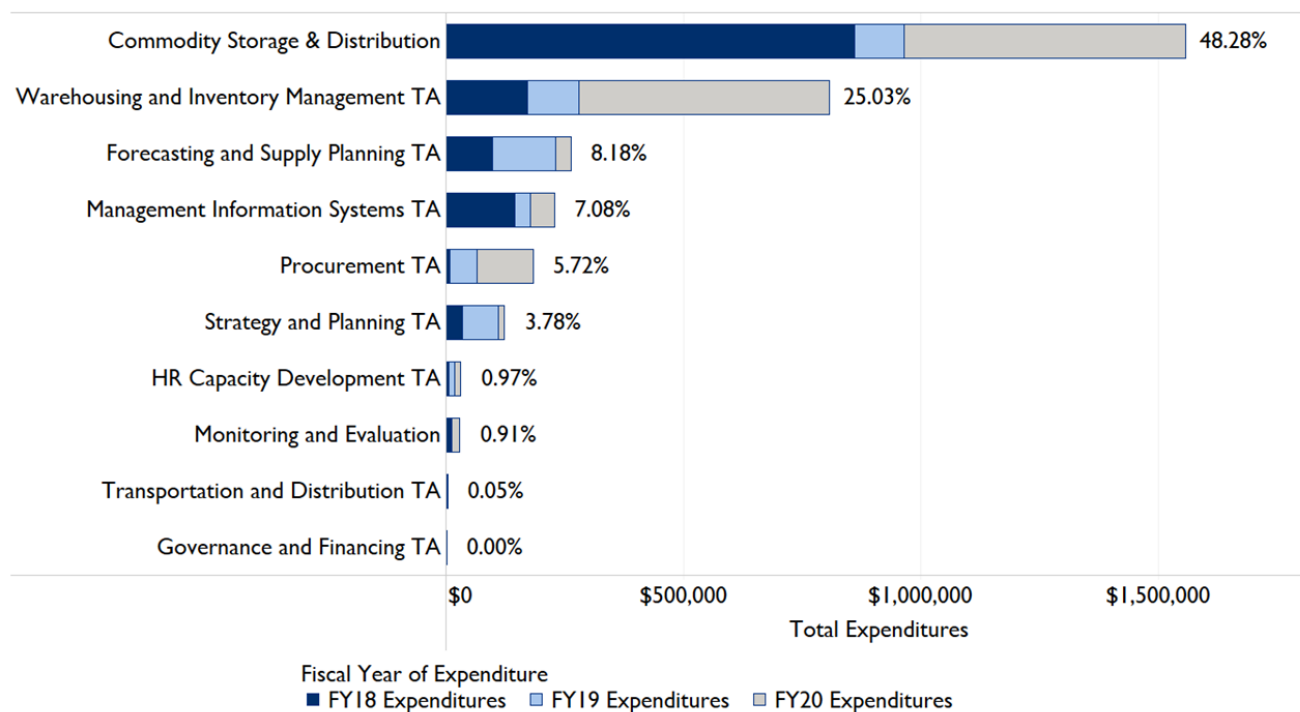
What are the main supply chain TA functions supported by PMI? Are there additional investments that PMI should make (e.g., increasing visibility of demand at health facilities) to ensure continual availability of quality products needed for malaria control and elimination at health facilities and the community level? In areas performing well, is it dependent on PMI/donor funding (e.g., PMI and Global Fund pay for warehousing and distribution)? Should more be done to foster self-reliance in domestic systems and, if so, what approaches should be considered?

- Warehousing and distribution-related management fees to the RMS as well as continuing to operationalize and build capacity at the warehousing and procurement levels of RMS. The capacity-building initiatives seek to ensure RMS is a sustainable unit moving forward.
- Quantification, forecasting, and strategic planning for malaria commodities.
- Expansion of quality management activities into data reporting at facility-levels; support will need to continue as capacity is built.
- The Stockout Reduction Initiative has also identified the following key areas for potential investment:

- Development and implementation of the professionalization framework for supply chain
- Development of pre-service and in-service training for supply chain management capacity-building
- Support for health facility staff to digitally capture supply chain transactions
- Support for and improve eLMIS and HMIS interoperability
- Digitalizing supply chain feedback measures at all supply chain levels

Supporting Data

Figure A-12. PMI supply chain investment by technical area



Key Question 6

Are there any other considerations that impact funding allocation in this category?

PMI also provides support to the national university laboratory for the quality control of ACTs according to international standards and post market surveillance, and to improve the capacity for medical product quality control systems. One potential impact to funding allocation is the current process for inspection of ITNs in Rwanda. Currently, RBC institutes a policy of Level II inspection as opposed to ISO Level I, which international suppliers have agreed to. This has created a recent delay in the procurement of nets to the country. PMI has supported dialogue and has agreed to find a solution that incorporates Level I inspection at the supplier site as well as by the RBC/RMS in Rwanda once the nets arrive. Service agreements are being drafted in 2021 and the approval of these could impact timing of procurements.

Conclusions for Supply Chain Investments

Rwanda continues to improve capacity of the RMS and aims to continue reducing the stockout rates while operationalizing the country’s own supply chain expertise. PMI will continue to support commodity procurement, quantification, and forecasting while also investing in capacity-building around eLMIS integration and data entry.

The RMS is currently scheduled to begin leading procurement of HIV antiretroviral treatments in 2022 and if this pilot shows success and capability, malaria commodities may be included in subsequent years. Until that time, PMI investments will maintain current commodity procurements and quantification exercises while also investing in capacity-building and continued operationalization of the RMS.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.2. SURVEILLANCE, MONITORING, AND EVALUATION (SM&E)

MOPDD Objective

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 2020–2024 strategic plan’s 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.”

PMI Objective in Support of MOPDD

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 done 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. Both assessments have found high concurrence between HMIS records and health facility registers.

PMI-Supported Recent Progress (FY 2020)

Rwanda has maintained and strengthened routine reporting on malaria cases by health workers in the HMIS and by CHWs through SISCom. Both mechanisms, supported through PMI and the President’s Emergency Plan for AIDS Relief, are vital for tracking malaria trends and were integrated in 2012 under the DHIS2 web-based platform. The MOPDD, PMI, and HMIS section developed data dashboards with relevant malaria indicators to facilitate data analysis, presentation, and timely decision-making at the district and central levels by malaria officers and the MOPDD. The following activities were supported by PMI:

- Trained 146 hospital and health center staff (data managers, M&E officers and community health supervisors) on malaria data management to improve surveillance and reporting in 5 prioritized districts. They in turn trained 3,679 CHWs from 5 districts
- Supported 10 hospitals and communities to improve use of RapidSMS; visited and supported 543 CHWs to improve their reporting
- Conducted quarterly meetings with CHWs to discuss malaria prevention, treatment, and reporting
- Supported malaria death audits in 15 hospitals
- Supported analysis and use of malaria data to inform programming and supported data quality assessments
- Supported data validation meetings at the facility and community levels
- Conducted integrated malaria supportive supervision; all 351 supported health facilities were reached
- Supported an analysis of the digital landscape in Rwanda

PMI-Supported Planned Activities (FY 2021 with currently available funds)

PMI will continue to support the following activities:

- Training health facility staff including M&E officers and data managers
- Supporting reporting, especially in discussion with CHWs and other health workers to improve reporting
- Conducting data quality assessments and strengthening data reporting to inform programming
- Supportive supervision at all health levels to improve performance
- Digitalization of the community program in selected districts
- Conducting an MIS in late 2022/early 2023

Key Goal

To support the MOPDD to build their capacity to conduct surveillance as a core malaria intervention using high quality data from both surveys and routine health information systems.

Key Question 1

Which data sources are available to inform estimates of intervention coverage, service availability and readiness, and morbidity and mortality?

Supporting Data

Table A-13. Available malaria surveillance sources

Source	Data Collection Activity	2019	2020	2021	2022	2023	2024
Household Surveys	Demographic Health Survey (DHS)		X				P
Household Surveys	Malaria Indicator Survey (MIS)				P		
Household Surveys	Multiple Indicator Cluster Survey (MICS)						
Household Surveys	EPI survey						
Health Facility Surveys	Service Provision Assessment (SPA)						
Health Facility Surveys	Service Availability Readiness Assessment (SARA) survey						
Health Facility Surveys	Other Health Facility Survey	X			P*		
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies (TES)			P		P	
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 (IDSR)						

Source	Data Collection Activity	2019	2020	2021	2022	2023	2024
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System (eLMIS)	X	X	P	P	P	P
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System	*	*	*	*	*	*
Other	EUV						
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes, and Practices Survey, Malaria Behavior Survey						
Other	Malaria Impact Evaluation						
Other	Entomologic Monitoring Surveys						

*Asterisk denotes non-PMI funded activities, X denotes completed activities, and P denotes planned activities. eLMIS activities refer to TA and staffing support via Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM).

Key Question 2

What HMIS activities have been supported? What current priorities will be supported with FY 2022 MOP funding?

PMI does not directly support the HMIS in Rwanda. PMI supports reporting of malaria surveillance data from health facilities and by community health workers. In addition, PMI has supported an assessment of connected diagnostics. The focus for FY 2022 is to increase community involvement and engagement in malaria control. Despite the decrease of malaria incidence in several high endemic districts, isolated malaria hotspots still remain. The proposed enhanced surveillance at the community level will engage CHWs to monitor and report malaria cases and any increases in incidence. This data will inform and allow for targeted control measures.

Key Question 3

Are there specific outcomes of past/current HMIS strengthening efforts that can be identified?

PMI does not directly support the HMIS in Rwanda but does provide support for data collection and reporting through healthcare worker in-service training, supervision and mentorship and data quality assessments. (*Please see Section 2.1 for information on these case management interventions.*)

The MOPDD routinely analyzes data from HMIS and SISCom to evaluate key malaria epidemiological indicators. The completeness of reporting of malaria related data in HMIS was 97 percent and the on-time reporting was 99 percent (Rwanda Malaria and Neglected Tropical Diseases Annual Report 2019–2020).

Key Question 4

Are there any other considerations that impact your funding allocation in this category (e.g., strategic information or capacity-building in-country)?

N/A

Conclusions for Surveillance, Monitoring, and Evaluation Investments

Rwanda has a highly functioning HMIS system for both health facilities and CHWs.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.3. OPERATIONAL RESEARCH

MOPDD Objective

Ensure delivery of effective malaria prevention and control interventions and mitigate against threats to malaria control.

MOPDD Approach

The Rwanda Malaria Strategic Plan (2020–2024) notes that although research studies, including program monitoring evaluations such as a TES, are conducted, there currently is no guiding malaria specific research agenda. The RBC and the MOPDD remain actively engaged in the design and implementation of program evaluation and operational research activities.

PMI Objective in Support of MOPDD

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.

PMI-Supported Recent Progress (FY 2020)

N/A

PMI-Supported Planned Activities (FY 2021 with currently available funds)

N/A

PMI Goal

PMI will conduct PE/OR that helps to evaluate coverage of population at-risk, intervention quality, or delivery efficiency; study reducing malaria transmission and disease burden; test effectiveness of new or evolved priority interventions and strategies; or explore new metrics and mechanisms to assess intervention impact.

Key Question I

In consultation with the MOPDD, have technical challenges or operational bottlenecks in program interventions been identified that require PE/OR? How have they been prioritized?

The MOPDD is concerned with insecticide resistance as a threat to malaria control and is field testing newer generation nets (PBO and dual AI nets) in certain non-IRS districts as an insecticide resistance mitigation strategy. Epidemiological impact of the newer generation nets and net durability (physical and chemical) are being conducted with support of donors.

The MOPDD has prioritized further monitoring of documented artemisinin resistance in Rwanda. In 2018, a TES identified an increase in the prevalence of the artemisinin resistance marker, which was first noted in the 2013–2015 TES, and that the marker was associated with delayed parasite clearance, indicative of artemisinin resistance. As a follow up to this study, a 2020–2021 TES is being implemented. Notably, efficacy of AL remained high in the 2018 TES study, ranging from 94 percent to 97 percent among sites.

Supporting Data

Table A-14. Ongoing program evaluation and operational research

Funding Source	Implementing Institution	Research Question/Topic	Status/Timeline
Unitaid and the Global Fund	IVCC/PATH	New Nets Project: Evaluating the impact of next-generation insecticide-treated bed nets	2019–2022

Key Question 2

Are there specific challenges in any intervention areas that merit further exploration or research with the potential of establishing strategies or interventions applicable in the near future?

N/A

Key Question 3

Are there any other considerations that impact your funding allocation in this category?

N/A

Conclusions for Program Evaluation and Operational Research Investments

PMI will continue to work with the MOPDD to consider additional program evaluation or operational research opportunities.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.4. SOCIAL AND BEHAVIOR CHANGE (SBC)

MOPDD Objective

The objective of Rwanda’s malaria SBC strategy is to provide the framework and guiding principles for malaria SBC interventions in order to increase the use of malaria interventions. The overall objective of the malaria SBC strategy is to increase malaria awareness, knowledge, and correct practices and behaviors toward malaria prevention and control.

MOPDD Approach

The Malaria Strategic Plan (MSP) 2020–2024 and Malaria National Guidelines (2020) detail the MOPDD SBC approach. The MSP 2020–2024 recommends revising and finalizing the Social and Behavior Change Communication Strategy 2017–2020, with the target of reaching 85 percent of the population who have correct and consistent practices and behavioral toward malaria control interventions by 2024. Most SBC activities are implemented at the local level, but there are also targeted activities at national level.

Among the interventions to reach the 85 percent target, the MOPDD is working with the SBC program to focus on the role of the community in malaria prevention and control activities including the development of integrated messages (e.g., ensure the use of malaria preventive services and early treatment-seeking behaviors) to sensitize communities and the promotion of community engagement through existing structures such as parent forums and community meetings (weekly or monthly). The MOPDD communication approach stresses the importance of interpersonal communication within the community as the cornerstone of any malaria intervention by building on an “enabling environment” and strong health services. Other SBC activities implemented by the MOPDD are funded by Global Fund (e.g., environmental management including larval source management) and African Leaders Malaria Alliance (e.g., support the Zero Malaria Starts with Me campaign).

These malaria SBC strategies align with Rwanda’s national SBC policy for the health sector that aims to strengthen the implementation of overall development objectives in Rwanda. This national policy emphasizes enabling the population to make informed health behavior choices by providing appropriate information and using quality messages and methods, including the use of media and interpersonal communication.

PMI Objective in Support of MOPDD

PMI contributes to the country’s SBC strategy through an implementing partner that works closely with the MOPDD. PMI supports SBC at both the local level (supporting SBC in 20 districts) and the national level by contributing to the Health Promotion TWG and using mass media to create awareness and behavior change in the prevention and treatment of malaria such as radio broadcasts. PMI support of SBC focuses broadly on prevention and prompt diagnosis and treatment of malaria. PMI is among the main partners supporting malaria SBC activities.

PMI-Supported Recent Progress (FY 2020)

PMI has supported SBC activities including promoting ITN use and improving malaria case management. PMI supported the use of multi-channel approaches, stressing the importance of prevention and prompt diagnosis and treatment of malaria. These activities included interpersonal communication, drama series, radio broadcasts and short radio sketches with the following achievements: 24 malaria episodes through urunana drama series, 16 radio talk shows and 4 “Five– minute” radio sketches. Key messages included encouraging the population to use rectangular mosquito nets (which were distributed for the first time since 2012), early care-seeking behaviors, use of ITNs by pregnant women, recognizing signs and symptoms of severe malaria, and other malaria preventive measures.

At the central level, PMI was actively involved in the Health Promotion TWG, contributed to the production of malaria communication materials and is supporting the production of a video focusing on malaria prevention and prompt care-seeking.

PMI has also been supporting SBC activities in 20 districts using community outreach sessions in community gathering and education sessions reaching around 100,000 people with malaria messages.

PMI-Supported Planned Activities (FY 2021 with currently available funds)

PMI will continue to support implementation of the MOPDD's SBC strategy working in collaboration with the MOPDD and partners. This will include the implementation of SBC activities at the national and community levels to strengthen the capacity of MOPDD and implementing partners to develop, implement and monitor SBC interventions. Through its implementing partners, PMI will continue malaria messaging through the use of existing channels such as the *umudugudu* (village) and *umuganda* networks (community work and messaging days) to create awareness on malaria prevention. Specific activities include the following:

- SBC interventions to focus on acceptance and use of rectangular ITNS, which were distributed during the ITN mass campaign in 2020 for the first time since 2012 (conical nets primarily have been distributed and used in the interim).
- Central-level support for strengthening capacity through the Health Communication Center and MOPDD to implement Rwanda's national SBC strategy, and to continue supporting MOPDD to shape SBC approaches in malaria control. The support will focus on designing, implementing, monitoring, and evaluating SBC activities.
- Community-level support for healthcare workers and CHWs to promote early care-seeking and appropriate case management.

Key Goal

Through the use of SBC interventions and in alignment with a country's national malaria control communication strategy, PMI supports the uptake and correct and consistent use of malaria interventions, thereby improving the overall quality of malaria control efforts that will contribute to reductions in malaria.

Key Question I

What behaviors is PMI proposing to prioritize through its SBC programming? What data support this prioritization? Will support be geographically targeted or national?

Supporting Data

Table A-15. Prioritized behaviors with FY 2022 funds

Behavior	Target Population	Geographic Focus	Justification
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 MIS 2017 showed geographic variations in ITN use among pregnant women (e.g., 86% in North province vs. 47% in East province). There is a need to continue and strengthen SBC activities countrywide with a special focus on the regions and populations with a 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 the 2017 MIS and the 2020 DHS, 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.

Key Question 2a

For correct and consistent use of ITNs, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Identified barriers for correct use of ITNs include the perception that it is difficult to sleep under a net when the weather is warm, the low risk perception for malaria in older children (which leads to caregiver attention being greater for young children than older children and older children being resistant to sleeping under the nets), the preference for conical ITNs, and the belief that ITNs allow for bedbugs to “hide” in the nets in the day and fall down from them at night.

Although these barriers are identified, there is a gap around information on the most important SBC strategies that would motivate, increase, and sustain net use. PMI will continue working with the SBC team through the Health Promotion TWG to develop these SBC strategies.

Supporting Data

Although the Rwanda MSP 2020–2024 provides high-level approaches for SBC, there is a need for the MOPDD and SBC malaria stakeholders to work together to design specific messages that target identified barriers. The MIS 2017 identified radio, interpersonal communication via CHWs and community events as being the best sources of information to reach the community. The MSP 2020–2024 also prioritized the community gatherings and CHWs as channels for SBC. These channels will be strengthened to allow providing the message at the community level on the importance of net use for all categories of age and resolving any issue related to nets use, such as demonstration of how to hang an ITN and how to properly care for a net.

Key Question 2b

For prompt care-seeking for fever, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Identify the key facilitators and barriers to prompt care-seeking with the availability of free community care for malaria for all age groups.

The formative report (2019) identified the following as barriers to prompt care-seeking:

- 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
- The practice of consulting a traditional healer before seeking care from the formal health system

Key Question 3

What is the country's capacity to design, implement, and monitor SBC interventions at the national and subnational level?

The coordination of SBC activities in the MOH are under the auspices of the Rwanda Center for Health Communication. Based in the Rwanda Biomedical Center, the activities of the Center for Health Communication are implemented through the Health Promotion TWG, of which the MOPDD is a member. This center coordinates, integrates, and harmonizes health messaging across the MOH, working specifically with the MOPDD, partners, and other GOR programs. PMI is the main partner supporting malaria SBC activities in Rwanda, together with the Global Fund, the African Leaders Malaria Alliance, and the GOR. This strong collaboration among key stakeholders minimizes the duplication of efforts. At the local level, involvement and ownership of local government (community meetings, umuganda, urugerero, and parents' forum) create a friendly environment to provide SBC in the community.

The main constraint for malaria SBC is inadequate funding for regular and sustained implementation of SBC activities at all levels, which has led to inadequate SBC tools and materials and a decline in SBC outcome indicators. PMI will continue to support the MOPDD to address identified constraints.

Conclusions for SBC Investments

PMI is proposing a small expansion of SBC activities. PMI will continue to support ITN use and prompt care-seeking but with more support to SBC at the community level using CHWs. In Rwanda there are four CHWs per village to serve a population of around 200 people, enabling them to reach each household. This setup will allow reaching the hard-to-reach communities with malaria SBC messages. In addition, PMI will continue to support SBC at the community level using existing structures such as parent forums and monthly and weekly community meetings to engage communities to actively participate in malaria prevention and control.

PMI will continue to provide technical support for capacity-building at the national level by participating in the Health Promotion TWG and the workshops organized by the Rwanda Health Communication Centre to develop messages and approaches to better target identified barriers.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.5. OTHER HEALTH SYSTEMS STRENGTHENING

MOPDD Objective

Rwanda has devoted significant resources to strengthening its health system, leveraging resources from its national budget, the Global Fund, the U.S. Government, private partnerships, and other donors. Health systems that allow accessibility to quality affordable health services are critical, as is a strong disease surveillance system to monitor, detect, and respond to disease outbreaks. Objective 4 of the revised MSP 2020–2024 aims to strengthen coordination, collaboration, and effective program management.

MOPDD Approach

The MOPDD has engaged in intersectoral collaboration with other governmental agencies such as the Rwanda Agricultural Board and the Ministry of Agriculture and Livestock on common issues to address insecticide resistance and larval source management.

In addition, the MOPDD has developed small public–private partnerships, such as the larviciding project, with international collaborators and other government institutions and initiated collaboration with neighboring countries in the Great Lakes Malaria Initiative involving member nations of the East African Community and the Democratic Republic of the Congo, all aimed at strengthening its health system.

PMI Objective in Support of MOPDD

PMI supports a broad array of HSS activities that cut across intervention areas, such as health worker training, 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 to facilitate workshops, training, and conference attendance.

PMI has supported both the Peace Corps Response and the Field Epidemiology Training Program (FETP) in Rwanda. The Advanced FETP is a two-year program aimed at epidemiological capacity-building to support cross-cutting priorities at national and subnational levels in multi-disease surveillance systems: Integrated Disease Surveillance and Response, malaria, HIV, and public health emergency response.

Prior to CY 2020, PMI provided support to the WHO program officer, who served as liaison from the WHO regional office to the RBC/MOPDD, provided malaria-specific TA, led or participated in malaria/subgroup TWGs, and assisted with the development of malaria program reviews and elaboration of malaria strategic plans with RBC/MOPDD and capacity-building for data use.

PMI-Supported Recent Progress (FY 2020)

PMI supported MOPDD staff to attend the American Society of Tropical Medicine and Hygiene (ASTMH) International Conference in 2020 and provided TA for development of presentations. PMI also supported the travel of the MOPDD case management director to the malaria branch laboratory at CDC, Atlanta as part of the PARMA collaboration with Rwanda to discuss the 2018 TES data analysis and future molecular capacity-building for Rwanda NRL.

In FY 2020, five out of 16 FETP trainees in the fourth cohort graduated; the fifth FETP cohort includes two residents undertaking malaria-related projects and the sixth FETP cohort of 15 trainees (including two malaria-focused trainees) were enrolled in December 2020. Five of the FETP projects were presented by trainees during the 2020 East African FETP conference which was focused on COVID-19.

PMI-Supported Planned Activities (FY 2021 with currently available funds)

PMI will continue its support for MOPDD capacity-building via conferences and workshop attendance, both national and international, its assistance for TWGs via logistical and operational support and the laboratory capacity-building at RBC. PMI will also continue its support for the FETP residents working on malaria projects and the Peace Corps Response.

Key Goal

To support continued capacity-building in epidemiology, public health leadership, and strengthening of malaria surveillance, prevention, and control in Rwanda.

Key Question 1

Upon identifying specific goals, objectives, and actions for health systems strengthening focused on reducing malaria infection, morbidity, and mortality, can you outline these and consider relevant support?

The FETP is aimed at epidemiological capacity-building to support cross-cutting priorities at national and subnational levels; this includes multi-disease surveillance systems (Integrated Disease Surveillance and Response, malaria, HIV and public health emergency response). These are in line with the MOPDD's objectives to strengthen health systems.

Supporting Data

PMI has supported FETP malaria residents since FY 2012. To date, five cohorts (11–17 residents each) of FETP residents have initiated the two-year program and three cohorts have completed (44 graduates). Among these 44 graduates, 34 are employed by MOH, four are in other GOR agencies, three have assumed WHO positions, and three are employed by nongovernmental organizations. Five MOPDD staff members have participated in the FETP. Non-malaria FETP residents continue to indirectly contribute to malaria control through their HSS efforts that include laboratory quality improvement, surveillance system projects, outbreak preparedness and response, and strengthening scientific communications.

Conclusions for Additional Health Systems Strengthening Investments

No change is proposed to PMI's support for additional health system strengthening activities. PMI will continue to support the Advanced FETP residents focused on malaria activities and the Peace Corps. The FETP program has proven to be an integral part of strengthening the health system in Rwanda with many of the fellows going on to secure public health jobs in the ministry and other public health institutions. The program was also crucial in the COVID-19 response in the country.

Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.