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Kenya

Malaria Operational Plan FY 2023

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This FY 2023 Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with national malaria control programs and other partners. Funding available to support outlined plans relies on the final FY 2023 appropriation from the U.S. Congress. Any updates will be reflected in revised postings.

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

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based Combination Therapy
AI	Active Ingredient
AL	Artemether-lumefantrine
ANC	Antenatal Care
CCMm	Community Case Management of Malaria
CDC	Centers for Disease Control and Prevention
CHA	Community Health Assistant
CHU	Community Health Unit
CHV	Community Health Volunteer
CoE	Committee of Experts
DHS	Demographic and Health Survey
DNMP	Division of National Malaria Program
DOT	Directly Observed Therapy
DQA	Data Quality Assessment
EPI	Expanded Program on Immunization
FELTP	Field Epidemiology Laboratory Training Program
FY	Fiscal Year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GOK	Government of Kenya
HCW	Health Care Worker
HMIS	Health Management Information System
HPTU	Health Products and Technology Unit
IPTp	Intermittent Preventive Treatment for Pregnant Women
IRS	Indoor Residual Spraying
ITN	Insecticide-treated Mosquito Net
KHIS	Kenya Health Information System
KMS	Kenya Malaria Strategy
LMIS	Logistics Management Information System
MCAT	Malaria Community Action Team
MIP	Malaria in Pregnancy
MIS	Malaria Indicator Survey
MOH	Ministry of Health
NQCL	National Quality Control Laboratory
OR	Operational Research
PMLLIN	Post-Mass Long-Lasting Insecticide-treated Net (survey)
PBO	Piperonyl Butoxide
PE	Program Evaluation
PMI	U.S. President's Malaria Initiative
PMS	Post-Marketing Surveillance

PPB	Pharmacy and Poisons Board
RDT	Rapid Diagnostic Test
SBC	Social and Behavior Change
SCHMT	Sub-county Health Management Team
SM&E	Surveillance, Monitoring, and Evaluation
SP	Sulfadoxine-pyrimethamine
TES	Therapeutic Efficacy Study
TWG	Technical Working Group
USAID	U.S. Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

To review specific country context for Kenya, please refer to the Country Malaria Profile, which provides an overview of the country malaria situation, key indicators, the National Malaria Control Program strategic plan, and the partner landscape.

U.S. President's Malaria Initiative

Launched in 2005, the U.S. President's Malaria Initiative (PMI) supports implementation of malaria prevention and treatment measures as well as cross-cutting interventions. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 24 countries in sub-Saharan Africa and three programs across the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Kenya began implementation as a PMI partner country in fiscal year (FY) 2007.

Rationale for PMI's Approach in Kenya

Since 2013, PMI has prioritized the areas of Kenya with the highest burden of malaria to complement funding from the Government of Kenya and other partners to achieve the greatest reduction in malaria morbidity and mortality. The eight counties of Bungoma, Busia, Homa Bay, Kakamega, Kisumu, Migori, Siaya, and Vihiga, with an estimated population of 10.4 million in 2022, form the lake endemic zone and have the highest malaria burden. PMI has focused its support for vector control, case management, supply chain management, malaria in pregnancy (MIP), social and behavior change (SBC), and surveillance, monitoring, and evaluation (SM&E) on these eight counties.

Overview of Planned Interventions

The proposed FY 2023 PMI funding for Kenya is $31 million. PMI will support the following intervention areas with these funds:

1. Vector Monitoring and Control

PMI supports the distribution of insecticide-treated mosquito nets (ITNs) through routine channels and through mass campaigns conducted every three years, indoor residual spraying (IRS) in high burden counties, and entomological monitoring. With FY 2023 funds, PMI will procure ITNs for distribution through antenatal care and child welfare clinics in 23 endemic and epidemic-prone counties and select sub-counties in six seasonal and low transmission counties. PMI will continue to support IRS in two counties, although IRS in one of the counties currently targeted will be replaced with new types of ITNs and associated SBC, as the malaria burden has declined

substantially, and a new, high burden county will be targeted for IRS beginning in CY 2024. PMI will continue to support entomological monitoring with new sites added in northern Kenya to monitor for the invasive mosquito *Anopheles stephensi*. Additionally, PMI will support the 36-month data collection for durability monitoring that was initiated following the 2020/2021 mass campaign.

2. Malaria in Pregnancy

With FY 2023 funds, PMI will continue to support the country in carrying out MIP interventions in the endemic regions of the country with a focus on the eight lake endemic counties. PMI will work collaboratively with the Division of National Malaria Program (DNMP) and county governments to enhance the capacities of both health care workers (HCWs) and community health volunteers (CHVs) to provide appropriate services for pregnant women and disseminate information on the importance of preventing MIP in communities. The capacity enhancement process will use different approaches such as training of different cadres at the facility and community levels, mentorship program for facility- and community-based HCWs, on-the-job training, and SBC, which will involve approaches like the human-centered design, development, and dissemination of messages and materials on how to manage MIP. This will help ensure pregnant women are able to access these services at the right time, thereby improving birth outcomes.

3. Drug Based Prevention

PMI does not support seasonal malaria chemoprevention and/or other drug-based prevention in Kenya.

4. Case Management

With FY 2023 funds, PMI will support integrated strengthening of case management at the national level, and in the lake endemic zone at the county, sub-county, facility, and community levels. The goal is to maintain a trained and equipped cadre of CHVs within 20 percent of community health units who are proficient in community case management of malaria (CCMm) and MIP. PMI will procure rapid diagnostic tests, artemisinin-based combination therapy, and injectable artesunate to meet the projected case management commodity gaps. PMI will support the DNMP and National Malaria Reference Laboratory in external quality assurance, slide bank maintenance, and diagnostic proficiency training. PMI will also support the DNMP to conduct therapeutic efficacy studies in the lake endemic counties per World Health Organization guidelines. Where possible, PMI will achieve these objectives by investing in local institutions to ensure sustainable capacity for these activities.

5. Health Supply Chain and Pharmaceutical Management

PMI supports the DNMP to ensure uninterrupted supply of malaria commodities nationally through supply chain strengthening activities at national and county levels including forecasting, quantification, pipeline monitoring, supply planning, good inventory management practices for warehousing and distribution of malaria commodities to health facilities, and working with regulatory authorities to assure quality of medicines and medical commodities. With FY 2023 funds, PMI will strengthen the capacity of the established Health Products and Technology units for strengthened leadership, governance, and oversight for malaria commodities. PMI will also complement the Ministry of Health and other donor efforts to ensure commodity availability for malaria prevention and treatment services nationwide and further strengthen integrated risk-based post marketing surveillance strategies across all strategic health programs. PMI will also support third-party monitoring of malaria commodities along the supply chain.

6. Social and Behavior Change

With FY 2023 funds, PMI will continue strengthening the capacity of SBC program personnel at the national level with skills to design, implement, and evaluate SBC activities undertaken in each intervention area, in addition to supporting the coordination of the SBC Committee of Experts. At the county and sub-county level, PMI will enhance the capacity of the Malaria Community Action Teams to continue cascading their activities within community health units and carrying out refresher training for CHVs. Additionally, through partnerships with local community-based organizations and collaboration with local leaders and CHVs, PMI will support multi-channel approaches that combine mass media, interpersonal communication, and structural interventions to increase adoption and maintenance of key malaria prevention and treatment behaviors.

7. Surveillance, Monitoring, and Evaluation

PMI support for SM&E is aligned to the Kenya Malaria M&E Plan 2019–2023 and prioritizes capacity development for malaria SM&E, including strengthening structures and mechanisms for SM&E coordination, ensuring the availability of quality data, and promoting the use of malaria data for planning and decision-making, including identification of the combinations of interventions with the highest impact and cost-efficiency in various malaria epidemiologic zones.

With FY2023 funding, PMI plans to support the 2024 Kenya Malaria Indicator Survey; the annual nationwide malaria health facility assessment; county and national levels for implementation of the malaria Health Management Information System, including data review and analysis; production and dissemination of county malaria bulletins; and routine data quality monitoring. PMI will also continue to support establishment and

operationalization of systems for malaria elimination at both the national level and in targeted counties. The support will include strengthening the capacity of health personnel in the targeted counties in malaria surveillance and strengthening of data collection and reporting systems for malaria surveillance in these counties.

8. Operational Research and Program Evaluation

PMI has not supported any operational research in Kenya in the recent past and does not plan to support this with FY 2023 funding. PMI FY 2022 funds will support the end-term evaluation of the Kenya Malaria Strategy 2019–2023. The evaluation is set to begin in the second half of 2023.

9. Capacity Strengthening

Capacity strengthening will focus on building institutional and individual skills of health workers across the various malaria program technical areas. With FY 2023 funds, PMI will strengthen the capacity of malaria program staff for technical leadership, oversight, and management of programmatic activities as well as costing for malaria interventions to inform domestic resource mobilization efforts. Case management support will include strengthening the capacity of staff across all levels of the health system in laboratory and clinical proficiencies for malaria case management, diagnostic external quality assessment processes, and molecular laboratory and bioinformatics platforms. In the counties and sub-counties, through training of trainers, mentors will be equipped with the skills to cascade training of health workers in the facilities. At the community level, CHVs will be trained on CCMm and MIP, including intermittent preventive treatment for pregnant women and ITN use. Workforce capacity strengthening for analysis and use of routine data for decision-making will also be supported targeting the sub-county and county malaria focal persons in endemic and epidemic-prone counties and through the Field Epidemiology and Laboratory Training Programs Frontline program.

I. CONTEXT AND STRATEGY

1. Introduction

Kenya began implementation as a U.S. President's Malaria Initiative (PMI) partner country in fiscal year (FY) 2007. This FY 2023 Malaria Operational Plan presents a detailed implementation plan for Kenya, based on the strategies of PMI and the Division of National Malaria Program (DNMP). It was developed in consultation with the DNMP and with the participation of national and international partners. PMI is proposing activities that build on partner investments to improve and expand malaria-related services, including investments by the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund). This document provides an overview of the strategies and interventions in Kenya, describes progress to date, identifies challenges and relevant contextual factors, and provides a description of activities that are planned with FY 2023 funding. For more detailed information on the country context, please refer to the Country Malaria Profile, which provides an overview of the country's malaria situation, key indicators, the DNMP strategic plan, and the partner landscape.

2. U.S. President's Malaria Initiative

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

Under the strategy, and building upon the progress to date in PMI-supported countries, PMI will work with National Malaria Control Programs and partners to accomplish the following objectives by 2026:

1. Reduce malaria mortality by 33 percent from 2015 levels in high-burden PMI partner countries, achieving a greater than 80 percent reduction from 2000.

2. Reduce malaria morbidity by 40 percent from 2015 levels in PMI partner countries with high and moderate malaria burden.
3. Bring at least 10 PMI partner countries toward national or subnational elimination and assist at least one country in the Greater Mekong Subregion to eliminate malaria.

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

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

3. Rationale for PMI's Approach in Kenya

3.1. Malaria Overview for Kenya

For more detailed information on malaria indicators, please refer to the Country Malaria Profile.

Kenya has made significant progress in the fight against malaria over the past decade, achieving an almost 50 percent reduction in malaria prevalence both nationally and in the lake endemic counties where the burden is highest (Kenya Malaria Indicator Surveys [MIS], 2020). Across Kenya, malaria risk is heterogeneous, and its epidemiology is influenced by altitude, rainfall patterns, and temperature. Therefore, malaria prevalence varies considerably by season and across geographic regions. The country is divided into six malaria transmission areas. Busia and Siaya are high transmission counties in Western Kenya with a PAPfPr greater than 30 percent. Bungoma, Kakamega, Kisumu, and Migori, all in Western Kenya, are moderate transmission counties, with a PAPfPr between 10–30 percent. Vihiga in Western Kenya, Mombasa at the coast, and Turkana in northwestern Kenya are low to moderate transmission counties, with a PAPfPr ranging from 5–10 percent. Homa Bay in Western Kenya, and Kilifi and Kwale counties at the coast, are low transmission counties, with a PAPfPr in this zone is between 1–5 percent. Finally, the remaining 35 counties fall into the category of very low transmission, with a PAPfPr below 1 percent.

Despite significant progress, malaria remains a major public health problem in Kenya and accounted for an estimated 6 percent of outpatient consultations in Kenya in 2021 (Ministry of Health [MOH] Kenya, 2022). The Kenya MISs indicated that the national prevalence of malaria among children younger than five years of age decreased from 8 percent in 2015 to 6 percent in 2020. This decline was driven by decreases in the high burden lake endemic counties, where PMI focuses over 70 percent of its investments. In this endemic zone, the prevalence of malaria among children younger than five years of age decreased from 27 percent to 19 percent during the same period. Prevalence-based models incorporating data from MISs, school surveys, and malaria vaccine and climate data for 2000 through 2020 suggest that the counties in the lake endemic zone have transitioned from high malaria transmission to low to moderate malaria transmission. Routine data from the Kenya Health Information System (KHIS) demonstrate that the annual incidence of diagnostically confirmed malaria cases in the outpatient setting also decreased, from 113 per 1,000 population in FY 2016/17 to 79 per 1,000 population in FY 2020/21. Nationwide, prevalence models based on the 2020 MIS and other data sources suggest that only 30 percent of the country's population lives in an area with a malaria prevalence over 1 percent; this represents a significant reduction from the 2015 Malaria Indicator Survey (MIS), after which 75 percent of the population lived in counties with malaria prevalence over 1 percent.

3.2. Key Challenges and Contextual Factors

Inadequate financing of the Kenya Malaria Strategy. The two main donors that support the Government of Kenya (GOK) and DNMP are PMI and Global Fund. Although the GOK contributes significantly to malaria programming through the provision of a health workforce and health facilities for diagnosis and treatment of patients, the program has inadequate financing to fully implement the national strategy. Nevertheless, the enactment of the community health services and facility improvement fund bills across a majority of high burden counties signals county-level commitment to malaria community and facility service delivery.

New malaria vector. *An. stephensi* has been reported in Djibouti, Ethiopia, Somalia, and Sudan, representing a threat to malaria control in Kenya. DNMP currently lacks sufficient funding for the strengthened epidemiological and entomological surveillance required to closely monitor this vector.

Emerging resistance to antimalarial drugs and insecticides. Lake endemic therapeutic efficacy study (TES) data demonstrated marginal artemether-lumefantrine (AL) efficacy in 2017, and in 2021, multiple countries in East Africa demonstrated evidence of locally emerging artemisinin resistance. Additionally, the spread of insecticide resistance to pyrethroids continues to be reported in lake- and coast-

endemic zones, requiring a shift to more expensive nets, such as those with piperonyl butoxide (PBO) or dual active ingredients (AI).

Court ruling barring non-diagnostic personnel from conducting rapid diagnostic tests (**RDTs).** In 2014, a delegated authority waiver allowing non-laboratory personnel to conduct diagnostic tests expired, and in 2019, a court ruling barred non-laboratory staff from conducting diagnostic tests. PMI continues to support the MOH and counties in efforts to address the legislation at national and county levels to allow community health volunteers (CHVs) to administer RDTs, an approach which is also supported by Kenya's Community Health Strategy. Nevertheless, community case management of malaria remains limited to the lake endemic counties (8/47), and coverage remains fragmented and suboptimal due to limited resources for establishment and maintenance of fully functional Community Health Units (CHUs).

Supply chain challenges. The COVID-19 pandemic and country supply chain system challenges, coupled with prolonged lead times, have interrupted the supply of malaria commodities, resulting in missed opportunities for timely delivery of nets, especially among pregnant women and children and for treatment of suspected malaria cases without confirmatory diagnosis.

Availability and quality of inpatient case and mortality data. Despite ongoing significant efforts to work with the DNMP and Division of Health Informatics to enhance national and sub-national coding and reviewing capacity, reporting rates for these key indicators now stand at 40 percent in 2020 compared to 28 percent in 2018.

Impact of COVID-19. The COVID-19 pandemic presented a challenge in delivery of health services and impacted early fever care seeking behavior, especially among pregnant women and children, thus negatively affecting access to ITNs and uptake of IPTp.

Malaria vaccines. In a more positive development, Kenya, together with Ghana and Malawi, conducted a pilot evaluation of RTS,S malaria vaccine introduction in selected areas of the lake endemic zone in 2019. Based on the results of this evaluation, the World Health Organization (WHO) has recommended malaria vaccine implementation for moderate to high transmission areas in the context of comprehensive malaria control. The vaccine pilot countries are expected to have priority for limited RTS,S vaccine supplies and in 2022, Kenya will apply for Gavi, the Vaccine Alliance funding for vaccine scale up. Kenya's routine immunization platform will lead vaccine implementation, and PMI will support the DNMP to assess its requirements for vaccine-related SBC, Health Management Information System (HMIS) and Logistic Management Information System (LMIS) adaptation, and technical assistance.

3.3. PMI's Approach for Kenya

Malaria transmission is heterogeneous in Kenya, and its epidemiology is influenced by altitude, rainfall patterns, and temperature. The country is currently divided into four epidemiological zones: endemic (lake and coast), epidemic (highland), seasonal (semi-arid), and low risk. Subnational restratification is ongoing and estimated to be completed in time for inclusion in the new Kenya Malaria Strategy (KMS) 2024–2029. Modeling of MIS 2020 data shows all counties in the highest burden zone (lake endemic) have transitioned from high transmission areas to low to moderate transmission areas based on the prevalence of malaria parasites in children younger than five years of age during this period. Further, these data demonstrate that the proportion of counties in Kenya with population parasite prevalence of 1 percent or greater has decreased from approximately 75 percent in 2015 to approximately 30 percent (34/47) in 2020. This corresponds to a significant decrease in the overall population at risk for malaria infection although, with the exception of those living in Nairobi county, all Kenyans are exposed to some risk of malaria infection in the counties where they live, in addition to travel-associated risk.

Since 2013, PMI has prioritized support to the areas of Kenya with the highest burden of malaria to achieve the greatest reduction in malaria morbidity and mortality. The eight lake endemic counties of Bungoma, Busia, Homa Bay, Kakamega, Kisumu, Migori, Siaya, and Vihiga, with an estimated population of 10.4 million in 2022 (MOH Kenya 2022), form the lake endemic zone and have the highest malaria burden, with the exception of five epidemic-prone sub-counties: three in Bungoma (Cheptais, Mt Elgon, Tongaren) and two in Kakamega (Likuyani, Lugari). PMI has focused its support on vector control, case management, supply chain management, malaria in pregnancy (MIP), SBC, and SM&E in these eight counties. The epidemic-prone sub-counties within this region receive ITNs, but they are not targeted for MIP services.

In the other 39 counties, DNMP, with Global Fund support, is the lead in providing technical support. PMI complements these efforts by: 1) providing national-level support for development, review, harmonization, and standardization of policy documents including development of documents, which includes support for elimination-related strategic documents; 2) strengthening malaria health information through the KHIS platform; and 3) strengthening regulatory systems for post-market surveillance, and quality assurance of malaria medicines and building workforce capacity. PMI also provides support at the national level for SM&E, SBC, supply chain management, health financing, and program management through participation in the GOK's Committee of Experts (CoEs) and Malaria Health Sector Working Group. Routine distribution of PMI-procured ITNs also extends beyond the lake endemic zone to cover 28 additional counties for a national total of 36 counties. Mass net distributions in 28 counties are primarily supported by Global Fund, with PMI filling critical gaps in the lake endemic

zone. Sulfadoxine-pyrimethamine (SP) for IPTp is distributed in the coastal and lake endemic counties, while PMI-procured ACTs, RDTs, and treatments for severe malaria are distributed nationwide, along with similar commodities purchased through Global Fund and GOK.

3.4. Key Changes in this Malaria Operational Plan

The recently developed county malaria profiles and results of the MIS 2020 point to a reduction in the prevalence of malaria as well as the population at risk. This required revising the geographic scope for distribution of ITNs to pregnant women and children, from 36 to 23 counties, plus sub-counties in six additional counties in 2023. The eight lake endemic counties will continue to receive ITNs for pregnant women and children under one year of age.

Growing evidence of pyrethroid resistance informed the shift from delivery of pyrethroid nets to PBO nets across all counties receiving nets through routine distribution to antenatal and child welfare clinics starting in 2024.

A decline in the parasite prevalence and incidence of malaria in Homa Bay county to 3.6 percent (in 2020) and 151 cases per 1,000 population (in 2021) informed a programmatic shift in the counties where IRS will be deployed. In 2024, IRS will be discontinued in Home Bay, where PBO or dual AI ITNs will be deployed and begun in Busia, a county whose prevalence was 38.5 percent (MOH Kenya) and incidence was 432.4 cases per 1,000 population (KHIS 2022) for the same period.

PMI will also support expansion of community case management of malaria (CCMm) training and supervision from 15 percent to 20 percent of CHUs in the lake endemic counties, and expansion of SBC activities into one additional sub-county per county in all the eight counties.

II. OPERATIONAL PLAN FOR FY 2023

1. Vector Monitoring and Control

1.1. PMI Goal and Strategic Approach

The Kenya DNMP goal for vector control is to protect 100 percent of people living in malaria risk areas through access to appropriate malaria preventive interventions. ITNs are the primary strategy for malaria prevention in Kenya. ITNs are currently distributed to 28 counties in mass campaigns conducted every three years with a target of universal coverage, and are supplemented by routine distribution through antenatal care (ANC) and child welfare clinics targeting pregnant women and children under one year of age in 36 counties (Figure 1a). With declines in malaria in many parts of Kenya, routine distribution will be scaled back to 23 counties plus targeted distribution in select sub-counties in six counties, starting in CY 2023. PMI procures ITNs for routine distribution while Global Fund procures the bulk of ITNs for the mass campaign. However, PMI will procure ITNs for up to four counties for the 2023/2024 mass campaign, while Global Fund will procure ITNs for the remaining 24 counties. Given widespread pyrethroid resistance in Kenya, PMI is committed to procuring PBO or dual AI ITNs. The DNMP originally planned to procure pyrethroid-only nets for the 2023/2024 mass campaign under the current Global Fund cycle but may procure PBO ITNs for two malaria endemic counties if they realize cost savings.

The DNMP strategy also includes targeted IRS and targeted larval source management (LSM). PMI is the only major donor funding IRS, with support in two high burden lake endemic counties (Figures 1a and 1b). The GOK, with technical support from the Government of Cuba, is implementing larval source management in the eight high burden lake endemic counties. PMI does not support larval source management in Kenya.

Figure 1a. Map of Vector Control Activities in Kenya, Nationwide

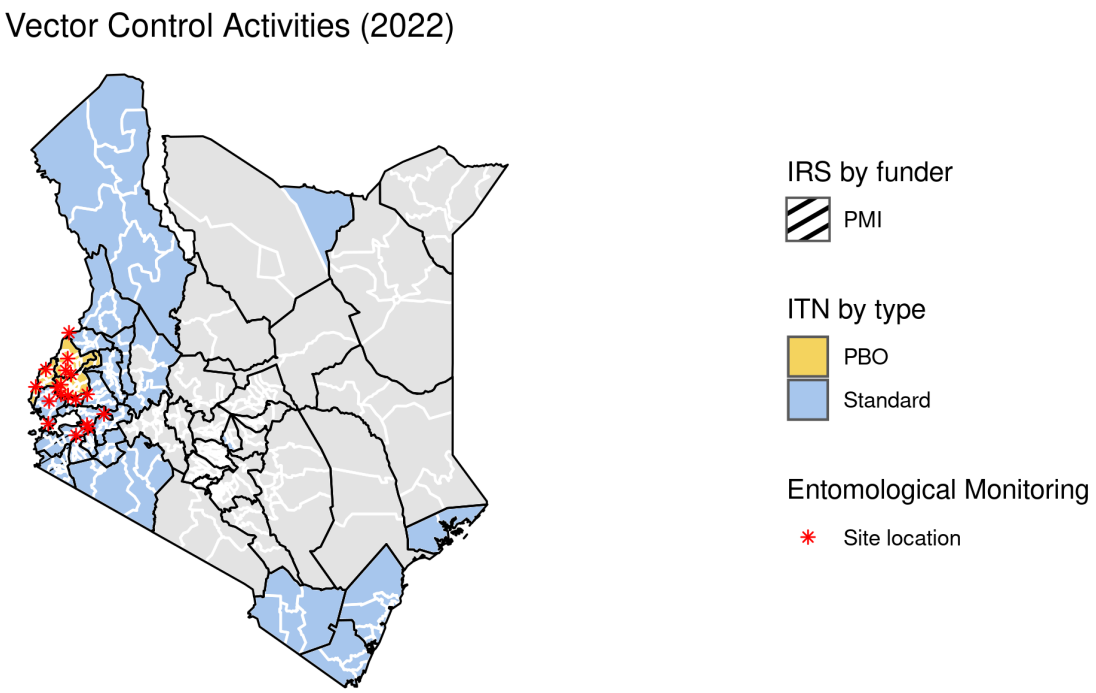
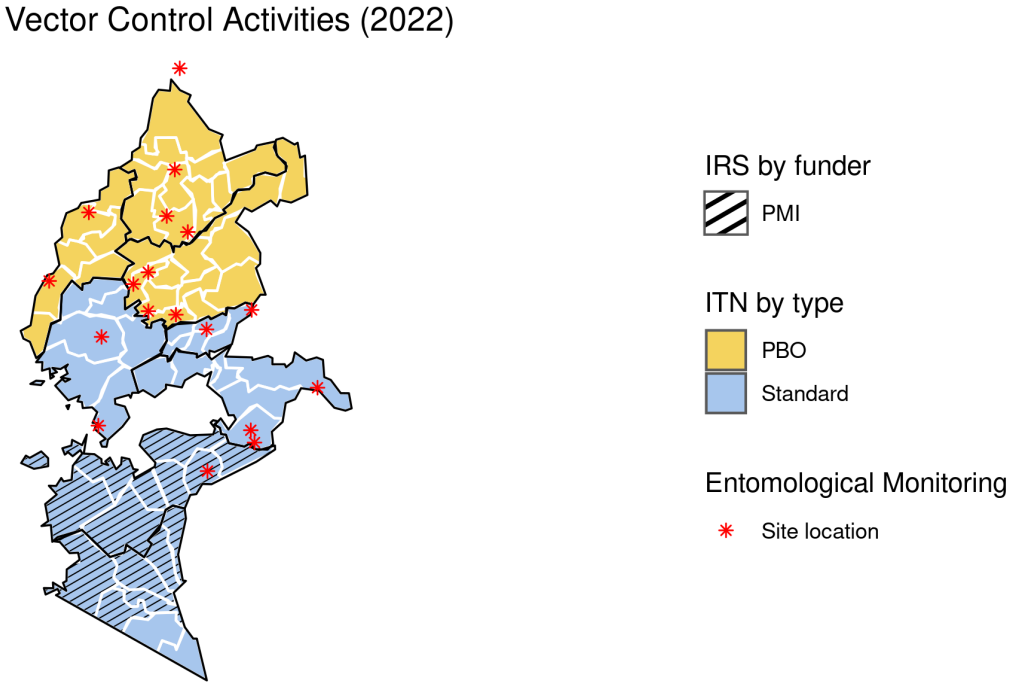


Figure 1b. Map of Vector Control Activities in Kenya, Lake Endemic Counties



1.2. Recent Progress (between April 2021 and March 2022)

- Supported entomological monitoring in 14 sentinel sites in eight counties in the lake endemic region of western Kenya (Figures 1a and 1b). Monitoring activities included insecticide resistance monitoring and vector bionomics monitoring in all sites, while insecticide residual efficacy monitoring was conducted in two sites where IRS was implemented. For more information about entomological monitoring, please refer to the 2021 Entomological Report.
- Supported community-based entomological monitoring in three sites in two counties (Figures 1a and 1b). Community-based entomological monitoring involved the use of light traps placed by CHVs in targeted houses throughout each month. Batteries were charged using solar panels provided to the CHVs, and mosquitoes were preserved in ethanol until they could be processed at a central location.
- Supported the procurement of PBO ITNs for three high burden lake endemic counties (Figures 1a and 1b) and supported distribution in Bungoma county through the 2021 mass campaign. PMI also procured and distributed PBO ITNs through ANC and Expanded Program on Immunization (EPI)/child welfare clinics in three high burden counties. For 33 other counties, PMI supported the procurement and distribution of pyrethroid-only ITNs for distribution through ANC and EPI/child welfare counties.
- Supported ITN durability monitoring by implementing pre-distribution data collection, monitoring the Olyset Plus and PermaNet 3.0 from the 2021 cohort.
- Supported the national level in the planning of supportive supervision and monitoring activities for the counties, and supported health facilities and community-level SBC activities to improve demand for ITNs, increase appropriate use and, promote care. For more information, please refer to the Social and Behavior Change section.
- Supported the planning, implementation, and evaluation of IRS in two counties (Migori and Homa Bay), covering 385,911 structures and protecting 1,612,510 people during March/April 2022 (Figures 1a and 1b). For more information about IRS, please refer to the most recent End of Spray Report.
- Provided technical assistance to the DNMP and county health personnel with planning, training, supervision, and close-out of IRS operations in two counties (Migori and Homa Bay).
- Trained and engaged community members and other county health personnel in two counties to support IRS mobilization and spray activities.
- Supported training of one DNMP staff on surveillance for *An. stephensi* in Ethiopia.

1.3. Plans and Justification for FY 2023 Funding

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

1.3.1. Entomological Monitoring

PMI will continue to support entomological monitoring activities in Kenya, including insecticide resistance monitoring and vector bionomics in a total of 18 sites. Longitudinal entomological surveys will be carried out in 14 sites in the eight high burden counties in western Kenya with an additional three sites monitored through community-based vector surveillance. In the standard sites, vectors will be monitored using pyrethrum spray catches and CDC light traps, with supplemental collections using window exit traps and clay pot resting traps in six sites targeted with either IRS or PBO ITNs. Community-based collections will employ only CDC light traps.

Mosquitoes in all sites will be monitored for resistance to pyrethroids (permethrin, deltamethrin, and alpha-cypermethrin) with and without the synergist PBO, an organophosphate (pirimiphos-methyl), a neonicotinoid (clothianidin), and a pyrrole insecticide (chlorfenapyr). In IRS sites, cone bioassays will be done to monitor the quality of spraying and determine the residual life of IRS insecticides.

In addition, PMI will support one site in northwestern Kenya for surveillance for the invasive malaria vector *An. stephensi*. PMI will also collaborate with local partners and provide technical support to the DNMP to facilitate surveillance for *An. stephensi* in northeastern and coastal Kenya. Habitat suitability models suggest that *An. stephensi* could become established in several areas throughout Kenya, and reports from Ethiopia indicate that this species has been found close to the Kenya border.

Summary of Distribution and Bionomics of Malaria Vectors in Kenya

As of 2021, the mosquito populations were predominantly *An. funestus* s.l. and *An. gambiae* s.l. across all sites. Except in Busia and Bungoma, *An. funestus* s.l. was the most common anopheline in non-IRS sites. Mosquito populations in the lake endemic counties have two peaks following the long rains (April–June) and short rains (October–November). The most recent human landing catch data are several years old but indicated that peak biting by *An. funestus* occurs between 11 p.m. and 8 a.m., although some biting did occur after 8 a.m. Most exposure to bites by this species occurred indoors. *An. gambiae* s.l. (predominantly *An. arabiensis*) showed similar patterns, although the numbers collected indoors and outdoors were similar. IRS significantly impacted densities of *An. funestus* but not *An. gambiae* s.l. (predominantly, *An. arabiensis*), suggesting the latter are less likely to rest indoors. Between October 2019

and June 2021, the overall sporozoite rate was 0.5 percent. However, no infected mosquitoes were detected in the IRS counties.

Status of Insecticide Resistance in Kenya
Pyrethroid resistance is widespread in *An. gambiae* s.l. across study sites in Kenya. The addition of PBO to permethrin, alphacypermethrin, or deltamethrin generally increased mortality compared to permethrin, alphacypermethrin, or deltamethrin alone although in most cases, it did not fully restore susceptibility. Resistance to pirimiphos-methyl was detected at one site (Migori), but *An. gambiae* s.l. was susceptible in all other sites tested. *An. gambiae* s.l. was fully susceptible to clothianidin in six of eight sites with full susceptibility (>98 percent mortality) reached within 72 hours post-exposure. However, in two sites, mortality of *An. gambiae* s.l. was >90 percent but did not reach full susceptibility after 120 hours post-exposure. All *An. gambiae* s.l. populations tested were fully susceptible to chlorfenapyr.

An. funestus was resistant to all pyrethroid insecticides. Susceptibility was restored after exposure to PBO for both permethrin and deltamethrin. However, while PBO pre-exposure increased the mortality of *An. funestus* exposed to alphacypermethrin, it remained below 90 percent. *An. funestus* is fully susceptible to pirimiphos-methyl, clothianidin, and chlorfenapyr.

1.3.2. Insecticide-treated Mosquito Nets
With FY 2023 funds, PMI will continue to support the procurement and distribution of ITNs through routine channels (ANC and EPI/child welfare clinics). Based on the low malaria risk in some areas of the country, the DNMP is recommending a reduction in the number of counties targeted for routine ITN distribution from 36 to 23 counties, plus six counties with distribution in select sub-counties. PMI will shift to this reduced geographic scope for ITN distribution. Given widespread resistance to pyrethroids, PMI is committed to procuring only PBO ITNs or dual AI ITNs for Kenya, although currently no dual AI ITNs are registered for use in Kenya. Once dual AI ITNs are registered, PMI will select the most appropriate ITNs based on insecticide resistance data, in consultation with the DNMP.

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

ITN Distribution in Kenya
In Kenya, ITNs are distributed via mass campaigns targeting universal coverage every three years. ITNs are distributed continuously through ANC and EPI/child welfare clinics targeting pregnant women and children under one year of age. PMI transitioned from pyrethroid-only ITNs to PBO ITNs for three high burden counties supported during the 2021 mass distribution campaign, although the DNMP, with Global Fund resources,

continues to procure pyrethroid-only ITNs for the rest of the country due to concerns about the higher cost of PBO ITNs and reduced coverage that would occur if a switch were made without additional resources. The DNMP, with Global Fund resources, plans to procure pyrethroid-only ITNs through the end of the current Global Fund cycle which ends in 2023. However, if other commodity savings are realized, the DNMP may consider PBO nets for Siaya and Kisumu, which are the only two counties in western Kenya not currently targeted with IRS or PBO ITNs in the next mass campaign. However, while there is currently a pipeline of pyrethroid-only ITNs to be distributed until July 2023, PMI will select only PBO or dual AI ITNs for both mass campaigns and routine distribution channels in future procurements.

Please refer to the **ITN Gap Analysis Table** in the annex for more detail on planned quantities and distribution channels.

Table 1. Streamlined Durability Monitoring

Campaign Date	Site	Brand	Baseline*	12-month	24-month	36-month
2021	Busia	Olyset Plus	February 2022	Planned	Planned	Planned
2021	Kakamega	PermaNet 3.0	February/March 2022	Planned	Planned	Planned

*Pre-distribution

PMI supported ITN durability monitoring of DawaPlus 2.0 (deltamethrin polyester ITN) distributed in Busia county and DuraNet (alphacypermethrin polyethylene ITN) distributed in Kwale county in the 2017 mass campaign (see Country Malaria Profile). PMI is supporting streamlined durability monitoring to assess the duration of insecticidal efficacy of two PBO ITNs that were distributed during the 2021 mass campaign. Nets that were not distributed during the mass campaign were collected from the warehouse and are currently undergoing bioassays for insecticidal efficacy and chemical assays for insecticidal content. The 12-month follow up is planned for June/July 2022.

1.3.3. Indoor Residual Spraying (IRS)

PMI will continue to support the IRS in two high-burden lake endemic counties. However, the counties targeted will shift, as the malaria burden in Homa Bay has declined substantially with prevalence below 5 percent. A new high burden county will be targeted for IRS, with FY 2023 funding for spraying to occur in 2024. The new county selected for IRS will likely be Busia, where malaria prevalence in the 2020 MIS was approximately 40 percent. IRS will continue in Migori county, where malaria prevalence has declined but remains above 10 percent.

According to the Kenya Insecticide Resistance Management Strategy, IRS should be conducted with a single insecticide for two consecutive years and then rotated with another insecticide. Based on this policy, pirimiphos methyl will be sprayed in Migori,

while clothianidin and deltamethrin + clothianidin will be sprayed in Busia in 2024. The current policy indicates that a neonicotinoid insecticide should be sprayed in the new county. However, this assumes that the IRS will continue in both Homa Bay and Migori.

Table 2. PMI-supported IRS Coverage

Calendar Year	County*	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide
2021	Migori Homa Bay	497,564	97.4	2,083,177	Migori: Fludora Fusion (deltamethrin + clothianidin) Homa Bay: Fludora Fusion (deltamethrin + clothianidin), Actellic 300CS
2022	Migori Homa Bay	413,985	96.8	1,614,938	Migori: Fludora Fusion (deltamethrin + clothianidin) Homa Bay: SumiShield (clothianidin)
2023**	Migori Homa Bay	**	**	**	pirimiphos methyl
2024**	Migori Busia	**	**	**	Migori: pirimiphos methyl; Busia: clothianidin & deltamethrin + clothianidin

**Planned

IRS Insecticide Residual Efficacy in Kenya

Wall bioassays were conducted monthly following the 2021 IRS campaign at sites in Migori and Homa Bay where IRS was implemented. In one site sprayed with Actellic 300CS, the residual efficacy was approximately six months. The residual activity of Fludora Fusion remained above 80 percent mortality for at least nine months.

2. Malaria in Pregnancy

2.1. PMI Goal and Strategic Approach

PMI Kenya's objective for MIP interventions supports the country's national malaria strategy 2019–2023[1] under Objective 1, which aims to protect 100 percent of people living in malaria risk areas through access to appropriate malaria preventive interventions by 2023. This is planned to be achieved through the provision of ITNs at the first ANC visit and SP (IPTp) beginning at 13 weeks in all malaria endemic counties (14 lake and coast endemic counties).

PMI Kenya's investments in MIP are focused mostly in the eight lake endemic counties in the western region of the country. In addition, PMI supports other counties through the dissemination of promotional materials and policy guidelines on MIP. In the eight counties, PMI's implementing partner works in consultation and collaboration with the

[1] Kenya National Malaria Strategy 2019–2023

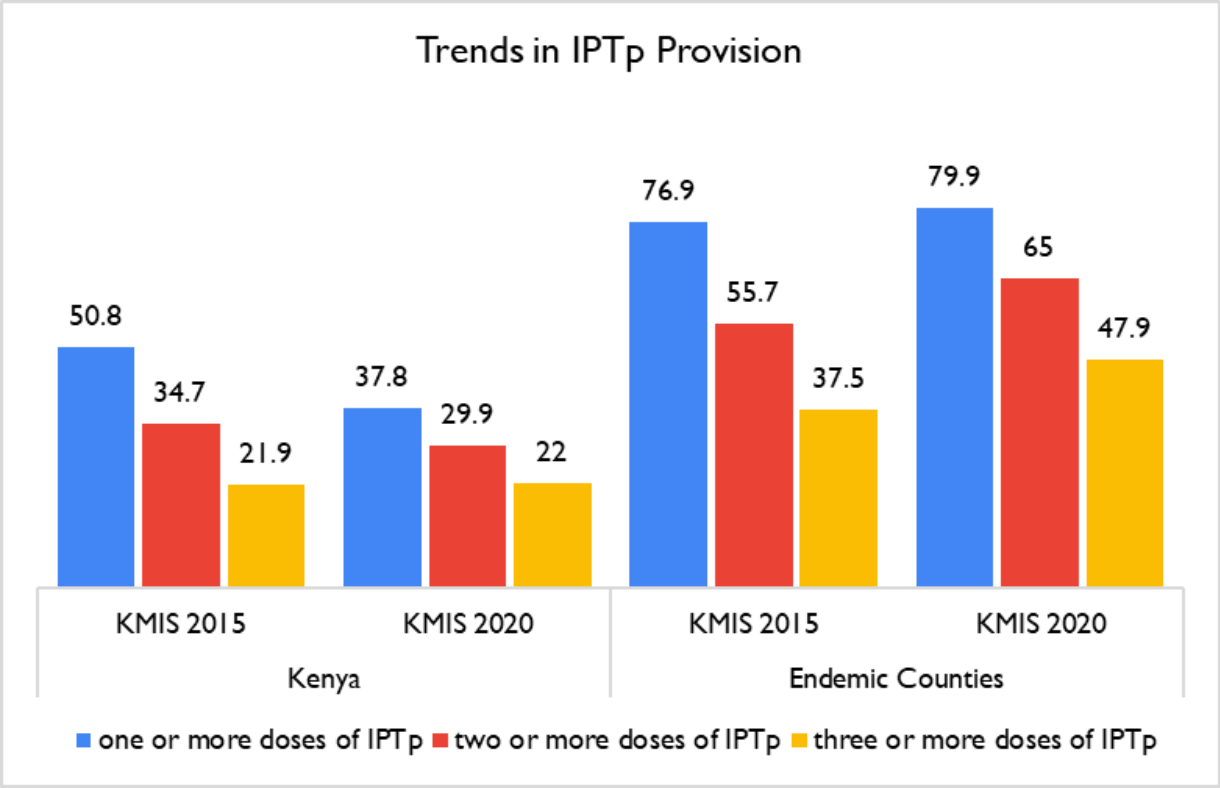
county's health management teams and other stakeholders to identify sub-counties where each partner will work, thereby avoiding duplication. In the counties, the PMI partner works with health workers who provide services in health facilities where pregnant women receive a minimum of three doses of IPTp during their ANC visits. At the community level, community health volunteers raise awareness on the importance of IPTp during pregnancy and refer those who may have missed these services to health facilities.

IPTp doses in health facilities are administered as directly observed therapy (DOT) based on the IPTp provision schedule of eight ANC contact visits. In 2020, Kenya adopted the WHO's 2016 guidance on starting IPTp between 13 and 16 weeks. The recommended IPTp provision schedule in Kenya starts with the first dose between 13-16 weeks, followed by subsequent doses with an interval of four weeks between doses.

The DNMP guidelines for diagnosis, treatment, and prevention of malaria 2020 (6th edition) recommends initiation of IPTp between 13 to 16 weeks of gestation. However, the 2020 MIS indicated that 28 percent of women presented for their first ANC visit during the first trimester of pregnancy, while 55 percent made four ANC visits during their pregnancy. Overall, 93 percent of pregnant women received ANC from a skilled provider for their last birth. Late ANC attendance is one of the main barriers to women receiving the recommended three doses of IPTp.

As stipulated in the KMS 2019–2023, although the objective is to attain 100 percent coverage of all pregnant women with the recommended doses of IPTp, this has remained below the target with modest improvements over the years. The 2020 MIS showed improvement in the coverage for IPTp1, 2 and 3 in the endemic counties, accompanied by a drop in the same for the whole country (Figure 2), indicating that IPTp was being targeted better in the high malaria transmission counties as per the KMS.

Figure 2. Percentage of Women Covered by Intermittent Preventive Treatment in 2015 and 2020



Some of the barriers identified in the past include late ANC attendance, economic and cultural barriers, health worker attitudes, drug stockouts, and lack of supplies for the provision of DOTs.

Late ANC attendance is associated with economic and cultural issues. Economic issues are related to distance and lack of money for transport to health facilities or costs associated with payment to the laboratory for ANC profiling at the health facility.[2] This may lead to women delaying their attendance at health facilities and not getting the recommended doses; other women delayed attendance and only ever attended for the sole purpose of getting a card which would later enable them to deliver in a health facility.[3] On cultural barriers, some studies have shown the influence of mothers-in-law in determining when the pregnant mother attends her first ANC visit, and/or some women hide their pregnancies in the early months due to fear of being bewitched by

[2] Dellicour, S., Hill, J., Bruce, J. *et al.* Effectiveness of the delivery of interventions to prevent malaria in pregnancy in Kenya. *Malar J* **15**, 221 (2016). https://doi.org/10.1186/s12936-016-1261-2.
[3] Mason, L., Dellicour, S., Ter Kuile, F. *et al.* Barriers and facilitators to antenatal and delivery care in western Kenya: a qualitative study. *BMC Pregnancy Childbirth* **15**, 26 (2015). https://doi.org/10.1186/s12884-015-0453-z.

envious people in the community.[4] Health workers' attitudes have been cited in many studies as a deterrent to women delaying or discontinuing ANC visits, where pregnant women felt that health workers were not courteous, and some were even rude or kept women waiting for long periods.[5]

PMI, DNMP, and other stakeholders are taking measures to address the identified barriers through different approaches. PMI uses SBC approaches like human-centered design to address some of the barriers by involving the community in the design of solutions targeting identified barriers. Some studies have shown that lack of knowledge on ANC attendance among mothers contributes to low ANC attendance.[6] To address this, PMI facilitates the training of different cadres of health workers (community volunteers and facility-based health workers) on MIP and its importance in ensuring the delivery of healthy babies. PMI also facilitates the establishment of malaria community action teams (MCATs) who cascade actions identified and planned by the community that address key barriers and challenges hindering the uptake of IPTp and other malaria control tools (i.e., ITNs and adherence to malaria treatment). CHVs and MCATs organize sessions where they counsel pregnant women on the proper use of ITNs and the importance of attending ANC early and often.

PMI and the DNMP work collaboratively at the national level to carry out an annual drug quantification exercise to determine the country's need for malaria commodities, including IPTp. In addition, regular supportive supervision to poorly performing facilities is carried out to monitor the quality of services provided and plan for actions to address the challenges identified.

2.2. Recent Progress (between April 2021 and March 2022)

PMI supported the following activities at the national level and in the eight lake endemic counties and achieved the following:

- Trained 78 sub-county mentors who cascaded the training and mentorship to health care workers (HCWs) on MIP, and conducted supportive supervision on a quarterly basis.
- Supported mentoring of 2,079 HCWs on case management and management of MIP.

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[4] Chimatiro, C.S., Hajison, P., Chipeta, E. *et al.* Understanding barriers preventing pregnant women from starting antenatal clinic in the first trimester of pregnancy in Ntcheu District-Malawi. *Reprod Health* **15**, 158 (2018). https://doi.org/10.1186/s12978-018-0605-5.

[5] Ochieng, C.A., Odhiambo, A.S. Barriers to formal health care seeking during pregnancy, childbirth and postnatal period: a qualitative study in Siaya County in rural Kenya. *BMC Pregnancy Childbirth* **19**, 339 (2019). https://doi.org/10.1186/s12884-019-2485-2

[6] Populations Services Kenya. (2017). Malaria qualitative study in endemic and epidemic zones in Kenya. https://pdf.usaid.gov/pdf_docs/PA00T96V.pdf

- Supported training of 33 health workers in admitting facilities on the management of severe MIP.
- Supported training of 1,000 CHVs on community case management and on MIP interventions at the community level.
- Supported the production and distribution of PowerPoint slides for malaria case management and MIP, job aids, soft copies of posters, dosing charts, and information, education, and communication materials which were shared with HCWs.
- Facilitated meetings to review health and community workers in-service curricula to identify guidelines, standard operating procedures, and orientation materials related to MIP that needed updating at the national level.
- Supported the quarterly MIP CoE's deliberations on distribution plans for revised IPTp3 data recording tools. Participants in these meetings included representatives from the Division of Reproductive Health, WHO, CDC, PMI, and learning institutions.

2.3. Plans and Justification for FY 2023 Funding

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

With FY 2023 funding, PMI will continue to support MIP activities at three levels in the country similar to previous years. At the national level, PMI will support the DNMP in the quantification of SP and planning for procurements, and the development and review of guidelines and other relevant documents pertaining to MIP interventions. At the county level, PMI will support development of human resource capacities to implement MIP activities through the training and reorientation of HCWs on new guidelines and approaches in managing MIP, including ANC schedules, treatment, and management of uncomplicated and severe MIP, giving SP as DOT at the facility and counseling pregnant women. At the community level, PMI will support SBC activities as outlined in the Social and Behavior Change section, working with CHVs and organized groups such as women's groups to raise awareness on the importance of ANC attendance at the right time to get the required doses of IPTp and any other services offered to pregnant women.

The following activities will be carried out with FY 2023 funding:

- Revise MIP capacity documents and promotion materials.
- Carry out refresher training for HCWs previously trained in prevention of MIP (diagnosis, treatment, and MIP) through mentorship (at least two HCWs per facility in 1416 facilities).

- Carry out supportive supervision in 1,200 health facilities (at least one visit per facility) across the eight lake endemic counties.
- Carry out refresher training for CHVs on MIP interventions, including minimizing missed opportunities for ANC attendance.
- Facilitate the registration and referral of pregnant women to health facilities as well as the dissemination of MIP SBC messages to pregnant women to increase uptake of IPTp3+ doses and the consistent use of ITNs, in addition to providing supplies for the DOT corners in health facilities.
- Carry out supportive supervision and mentorship on MIP at the community level.

Please refer to the **SP Gap Analysis Table** in the annex for more detail on planned quantities and distribution channels.

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

3. Drug-based Prevention

PMI does not support seasonal malaria chemoprevention and/or other drug-based prevention in Kenya.

4. Case Management

4.1. PMI Goal and Strategic Approach

PMI supports the KMS 2019–2023 Objective 2, to manage 100 percent of suspected malaria cases according to malaria treatment guidelines by 2023. This objective will be achieved through the following strategies:

1. Strengthen capacity for integrated malaria case management.
2. Strengthen capacity for case management of severe malaria.
3. Provide malaria case management at the community level in targeted areas.
4. Ensure quality malaria parasitological diagnosis.
5. Procure diagnostic and treatment commodities.

The DNMP's National Guidelines for the Diagnosis, Treatment, and Prevention in Malaria in Kenya 2020 (6th edition) promotes a comprehensive case management strategy including universal, quality-assured parasitological testing of all cases of suspected uncomplicated malaria, prompt and effective treatment with ACTs of all cases of parasitologically confirmed uncomplicated malaria, and emergent pre-referral and/or definitive management of severe febrile illness and severe malaria. PMI supports all aspects of this approach through support to national-level policy and programmatic activities, commodity procurement, and improvement of facility- and community-level

health worker performance. PMI supports nationwide procurement of malaria RDTs, ACTs, and injectable artesunate, accounting for approximately 47 percent of the country's malaria commodity needs; the Global Fund supports 43 percent; while GOK supports the remaining 10 percent. PMI also supports facility-level targeted training and supportive supervision activities in all sub-counties in the lake endemic zone.

CCMm services remain limited to the lake endemic counties (8/47), and coverage is fragmented and suboptimal due to limited resources for establishment and maintenance of fully functional CHUs. In Kenya, CHUs are linked to health facilities, and each CHU consists of one Community Health Assistant (CHA) who supervises 10 CHVs. Each CHU is responsible for up to 5,000 people (500–1,000 households). Two approaches to CCMm are currently pursued in Kenya: CCMm and iCCM. The CCMm approach involves targeted training and supervision of community health workers to deliver CCMm to individuals of all ages in endemic zones, whereas iCCM involves supporting the integrated management of malaria, pneumonia, diarrhea, and malnutrition in children younger than five years of age. Approximately 49 percent of CHUs in the lake-endemic region have been supported to provide CCMm (40 percent supported by Global Fund and nine percent supported by PMI). Global Fund also provides focused CCMm support for CHUs in two highland epidemic counties, Kisii and Nyamira. In its current grant cycle, Global Fund plans to expand coverage for CCMm to another 20 percent of CHUs in the lake-endemic region (60 percent total). PMI aims to expand support to CHUs by another 11 percent (20 percent total). Thus, lake endemic CHU coverage for CCMm is expected to approach 80 percent by 2024, leaving a gap of 20 percent. In recent years, UNICEF has supported iCCM in 11 counties, including areas of two lake-endemic counties, Siaya and Homa Bay. Other organizations have also implemented iCCM to a limited degree. However, this iCCM support has not been maintained consistently.

PMI does not provide payments to CHVs but has worked with lake endemic counties to set up the county government legislative systems that allow counties to pay CHVs. Lake endemic counties pay CHVs stipends, although the stipend amount varies between counties (~2,000 to ~3,000KES). One current challenge faced by the community health system is the 2019 court ruling prohibiting non-laboratory personnel from conducting diagnostic tests. To address this and maintain community health worker capacity to test and treat malaria, PMI works with partners to provide technical assistance to the MOH to address the root causes that resulted in the court ruling. This includes the collaborative development of community-level biosafety guidelines, curricula for community-level rapid diagnostic testing, and a health worker task sharing policy.

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

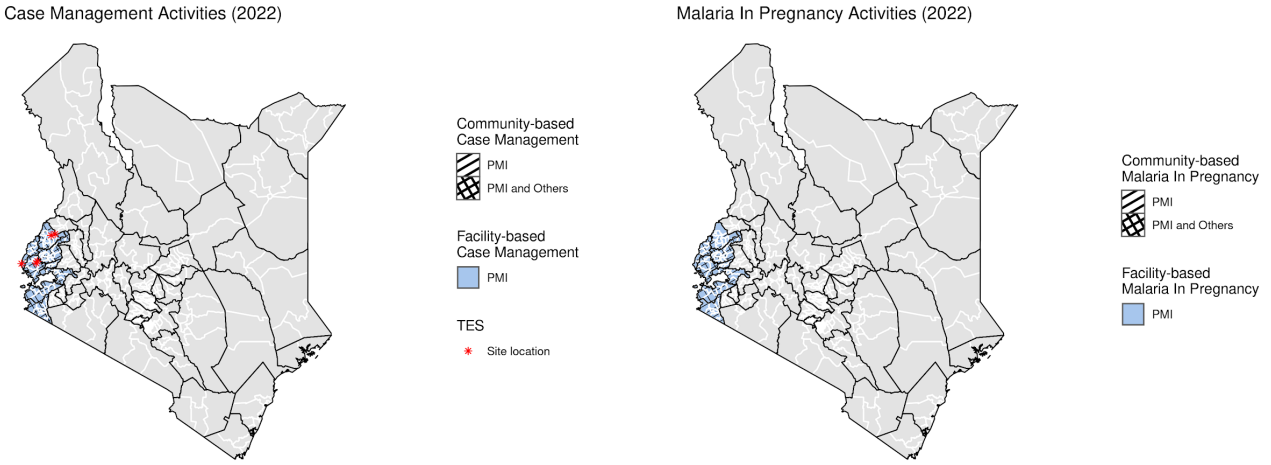
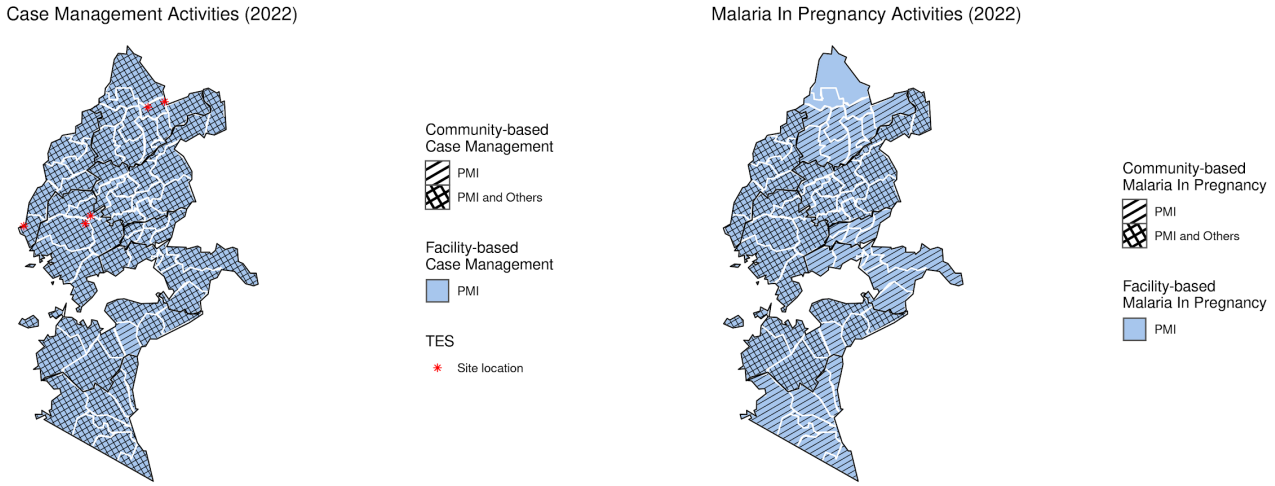


Figure 3b. Map of Case Management, Community Health, and Malaria in Pregnancy Service Delivery Activities in Kenya, Lake Endemic Counties



4.2. Recent Progress (between April 2021 and March 2022)

Despite significant funding decreases in recent years, PMI has maintained and modestly expanded its case management portfolio by providing support to the national, county, sub-county, facility, and community levels (see Figures 3a and 3b). The following activities were successfully completed:

National-level Case Management Activities

- Reviewed and recommended updated central-level policy by facilitating and providing technical assistance to the Case Management components of the

Midterm Review of the KMS 2019–2023 and the DNMP Operational Research Priority Setting Workshop.

- Developed and improved national training and supervision capacity by updating pre-service training curricula for the seven health care worker cadres who receive formal training in institutions of higher learning; supporting the development of standardized malaria course content for continuing medical education; developing malaria case management mentoring toolkit and guide; digitizing supportive supervision checklists on the Health Network Quality Improvement System (HNQIS); and initiating the transition of the HNQIS to DNMP.
- Supported program implementation by supporting the production and dissemination of national guidelines for diagnosis, treatment, and prevention of malaria; supporting the production and dissemination of malaria job aids, dosing charts, and information, education, and communication materials; and disseminating orientation packages for the sensitization of CHVs on CCMm to Sub-county Health Management Teams (SCHMTs) and CHAs.
- Supported the implementation of sustainable quality systems for malaria diagnostics by distributing diagnostic guidelines to county reference laboratories and laboratory staff; and developing a slide bank protocol for the national malaria reference laboratory.
- Collaborated with DNMP, District Health Information System, and other partners to support the country's transition to the International Classification of Diseases-11.
- Convened and led four national-level Case Management CoE meetings, and convened eight county-level malaria technical working groups (TWGs).
- Conducted the training of 45 laboratory technologists in basic malaria diagnostic refresher training courses.

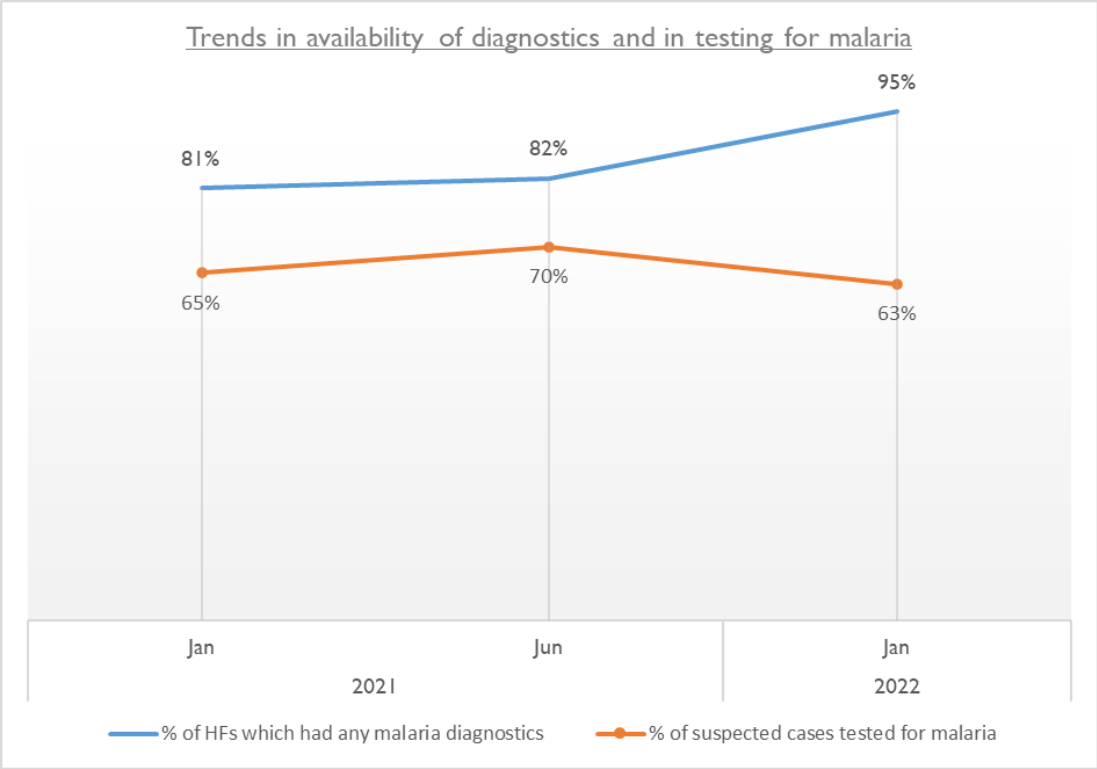
Case Management Findings from the Annual Health Facility Assessment

The first malaria health facility assessment was undertaken in January 2022. This PMI and Global Fund co-funded activity aimed to assess health workers' adherence to national malaria case management guidelines for outpatients and inpatients presenting with suspected malaria, among other objectives. The sampling methodology of the health facility assessment[7] differs from that of the quality of care surveys carried out prior to 2022, and the trends charts below need to be interpreted with that in mind.

[7] The general objective of the 2019 outpatient Quality of Care (QOC) survey was to monitor progress in achieving KMS objectives for health systems support activities and the quality of outpatient malaria case management practices at public health facilities in Kenya. The general objective of the 2022 health facility survey was to assess the impact of surveillance trainings and adherence to national malaria case management guidelines. All health facilities for the outpatient QOC survey (n=170) were randomly

In January 2022, the testing rate was 63 percent, despite 95 percent availability of any diagnostics (see Figure 4; among confirmed cases, 47 percent were diagnosed by RDT and 53 percent by microscopy). The gap between testing rate and test availability might be explained by oversampling of hospitals in non-malaria endemic counties, where the index of suspicion for malaria is low and therefore fewer febrile patients are tested for malaria.[8]

Figure 4. Availability of Diagnostics and Parasitological Testing for Malaria, Quality of Care Survey

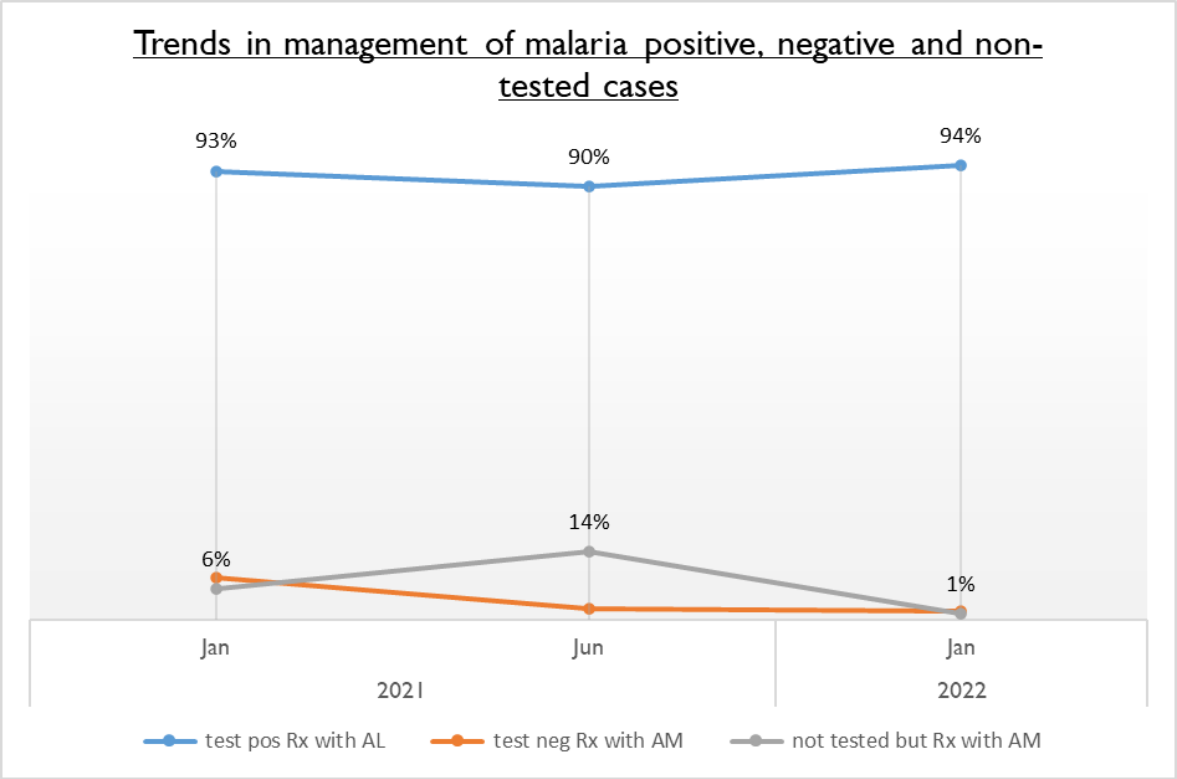


In the same assessment, in January 2022, 94 percent of positive test cases were treated with AL, the recommended treatment for uncomplicated malaria per the national treatment guidelines (see Figure 5). Just 2 percent of negative test patients were treated with AL, and 1 percent of untested participants were treated with AL, which represents misalignment with the national treatment guidelines, albeit to a small degree.

sampled from all 47 counties, whereas for the health facility assessment (n=172), stratified random sampling was done for level 3 to 5 facilities (to ensure inclusion of two hospitals in each county), while the level 2 and 3 facilities were randomly sampled.

[8] The DNMP assessment team was requested to provide a breakdown of findings by malaria transmission risk for subsequent assessments.

Figure 5. Management of Suspected Malaria Cases Based on Test Results, Quality of Care Survey

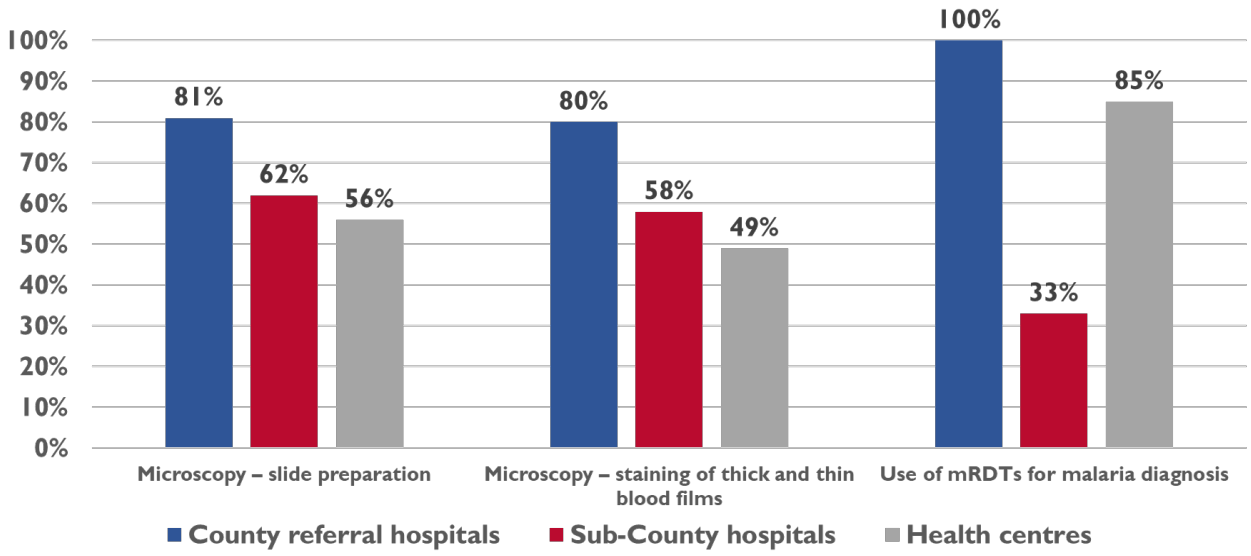


Case Management Findings from the National Lab Assessment

Quality malaria case management requires accurate diagnosis, which depends on well-trained microscopists, functional equipment, supplies, quality assurance, and consistent supervision. To assess malaria diagnostic capabilities in Kenya, PMI supported the DNMP to conduct a national cross-sectional assessment of 164 public health facilities (17 county hospitals, 47 sub-county hospitals, 100 health centers) in 43/47 counties in September 2020, and the results were published in late 2021. Less than 50 percent of health centers and sub-county hospitals participated in quality assurance programs compared to 100 percent for county referral hospitals. Standard operating procedures were available in a third of health centers, about half of sub-county hospitals, and in all county referral hospitals. WHO-guided proficiency testing of 112 microscopists with 568 positive and 460 negative slides identified 17 percent false negatives and 7 percent false positives. Compared with the WHO-informed 80 percent national standard, microscopists achieved 76 percent agreement (A) with a Kappa (K) value of 0.52 on parasite detection (0.44 in health centers; 0.70 county referral hospitals), and A: 48 percent; K: 0.29 on species identification (0.25 in health centers; 0.36 county referral hospitals). Parasite quantification results were available for 125/1,028 (12 percent). Multi-level diagnostic inadequacies, particularly in lower-level facilities where most malaria cases present, reduce malaria case management quality (see Figure 6). To

address these gaps, PMI will increase the proportion of its case management activities devoted to malaria diagnostics and external quality assurance.

Figure 6. Percentage of Laboratory Staff Demonstrating Competence in Microscopy Slide Preparation, Staining, and Malaria Rapid Diagnostic Test Use, National Laboratory Assessment 2020



Commodities

- Supported the procurement of 6.5 million malaria RDTs and distribution of just under half of those (3,284,375) for use across the country, accounting for approximately 63 percent of the total procured and 41 percent of the total distributed.
- Supported the procurement and distribution of four microscopes and consumable microscopy commodities to TES sites.
- Supported the procurement and distribution of 3,090,000 and 2,703,720 malaria AL treatments, respectively, for use across the country, accounting for approximately 33 percent of the total procured and 58 percent of the total distributed.
- Supported the procurement and distribution of 903,500 and 153,405 vials of injectable artesunate, respectively, for use across the country, accounting for approximately 58 percent of the total procured and 28 percent of the total distributed.

County/Sub-county Levels

- Facilitated County Health Management Teams to conduct quarterly supportive supervision to 63 targeted sub-counties; facilitated SCHMTs to conduct targeted quarterly clinical supportive supervision visits to 720 facilities and community units using digitized checklists.

- Held 24 quarterly learning workshops to interrogate KHIS malaria case management data and dashboards to inform case management quality of care improvement interventions at the county and sub-county levels.
- Set up servers to host TrainSMART and training dashboards to harmonize training efforts across implementing partners; facilitated the use of training data to generate 24 quarterly reports to inform health care worker case management capacity needs.

Facility Level

- Trained 61 supervisors in on-site training and supportive supervision.
- Facilitated mentorship of 1,140 health care workers through on-site training and supportive supervision visits in 720 facilities in 63 sub-counties; identified and supported 24 facility-level champions to conduct continued mentorship within their focal facilities and community units.
- Strengthened health care worker capacity on malaria case management by supporting 189 virtual continuing medical education events across 31 sub-counties in the eight lake endemic counties with 900 participants receiving continuing medical education credits.
- Strengthened the management of severe malaria by supporting a five-day clinical mentorship refresher course for 64 HCWs and three structured post-training follow-ups of the 64 trainees.
- Supported quarterly mortality and morbidity data reviews for each of the eight counties.
- Conducted 24 quarterly virtual case discussions using the ECHO platform, a virtual case presentation and learning platform focusing on improving quality of care.[9]
- Strengthened data capture and use by facilitating monthly data review meetings at 72 facilities, including use of the inpatient data visualization tool in targeted high-volume facilities; providing targeted technical assistance and monitoring the use of wall charts at 1,200 facilities; and sensitizing clinicians and health records information officers at 80 inpatient facilities on International Classification of Diseases-11 disease classification coding to improve accuracy of inpatient data reporting.
- Leveraged existing quality improvement teams at 95 facilities to be supported by their respective SCHMTs to conduct quarterly quality improvement meetings and implement quality improvement projects targeted at improving case management outcomes.

[9] https://hsc.unm.edu/echo/what-we-do/about-the-echo-model.html

Community Level

- Supported SCHMTs and CHAs to train 2,500 CHVs and conduct quarterly supportive supervision of 250 CHUs on CCMm.
- Strengthened data capture, reporting, and use at the community level by facilitating printing and distribution of community referral and reporting tools for 250 supported CHUs and supporting SCHMTs to conduct quarterly data review meetings for supported CHUs.

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

4.3. Plans and Justification for FY 2023 Funding

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

National-level Case Management Activities
PMI will continue to support guidelines development, Case Management Committees of Experts, the diagnostic external quality assurance program, and microscopy proficiency testing programs as described in the Recent Progress section.

Commodities
PMI will continue to procure RDTs, ACTs, and injectable artesunate as described in the Recent Progress section.

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

Facility Level
PMI will continue to support training and supervision of HCWs on malaria case management, including severe malaria; strengthen facility-level data capture and use; and improve case management processes aimed at improving outcomes as described in the Recent Progress section.

Community Level
PMI will continue to support CCMm activities for all ages, integration of CCMm with iCCM platforms, and data capture, reporting, and use at the community level as described in the Recent Progress section.

PMI supports the compensation of CHVs in Kenya by supporting county governments to create and implement legislative frameworks that codify protections and remuneration

schemes for this health worker cadre. This is further described in the Capacity Strengthening section.

Private Sector

PMI will be developing a private sector activity focused on increasing access to malaria services for unreached populations. PMI will support the broader private sector health strategy to address policy and legislative barriers that hinder access to strategic program health services including HIV, reproductive health, and malaria in the private sector, and support a low-cost health insurance model that expands access to malaria and other services in the private sector and improves quality of care (test and treat) through existing regulatory platforms/frameworks.

Monitoring Antimalarial Efficacy

Table 3. Ongoing and Planned Therapeutic Efficacy Studies

Therapeutic Efficacy Studies			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
2021–2022	Phase 1: Siaya, Bungoma	AL, DP	CDC
2022–Present	Phase 2: Siaya, Busia	AL, DP	TBD
Planned TESs (funded with previous or current Malaria Operational Plan)			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
2024	TBD	AL, DP	TBD

AL = artemether-lumefantrine; DP = dihydroartemisinin-piperaquine; CDC = Centers for Disease Control and Prevention; TBD = to be determined

5. Health Supply Chain and Pharmaceutical Management

5.1. PMI Goal and Strategic Approach

Objective 6 of the KMS 2019–2023 outlines two critical approaches for strengthening the health supply chain: 1) enhancement of malaria commodity security at all levels of the health system, and 2) availability of quality malaria commodity data for supply chain decision-making. The Kenya Health Products and Technologies Supply Chain Strategy 2020–2025 envisions a sustainable, resilient and responsive health products and technologies supply chain system with a mission to provide a steady supply of quality and affordable health products and technologies through a functional supply chain system. The supply chain strategy defines the roles and responsibilities of the Health Products and Technologies Units (HPTUs) at the national and county levels for oversight and governance of all essential medicines and medical commodities. Pharmacy and Poisons Board (PPB) and National Quality Control Laboratory (NQCL) play a critical role in ensuring quality and regulatory standards for all medicines and medical commodities.

PMI complements DNMP, HPTU, PPB, NQCL, and other donor efforts to assure continuous availability of malaria commodities, which are essential for quality malaria service delivery through support for efficient procurement, warehousing, and distribution. PMI also supports the DNMP, PPB, and NQCL to strengthen supply chains through leadership and governance regulation and quality assurance activities that focus on building capacity of staff within the recently established HPTUs at the national and county levels; facilitating and providing technical leadership for the DNMP Commodity Security Committee of Experts and county commodity TWGs; and building capacity of health workers for inventory management and pipeline monitoring toward enhanced commodity security at all levels of the health system. PMI also works with the DNMP to ensure end-to-end visibility of quality supply chain data for decision-making at all levels of the system and has invested in a robust LMIS within the KHIS that receives complementary data from other sources.

PMI also invests in third-party monitoring of malaria commodities alongside other U.S. government-funded commodities to enhance accountability for health products and mitigate against identified supply chain risks.

5.2. Recent Progress (between April 2021 and March 2022)

PMI's principal supply chain investments aimed at improving and maintaining commodity availability at service delivery points, including investments in:

- Forecasting and supply planning
- Regular pipeline monitoring
- Order management
- Logistics management information system enhancements and expansion
- Technical assistance for quarterly Procurement and Supply Management CoE meetings and monthly commodity management sub-committee meetings at the national level
- Operationalizing county HPTUs
- Risk management for all malaria commodities through health facility-based supportive supervision and supply chain audits
- Technical input for the annual health facility survey that captures data on pharmaceutical management of malaria commodities
- Technical support toward bi-annual county malaria meetings that bring together the county pharmacists and lab personnel from all 47 counties for cross-learning and third-party monitoring of malaria commodities to enhance accountability and visibility across the entire supply chain.

Key achievements include:

- Conducting support supervision visits and supply chain audits across 1,349 facilities in the eight malaria endemic counties.
- Participating in the biannual county pharmacists and lab technology meetings for all 47 counties to advocate ITN reporting system transition and a streamlined county malaria commodity order schedule toward improving efficiency in distribution.
- Coordinating redistribution of malaria commodities across counties to mitigate stockouts and prevent expiries worth $96,946.
- Providing support to the 2023 mass net campaign by distributing 1.95 million nets to dropoff points in Kakamega and Busia counties and distributing 1.3 million nets to beneficiaries in Bungoma county.
- Successfully transitioning ITN LMIS reporting from a parallel reporting system to the KHIS, with a current reporting rate of 76 percent.
- Providing technical leadership for the annual forecasting and supply planning for malaria commodities, totaling $101.5 million for the period 2022–2025.
- Establishing and operationalizing 42 county HPTUs.
- Supporting the midterm review of the KMS 2019–2023 with a focus on the supply chain component that noted the lack of a framework to address commodity security and accountability issues at service delivery points. Further, it was noted that commodity management capacity (skills and staffing) in counties were suboptimal.

In conjunction with these interventions, the availability of key malaria commodities varied across the epidemiological zones, with higher stockouts experienced in the non-malaria endemic counties. Stockouts experienced overall were due to supply chain disruptions in 2021 that occurred as a result of tax waiver challenges impacting PMI-funded commodities which necessitated shipment and order placement delays to prevent incurring demurrage costs. Overall stockout rates were highest for ITNs, which are only procured through PMI. Other malaria commodities are co-funded with Global Fund and GOK, and Global Fund was able to call forward their orders to mitigate stockouts.

The graphs below show stockout rates for the period of Jan. 2021 to June 2022 for AL, RDTs, and ITNs respectively (see Figures 7-9).

Figure 7. Proportion of Health Facilities Stocked Out of All Artemether-lumefantrine Presentations

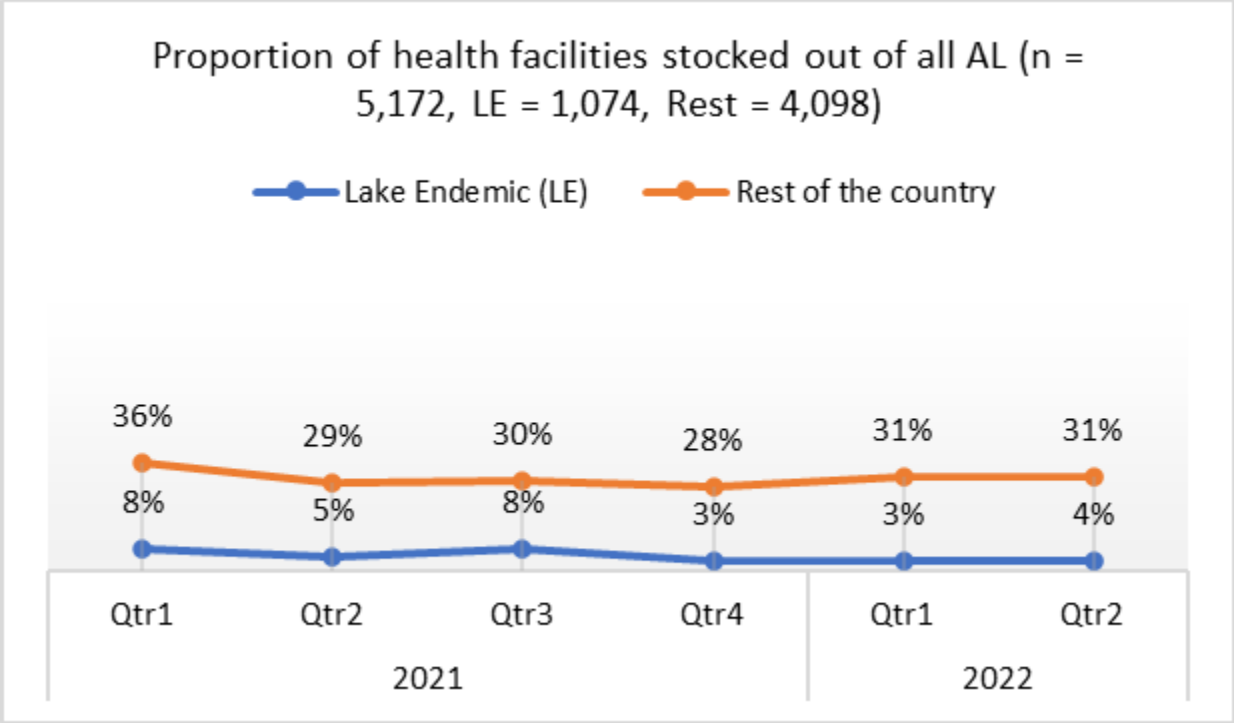


Figure 8. Proportion of Health Facilities Stocked Out of Rapid Diagnostic Tests

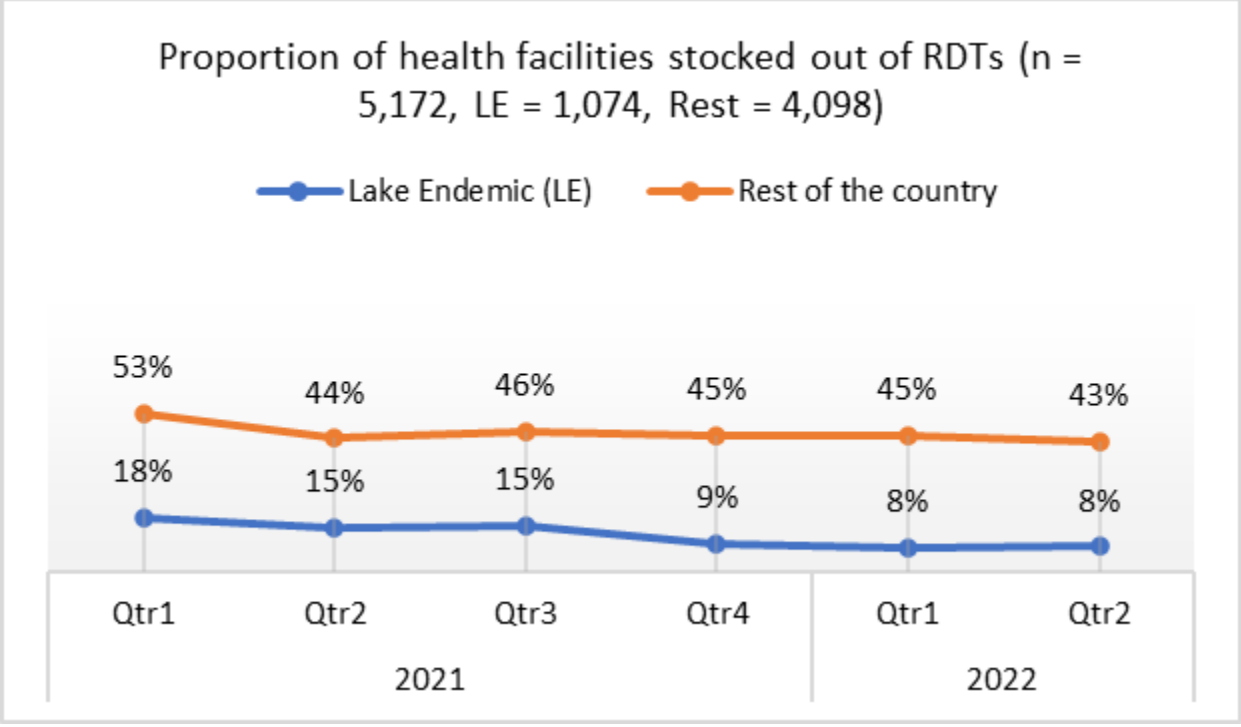
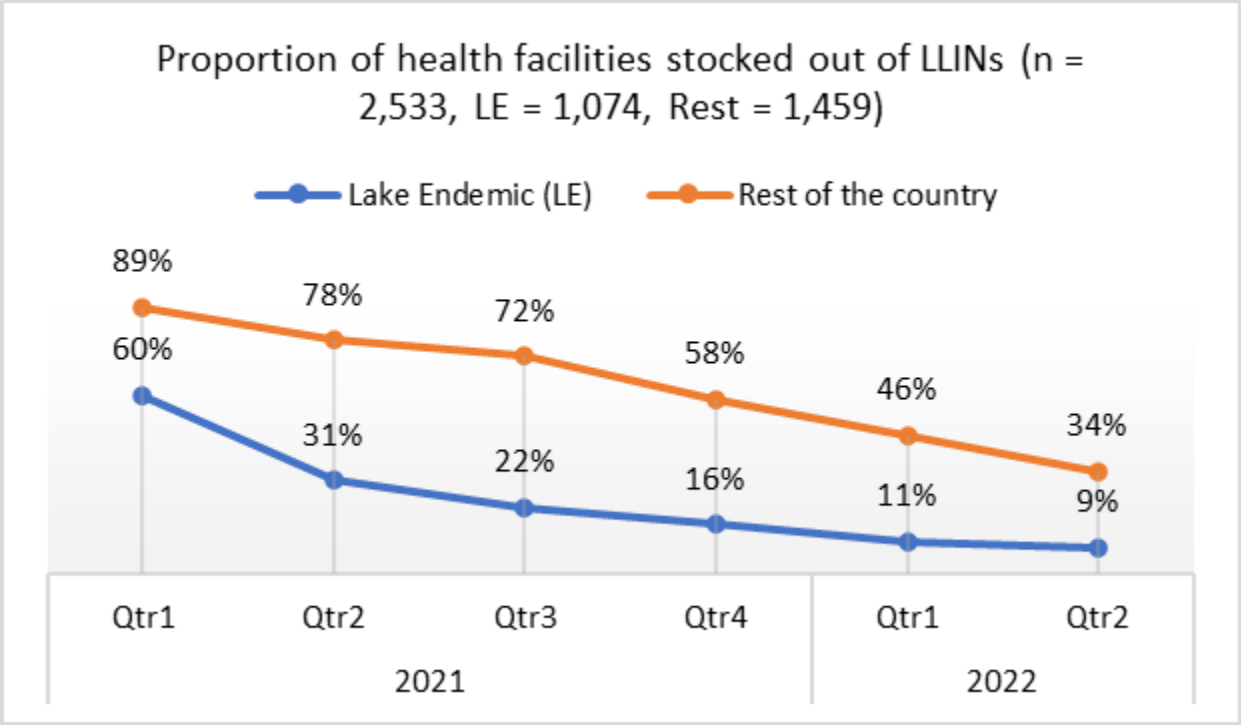


Figure 9. Proportion of Health Facilities Stocked Out of Insecticide-treated Mosquito Nets



The primary reasons for the variation in stockouts include:

- Rationalization of orders when there was limited supply at central level, prioritizing lake endemic counties for resupply. especially for ITNs
- Local arrangements by low risk counties with low consumption rates for antimalarials and diagnostics to keep malaria medicines and RDTs in selected central sites (e.g. the sub-county hospitals) and to only request limited supplies when they had patients, therefore depicting an artificial stockout
- Better inventory management practices adopted through intense support to lake endemic counties that account for about 70 percent of the antimalarial commodity needs, including use of the automated dashboard to determine resupply, thus contributing to improved stock management

PMI investments in the country regulatory and quality assurance systems aimed to strengthen the capacity and institutional capability of the PPB and NQCL to sustainably strengthen medical product quality assurance systems through:

- Co-leading with PPB the inclusion of the Post-Marketing Surveillance (PMS) TWG and risk-based PMS in the newly enacted PPB PMS/Pharmacovigilance (PV) 2022 rules that provide the legislative framework for quality assurance

systems for all medicines and medical devices, including antimalarials and RDTs.

- Supporting institutionalization of pharmacovigilance PMS activities through development of a robust PMS strategy and a costed work plan
- Conducting risk-based PMS activities to monitor the quality of malaria products in the public and private sectors covering 160 facilities across the eight lake endemic counties. All antimalarials passed the quality testing; one AL product (Game 20/120 tablets) was non-compliant on country labeling requirements.
- Developing and disseminating the Quality Assurance framework for malaria commodities
- Supporting NQCL to identify cost drivers to inform financial sustainability of lab services
- Supporting PPB organizational capacity building through deployment of a self-directed learning platform for in-service continuous technical skills development for regulatory staff.

During the last year, PMI supported third-party monitoring of supply chain risk for malaria commodities across the country with focus on four areas: delivery risk,[10] receipt record risk,[11] stock accuracy risk,[12] and stock recording risk.[13] The third-party monitoring TPM was accomplished through spot checks at health facilities shortly after delivery of U.S. government-funded health commodities to 109 health facilities in the lake endemic counties and 306 health facilities in the rest of the country between December 2021 and May 2022. The delivery risk was found to be similar across PMI- and non-PMI-supported counties, whereas all the other risks were lower for the PMI-supported counties—reflecting the impact of PMI investments in supply chain governance and capacity building at county and sub-county levels (see Figure 10).

[10] Delivery Risk: Quantity not received in full as supplied by MEDS.
[11] Receipt Record Risk: Stock card not updated at receipt of new deliveries.
[12] Stock Accuracy Risk: Stock card balance does not match physical count.
[13] Stock Recording Risk: Stock card not available or accessible.

Figure 10. Supply Chain Risk Assessment for Malaria Commodities

Low risk: <1.5; modest risk: 1.5 to <2.5; medium risk 2.5 to <3.5; high risk: 3.5 to <4.5; critical risk: >4.5

5.3. Plans and Justification with FY 2023 Funding

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

Planned activities with FY 2023 funds include:

- Forecasting, quantification supply planning, and regular pipeline monitoring for all malaria commodities
- Capacity building for strengthened leadership and governance of the Division of Health Products and Technology
- Strengthened use of supply chain data for informed decision-making, including re-order and resupply by counties
- Commodity data review meetings for sub-county and health facility staff

- Capacity building of county HPTUs to use supply chain data for decision-making and to carry out risk management of malaria commodities
- Semi-automating compilation of the malaria commodity monthly stock status report
- Support for the annual health facility survey
- Support to PPB to strengthen regulatory oversight for malaria commodities
- Risk-based post-market surveillance of malaria medicines and medical commodities
- Support to national and county governments for implementation of quality assurance framework for malaria commodities
- Development and consolidation of country-specific Good Manufacturing Practices content to support local pharmaceutical manufacturers
- Support third-party monitoring of malaria commodity distribution

These activities align with the DNMP and MOH strategies and complement the Global Fund 2021–2024 grant that is focused on health system strengthening efforts for supply chain management.

6. Social and Behavior Change

6.1. PMI Goal and Strategic Approach

PMI's SBC support in Kenya fully aligns with and contributes to the attainment of DNMP's objective to increase utilization of appropriate malaria interventions in Kenya to at least 80 percent by 2023. This includes support for implementation of four key strategies: 1) strengthening structures for the delivery of advocacy, communication, and social mobilization interventions at all levels, including building capacity and providing mentorship and technical assistance to counties; 2) strengthening program communication for increased utilization of malaria interventions at the household level through the use of multi-channel approaches that combine mass media, interpersonal communication, and structural interventions to promote new or modified behaviors; 3) increasing inter-sector advocacy and collaboration for malaria interventions by strengthening coordination of malaria advocacy activities with the aim of fostering strong linkages between the national and county governments and across health and non-health sectors; and 4) strengthening community-based SBC communication activities for all malaria interventions and ensuring the participation of local communities in malaria control initiatives through existing local networks such as religious institutions.

Nationally, PMI provides technical assistance and support for capacity strengthening activities and coordination and development of mass media materials and relevant tools and guidelines through the SBC CoE. At the county level, PMI support is concentrated in the eight lake endemic counties and involves the development of county health

communication strategies and implementation plans and the provision of technical assistance for coordination and material development. County SBC activities are directed at the community and health facility level. Through partnerships with local community-based organizations and collaboration with local leaders and CHVs, PMI supports the DNMP and Division of Health Promotion's efforts to expand the use of multi-channel approaches that combine mass media, interpersonal communication, and structural interventions to increase adoption and maintenance of key malaria prevention and treatment behaviors. These priority behaviors include correct and consistent ITN use, early and frequent ANC attendance, and prompt and appropriate care-seeking. PMI also supports efforts to understand and address provider attitudes, norms, and beliefs that may impact the delivery or quality of malaria services received at health facilities; and strengthen service communication among health care workers and CHVs.

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

Capacity Building

- Supported DNMP to finalize the development of the Malaria SBC Strategy 2022–2027 that emphasizes community engagement and aims to strengthen community capacity, and that utilizes human-centered design and the community action cycle to empower communities to identify solutions and design interventions to promote the adoption and maintenance of key behaviors. The strategy also aligns with the existing Kenya Malaria Communication Strategy, Community Health Strategy, and county-specific malaria SBC plans.
- Supported the regular convening of the national SBC CoE meetings and aided in the drafting and dissemination of meeting agendas and materials to strengthen coordination and harmonization of malaria SBC activities in Kenya.
- Supported malaria TWGs, including SBC coordination, in eight counties.

Formative Assessments, Research, and Monitoring and Evaluation

- Supported preliminary work to prepare for implementation of the Kenya Malaria Behavior Survey with data collection in 2022.
- Supported qualitative research on the barriers, enablers, influencers, and contextual factors that influenced community and health care worker behaviors. Based on these results, PMI has begun a co-creation process with different levels of stakeholders to inform activities that will strengthen engagement of males and coordination with local administrations and churches. Activities will be conducted later in 2022.

Mass Media

- Financed the adaptation of radio spots developed by DNMP for local context and supported the broadcasting of these spots 614 times over the one-year period. Also supported the broadcast of eight different longer, interactive shows with local health professionals that focused on malaria issues and included a live question and answer component.
- Supported the use of magnet theater edutainment sessions conducted in public spaces which addressed delayed care-seeking behaviors, ITN use, male involvement in support of ANC attendance, and early ANC attendance.

Interpersonal Communication

- Across all eight lake endemic counties of implementation, PMI support for MCATs expanded from 48 to 72 health facilities. MCATs are composed of the local administration, religious leaders, youth leaders, a CHV, and community health assistant representatives. The focus of the MCAT is resource mobilization, identification, prioritization, and action related to community challenges, in addition to mobilizing communities toward utilization of malaria interventions using the community action cycle framework. MCAT teams worked with local CHVs to engage 24,951 community members in dialogue sessions with tailored communication designed to promote healthy malaria behaviors. In particular, these dialogues focused on men, based on findings from recently concluded research that male partners did not understand their role in MIP services.
- A total of 144 CHUs supported by PMI performed up to 62,000 household visits per month. Additionally, over 1,400 CHVs visited households with pregnant women and/or children under five years of age to deliver standardized messages related to priority malaria behaviors that were identified in the Community Action Plan.
- PMI supported the training of 79 CHAs and 814 CHVs on community malaria SBC approaches and the training of 80 malaria mentors (health workers selected from targeted facilities to support CHVs and other facility staff on SBC-related issues) for provider behavior change.

6.3. Plans and Justification with FY 2023 Funding

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

With FY 2023 funding, PMI will support the following activities:

- Regular meetings of the national SBC CoE and county TWGs

- Continued implementation of mass and mid-media, including radio spots and programs promoting access to ITNs
- Expansion of MCAT support to new health facilities within PMI priority counties while maintaining the functioning of existing MCATs and CHUs
- Continued implementation support for interpersonal communication activities, including those targeting religious congregants and male partners of pregnant women
- Strengthened community-level SBC activity data collection and use

Priorities

While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, FY 2023 funds will prioritize promoting care-seeking for young children and ANC attendance. See Table 4.

Table 4. Priority Behaviors to Address

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Prompt and appropriate care-seeking	Caregivers of children under five years of age	Lake endemic counties	• Conduct community and household interpersonal communication through MCATs and CHVs. • Strengthen quality of care offered at community and health facility level through continued training of CHUs and malaria mentors and through broader service delivery and supply chain strengthening. • Include care-seeking messages in radio programming.
Early and frequent ANC attendance	Women of child-bearing age, male partners of women of child-bearing age	Lake endemic counties	• Conduct community and household interpersonal communication through MCATs and CHVs, including continuing activities that engage men to create more enabling environments for ANC attendance. • Work with religious and administrative leaders to continue to promote ANC attendance. • Strengthen quality of antenatal care through broader service delivery and supply chain strengthening.

Additional Support Activities

No additional SBC data collection activity is planned for FY 2023. Instead, focus will be on the use of the 2022 Malaria Behavior Survey results and the qualitative provider assessment study findings to inform programmatic implementation.

There is a need for continued SBC capacity building at both the national and subnational levels, with increased level of effort at the sub-county level. To bolster

capacity for the planning, design, implementation, and evaluation of SBC activities, PMI will continue to support:

- Coordination at the national level through targeted support to improve the effectiveness of the national SBC CoE and county TWGs
- Functioning of county health units and MCATs, supporting a system in which basic support is maintained in functioning units as support is expanded to new health facilities
- Strengthening capacity of key players and stakeholders for effective SBC design, implementation, and evaluation
- Capacity building for DNMP staff on the use of data, particularly from the 2022 data collection activities, to inform SBC program priorities and strategies.

7. Surveillance, Monitoring, and Evaluation

7.1. PMI Goal and Strategic Approach

DNMP Objective

Objective 5 in the KMS 2019–2023 is to strengthen malaria surveillance and use of information to improve decision-making for program performance. A related objective (Objective 3) is to establish systems for malaria elimination in targeted counties by 2023. In the KMS addendum of April 2022, there was no change in the two objectives. However, some new activities were added, and these are highlighted under “DNMP Approach” below.

DNMP Approach

In alignment with the KMS 2019–2023, the DNMP employs several approaches for strengthening malaria surveillance and the use of information for decision-making, including:

- Strengthening of malaria surveillance through the use of District Health Information System 2 (also known as KHIS) to obtain essential malaria surveillance data. Improvements will also be made to strengthen surveillance and data use, including:
    - Updating KHIS tools to strengthen malaria data collection and standardize information collected nationwide by all facilities
    - Conducting data quality assessments (DQAs) across the 47 counties (all referral hospitals plus two sub-county hospitals, two health centers, and one dispensary per county) to inform required improvements in the KHIS system

    - Creating a functional health supply chain portal in KHIS to make quality malaria commodity data available for decision-making
    - *New in the KMS Addendum of 2022:* Establishing a case-based surveillance system to support active case detection, notification, investigation, and response systems for elimination in targeted counties
- Conducting and facilitating health facility surveys and community surveys including the following:
    - Conducting malaria health facility assessments annually
    - Conducting therapeutic efficacy testing for ACTs every two years
    - Conducting country-wide health provider and laboratory assessment for malaria diagnosis
- Conducting and facilitating health facility surveys and community surveys, including the MIS, Post-Mass Long-Lasting Insecticide-treated Net survey (PMLLIN), and the Kenya Demographic and Health Survey (DHS)
- Strengthening of malaria Epidemic Preparedness and Response structures, including conducting annual Epidemic Preparedness and Response review and planning meetings (including threshold setting) and quarterly epidemic monitoring and detection review meetings, as well as post-epidemic evaluation
- Increasing the use of malaria data for decision-making, including the following:
    - Developing malaria surveillance bulletins and profiles as well as policy briefs
    - Conducting regular sub-national stratification for targeting of interventions
    - Strengthening engagement with county-level decision-makers to enhance evidence-based decision-making
    - Establishing and maintaining a system to ensure sharing of findings and progress updates of malaria research and non-research data
    - *New in the KMS Addendum of April 2022:* Establishing an online tool to track use of malaria surveillance data for decision-making at the subnational level semi-annually
    - *New in the KMS Addendum of April 2022:* Training subnational teams to manage and use data for decision-making with a focus on inpatient data
    - *New in the KMS Addendum of April 2022:* Establishing a malaria intelligence hub

- Monitoring the effectiveness of vector control tools and technologies and entomological surveillance; for more detail, refer to the Vector Monitoring and Control section.

PMI Objective in Support of DNMP

PMI support is aligned to the Malaria M&E Plan 2019–2023 and prioritizes capacity development for malaria SM&E in the following areas:

- Strengthening structures and mechanisms for SM&E coordination
- Ensuring the availability of quality data, including strengthening the KHIS platform, creating dashboards (including the malaria commodity dashboard and Epidemic Preparedness and Response dashboard), and capturing inpatient data
- Promoting the use of malaria data for planning and decision-making
- Providing technical oversight for the SM&E CoE meetings
- Coordinating strategic partnerships with entities such as universities and research institutions
- Building SM&E leadership competencies and capacity of MOH staff at the national, county, and sub-county levels

This support has been operationalized through a number of activities, including the following:

- Technical assistance to the MOH/Health Information System to maintain the KHIS platform, ensuring the routine collection of malaria information and creating dashboards to assist the DNMP and its partners.
- Development of quarterly malaria surveillance bulletins to monitor malaria. PMI supported the development of the bulletins from 2012 to 2014. Since 2015, the DNMP has sustained production of the quarterly bulletin without support from partners and continues to improve it with the addition of incidence maps and data reported through the community health information system.
- Technical assistance for SM&E at the county and sub-county levels to improve the quality of malaria data and enhance the use of malaria data to inform malaria programming in the eight lake endemic counties.
- Strengthening of collaborative data review processes by providing data review guidelines and technical assistance in analyzing data and packaging information to inform malaria programming, including production of county malaria bulletins.
- Support for operationalization and improving the functionality of county malaria TWGs that provide structured platforms for joint planning,

performance review, and accountability, and building capacity of county and sub-county malaria control coordinators on malaria SM&E.

- Support for periodic household surveys (MIS, DHS, PMLLIN) to obtain key malaria indicators. MIS surveys were conducted in 2010, 2015, and 2020, while PMLLIN surveys were conducted in 2017 and 2018. These surveys provide useful indicators of population coverage of malaria interventions. Through 2019, PMI and Global Fund co-funded health facility-based quality of care surveys to monitor malaria commodity stock levels and key malaria case management indicators in a representative sample of health facilities. In 2022, PMI and Global Fund jointly supported the inaugural annual Health Facility Assessment that combines inpatient and outpatient aspects of malaria case management.
- Support for three national malaria forums bringing together researchers, policy-makers and implementers to share evidence, inform malaria policies, and define the malaria agenda.
- Support toward the establishment of malaria elimination structures. The support included establishment of a malaria elimination CoE, and development of a malaria elimination implementation plan and draft tools for the baseline assessment of malaria elimination systems at national, county, and sub-county level in the four counties targeted for elimination.

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

PMI supported the following activities at the **central level**:

- Conducting the midterm review of the KMS (2019–2023). The findings were consolidated in a report and an addendum was added to the KMS highlighting the changes made.
- Updating the national malaria risk transmission map and county malaria profiles.
- Mapping malaria data elements with their respective data sources and initial development of a malaria module in the Kenya HIS.
- Developing and testing a new concept for malaria routine DQA that provides results that are generalizable within a county and also enables monitoring of data quality trends over time.
- Analyzing malaria inpatient data, including mortality. The findings were used to review performance of impact indicators during the midterm review of the KMS 2019–2023.

PMI supported the following activities at the **county, sub-county and health facility levels:**

- Reviewing and updating epidemic preparedness and response plans as well as roll-out of the automated malaria epidemic threshold monitoring dashboard in 11 of the 27 epidemic-prone counties. The other 16 counties had been covered in the previous year.
- Providing technical and logistical assistance to malaria TWG meetings in the eight lake endemic counties in collaboration with other PMI implementing partners.
- Developing concept and tools for mentorship on malaria SM&E and subsequent training of sub-county SM&E mentors in seven of the eight lake endemic counties.
- Mentoring health workers in 463 health facilities (52 percent of targeted health facilities) in six counties on documentation of malaria data using the revised Health Information System tools.
- Conducting baseline malaria routine DQAs in six of the eight target counties, disseminating the results during malaria TWG meetings, and developing data quality improvement plans to address identified gaps.

Findings from the Baseline Malaria DQA

The DQA was conducted in 163 health facilities in six counties in the lake endemic region. The remaining two counties will be assessed in FY 2023. Lot quality assurance sampling was undertaken, with the county as the lot and at least 19 health facilities per lot. Additionally, two hospitals were purposively sampled in each county.

Some key findings included: High completeness (>90 percent) of monthly report (MOH 705A), except Vihiga (69 percent) due to unavailability of revised tools (only 64 percent of facilities in Vihiga had the standard forms); missing data in source documents, mainly temperature, prescription, and column T (malaria column); and approximately 38 percent of facilities over-reporting confirmed malaria cases, 8 percent under-reporting, and 54 percent within quality limits. Over- and under-reporting of malaria cases is due to, among other reasons, incomplete filling of the registers and inadequate malaria data capture and reporting tools at health facilities.

Figure 11. Completeness and Timeliness of Data

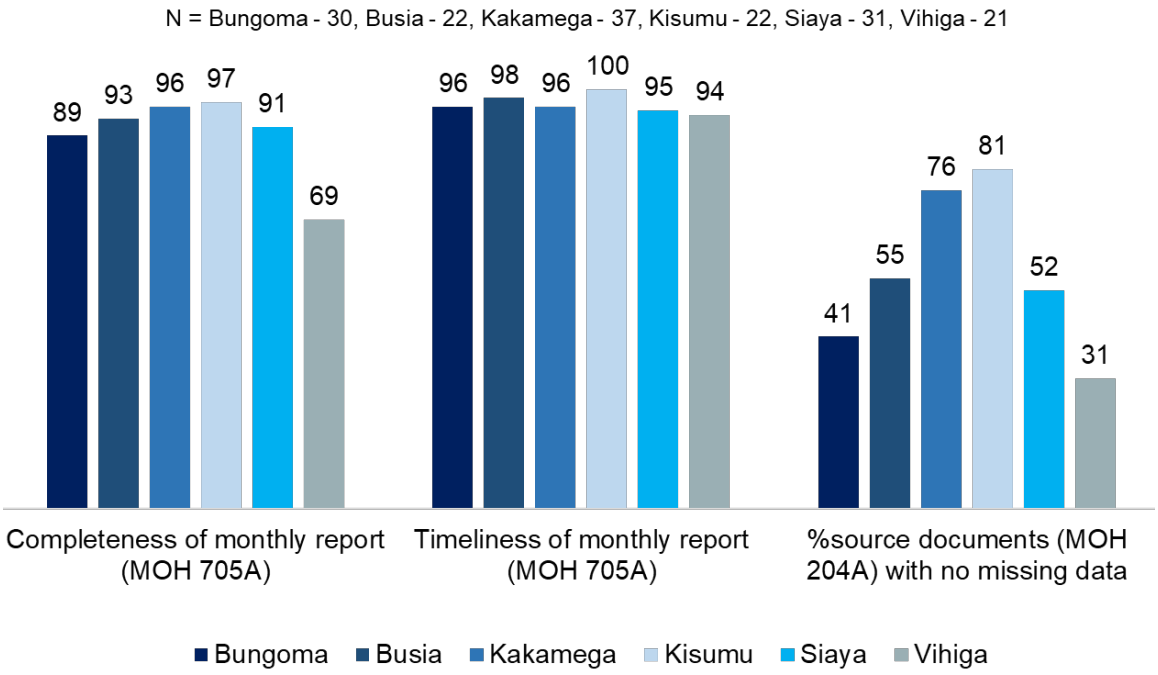
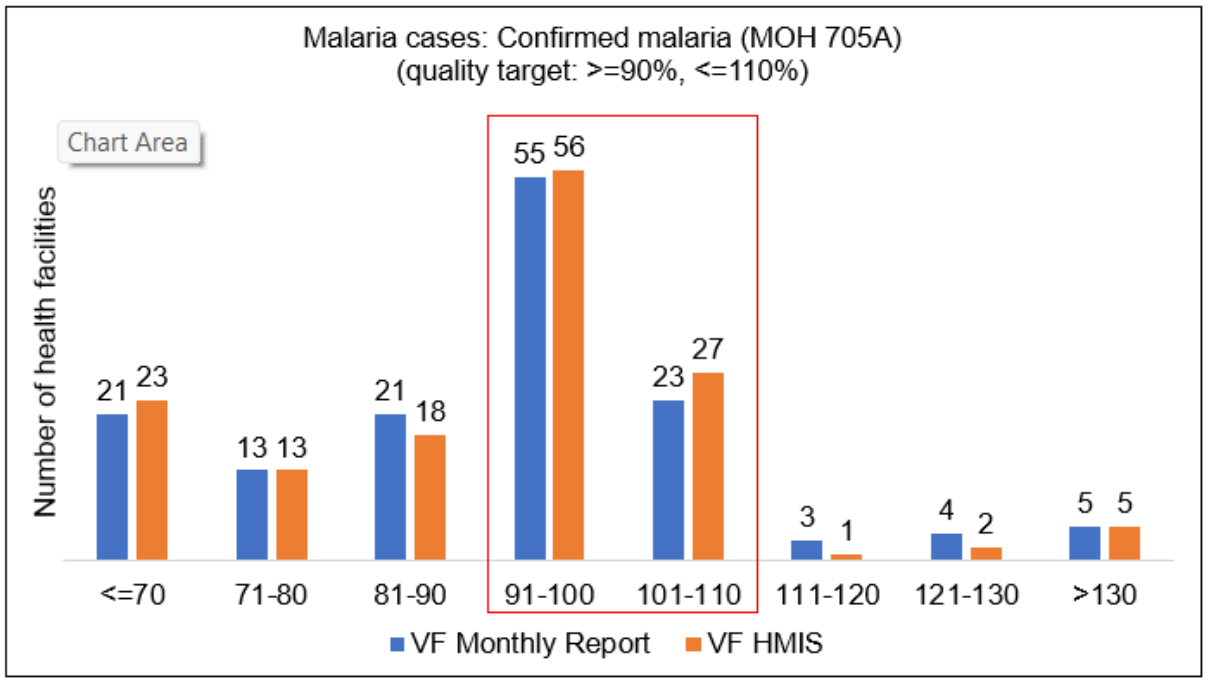


Figure 12. Accuracy of Data (Verification Factor)[14]



14 The verification factors for the monthly report and HMIS are computed by dividing the number of confirmed malaria cases in the OPD register by that in the monthly summary report (MOH 705) and in the KHIS, respectively.

In FY 2023, PMI plans to support the following activities with currently available funding:

- Continued support for KHIS, including:
    - Hosting through the University of Nairobi and maintenance of malaria dashboards
    - Finalization and roll-out of the KHIS Malaria module
    - Development of the KHIS entomology database
    - Support to the DNMP to digitize and publish training materials relating to case management and treatment guidelines through the MOH Virtual Academy.

- Strengthening malaria surveillance at national level through the following activities:
    - Support to DNMP to conduct an end-term evaluation of the KMS 2019–2023 and to develop a new strategy
    - Support to DNMP to develop comprehensive malaria surveillance guidelines
    - Finalization of the malaria elimination implementation plan
    - Support to DNMP to develop the Kenya malaria annual report
    - Convening of the Kenya National Malaria Forum in 2023
    - Support for the 2023 nationwide health facility assessment

- Strengthening malaria surveillance at county, sub-county, and health facility levels through the following interventions:
    - Support to counties to use midterm review findings and to update malaria transmission maps and county-level profiles for malaria programming
    - Technical assistance to counties to develop and disseminate malaria surveillance bulletins
    - Technical assistance for the malaria elimination readiness assessment
    - Baseline malaria routine DQA in Homa Bay and Migori
    - Continued support for follow-on DQA in the lake endemic counties
    - Training of malaria SME mentors in Migori county and continued support for mentorship
    - Technical and logistical support to the 26 epidemic-prone counties to conduct bi-annual malaria data reviews and strengthen their epidemic preparedness and response

Following the updated stratification exercise in-country, PMI FY 2021 funds will be reprogrammed to support a tailoring exercise that will include modeling of intervention mixes to identify the combinations of interventions with the highest impact and cost-efficiency in various malaria epidemiologic zones. The findings will inform the next KMS.

7.3. Plans and Justification with FY 2023 Funding

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

With FY 2023 funding, PMI will provide logistical and technical support for the 2024 Kenya MIS. The survey, which will be conducted in/around March 2024, will use the standard MIS indicators/questionnaires as in the last DHS, and includes malaria parasite and anemia prevalence. The Global Fund will provide co-funding and the MOH and Kenya National Bureau of Statistics will take the lead. PMI will co-fund the annual nationwide malaria health facility assessment conducted by the DNMP with the Global Fund.

PMI will provide continued support at county and national levels for implementation of the malaria HMIS, including data review and analysis, through the continuation of quarterly review meetings, production and dissemination of county malaria bulletins, and routine data quality monitoring performed by the sub-county and county health offices. PMI support for this activity is part of a broader HMIS strengthening effort supported by USAID, Global Fund, and the Kenya government.

PMI will continue to support the DNMP and targeted counties to establish and operationalize systems for malaria elimination, including strengthening passive surveillance, and establishment, where appropriate, of a case-based surveillance system.

Table 5. Available Malaria Surveillance Sources

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

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System						
Malaria Surveillance and Routine System Support	Support to Health Management Information System	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response	X*	X*	P*	P*	P*	P*
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System						
Other	End-use Verification Survey						
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes, and Practices Survey, Malaria Behavior Survey			X			
Other	Malaria Impact Evaluation						
Other	Entomologic Monitoring Surveys	X	X	X	P	P	P
Other	Post-Mass ITN Distribution Survey			X			P
Other	Countywide Provider & Laboratory Assessment for Malaria Diagnosis	X		X			

*Non-PMI funded activities.
**Delay due to COVID-19. 2020 TES enrollment was delayed until 2021 due to COVID-19; additionally, 2021 TES is incomplete due to pending molecular analyses; 2022 TES enrollment is underway.
X denotes completed activities and P denotes planned activities

8. Operational Research and Program Evaluation

8.1. DNMP Objective and Approach

One of the strategies under Objective 5 of the KMS 2019–2023 is "Facilitate Operational Research for Policy Making." Under this strategy, the DNMP endeavors to review and update the malaria operational research (OR) agenda; disseminate the outputs of the findings of OR activities to all relevant stakeholders; enhance collaboration with research and academia to promote sharing of findings and progress updates; and hold malaria research conferences and other fora to inform policy dialogue.

Malaria OR activities are coordinated under a CoE composed of malaria focal points and representatives from research institutions and academia (e.g., KEMRI-Wellcome Trust, University of Nairobi, and Moi University), other MOH division focal points, and malaria stakeholders, including PMI. The DNMP and stakeholders jointly or separately identify OR topics of interest and develop OR concept notes which are reviewed by members of the CoE and then used to source for funding from various sources. The CoE members meet quarterly to review progress for the OR studies that have been approved and are being implemented.

8.2. PMI Goal and Strategic Approach

Operational research and program evaluation (PE) continue to be a priority under the *Innovate and Lead* strategic focus area of the U.S. PMI Strategy 2021–2026, to assess

intervention combinations with high potential to reduce the malaria burden, improve efficiencies, and address inequities.

In Kenya, PMI contributes to the country's OR initiatives by participating in the CoE's deliberations on key research questions and concept and protocol development processes. When aligned with PMI priorities and reviewed by the PMI operations research committee, PMI may also offer to support the implementation of given research activities.

8.3. Recent Progress (between April 2021 and March 2022)

PMI has not supported any PE/OR activities in the recent past.

PMI-Supported Planned Activities (FY 2022 with currently available funds)
PMI will support the end-term evaluation of the current county malaria strategy (KMS 2019–2023)

No PMI-supported OR/PE is ongoing or has been recently completed.

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

Funding Source	Implementing Institution	Research Question/Topic	Current Status/ Timeline
Medicines for Malaria Venture	Strathmore University, Kenya MOH/DNMP, Kenya Medical Supplies Authority, Migori & Homa Bay counties	Pilot of multiple first-line therapy	Ongoing; ending TBD
Liverpool School of Tropical Medicine	Liverpool School of Tropical Medicine	Pharmacovigilance in pregnant women during pilot of multiple first-line therapy	Ongoing; ending date TBD
Global Fund	MOH/DNMP	National longitudinal surveillance of PF HRP2/3 deletions and bio-banking to support future antigen-based malaria diagnostics	Ongoing
Bill & Melinda Gates Foundation (BMGF)	KEMRI-Wellcome Trust	Malaria Molecular Surveillance for HRP2/3 Deletions and Resistance Markers	2022–2027
WHO	CDC/WHO	Malaria RTS,S Vaccine Program Evaluation	Ongoing; end date TBD
CDC	CDC/LSTM	Post-discharge Malaria Chemoprevention for the Management of Severe Anemia	Ongoing; end date TBD
BMGF/USAID Innovative Vector Control Consortium	KEMRI-Wellcome Trust/ LSTM/CDC	Evaluation of attractive targeted sugar baits	Ongoing; ending February 2024
Unitaid	KEMRI-Wellcome Trust//UND/CDC	Evaluation of spatial repellents	Ongoing; ending October 2023

Funding Source	Implementing Institution	Research Question/Topic	Current Status/ Timeline
European & Developing Countries Clinical Trials Partnership, PATH, Foundation for Innovative New Diagnostics	KEMRI-Wellcome Trust, CDC, Liverpool School of Tropical Medicine, MOH Malawi and Tanzania	Efficacy and safety of monthly intermittent preventive treatment using dihydroartemisinin-piperaquine (DP) versus DP+azithromycin versus SP for prevention of MIP	Ongoing; end date TBD

8.4. Plans and Justification with FY 2023 Funding

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

No OR/PE activities are proposed with FY 2023 funding.

9. Capacity Strengthening

9.1. PMI Goal and Strategic Approach

PMI Objective in Support of DNMP
PMI supports the DNMP for overall program management, coordination with multi-sectoral stakeholders, strengthening of linkages between national and county governments, and ensuring that DNMP staff have the skills and capacity to effectively fulfill their mandate for successful implementation of the KMS 2019–2023. PMI also supports domestic resource mobilization efforts of the DNMP through capacity building for program-based budgeting at national and county levels and costing of various interventions and county annual work plans.

DNMP Objective
Objective 6 of the KMS 2019–2023 is to provide leadership and management for optimal implementation of malaria interventions at all levels and to achieve all objectives by 2023. This objective addresses leadership, partnerships, and coordination at all levels to provide a comprehensive strategy implementation environment and the resources necessary for achievement of the KMS goals and objectives.

DNMP Approach
To achieve Objective 6 of the KMS 2019–2023, the DNMP is prioritizing the following activities:

- Aligning malaria governance and legislation to constitutional mandates and core functions

- Strengthening partnerships and coordination for malaria program management
- Strengthening capacity for malaria programming at national and country levels
- Strengthening resource mobilization initiatives for malaria
- Enhancing malaria commodity security at all levels
- Strengthening the use of supply chain data for decision-making

The DNMP is also providing leadership and coordination to ensure malaria prevention and control services are delivered equitably and efficiently in all health facilities in malaria endemic and epidemic regions of the country. The KMS 2019–2023 outlines the structure, terms of reference, and membership for the Malaria Health Sector Working Committee and CoE, whose roles include technical, operational, and strategic oversight of the KMS 2019–2023. The DNMP has appointed focal persons responsible for each objective area to work collaboratively with stakeholders as part of the CoE. Through these structures, the DNMP seeks to:

- Build capacity of staff through technical assistance offered in collaboration with other malaria partners, including through attendance at selected malaria conferences.
- Improve efficiency in the use of existing resources, and advocate for sustainable investment of malaria interventions at the national and county levels.
- Provide a safe and secure environment for meetings and interactions with stakeholders and leverage technology for communication and data acquisition.
- Strengthen linkages between national and county levels of government to ensure standardized and harmonized policy implementation and delivery of malaria services.
- Coordinate with other ministries and agencies, including regulatory bodies, the private sector, universities, civil society organizations, and relevant ministries.

9.2. Recent Progress (between April 2021 and March 2022)

PMI-supported capacity strengthening efforts and progress are reflected in several technical areas across this document. Additional activities not previously listed include:

- Supported the midterm review of the KMS and the development of the addendum to the revised KMS 2019–2023.
- Supported DNMP efforts to increase GOK funding for malaria programming through the development of an advocacy briefer on investing in malaria control and elimination activities and capacity building of program staff on

program budgeting. The GOK increased funding allocation to the malaria program by 13 percent in the current fiscal year.
- Supported DNMP with costing of the activities in the addendum to the revised KMS 2019–2023.
- Continued support for the DNMP website, including upgrading, to ensure continued visibility of the malaria program to the public and other stakeholders.
- Provided technical assistance to focus counties for planning and budgeting for increased resources in the health sector at the county level.
- Assisted counties with the development of malaria factsheets to advocate for malaria budget allocation increases from county authorities.
- Supported focus counties to strengthen leadership and governance systems through support for 42 county and sub-county malaria coordinators to attend training offered by the Kenya School of Government for sustained malaria control outcomes.
- Supported two Field Epidemiology Laboratory Training Program (FELTP) residents to help strengthen technical/scientific capacity at the national and county levels.
- Supported training for 32 county and sub-county staff in a malaria-focused epidemiology, surveillance, data management, and analysis curriculum through the FELTP Frontline Program, a three-month short course during which Frontline residents applied intensive classroom learning for mentored on-the-job projects with proven impact on various aspects of malaria service delivery.
- Supported one WHO national program officer who contributed to the midterm malaria program review, provided technical input for the quarterly CoEs across all technical focus areas, and coordinated engagement of WHO technical experts to facilitate consensus-building discussions on policy issues.

To continue building upon investments in capacity strengthening, PMI plans to support the following activities in FY 2023:

- Developing management and technical capacity of national and county level staff to ensure the malaria program meets the core functions outlined in the KMS 2019–2023.
- Collecting and analyzing data to support budget expansion and absorption for malaria program activities at national and county levels.
- Strengthening technical/scientific capacity at the national and county levels through engagement of FELTP staff in malaria data management and interpretation to inform prioritization of malaria interventions in the counties.

- Training county and sub-county staff in epidemiology, surveillance, data management and analysis through the FELTP Frontline Program.
- Continued support for WHO national program officer, who provided technical assistance to CoEs, MPR, TES, and planning for the new strategic plan during this reporting period.

9.3. Plans and Justification with FY 2023 Funding

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

PMI Kenya will continue to support capacity strengthening activities as described in the Recent Progress section.

10. Staffing and Administration

Up to five health professionals will oversee PMI in Kenya. The single interagency team led by the USAID Mission Director or their designee consists of a Malaria/Global Health Security Center of Excellence Director, Resident Advisor representing USAID, a Resident Advisor representing CDC, and two locally hired experts known as Foreign Service Nationals. The PMI interagency team works together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

ANNEX: GAP ANALYSIS TABLES

Table A-1. ITN Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	50,274,755	51,701,503	53,178,555
Total population at risk for malaria	15,082,427	15,510,451	15,953,566
PMI-targeted at-risk population	15,082,427	15,510,451	15,953,566
Population targeted for ITNs	35,459,926	25,285,659	26,000,597
Continuous Distribution Needs			
Channel 1: ANC	863,151	897,040	922,806
Channel 1: ANC Type of ITN	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO
Channel 2: EPI	764,394	794,386	834,389
Channel 2: EPI Type of ITN	PBO and Single Pyrethroid	PBO and Single Pyrethroid	PBO
Channel 3: School			
Channel 3: School Type of ITN			
Channel 4: Community			
Channel 4: Community Type of ITN			
Channel 5:			
Channel 5: Type of ITN			
Estimated Total Need for Continuous Channels	1,627,545	1,691,426	1,757,195
Mass Campaign Distribution Needs			
Mass distribution campaigns	0	0	18,399,225
Mass distribution ITN type			PBO and Single Pyrethroid
Estimated Total Need for Campaigns	0	0	18,399,225
Total ITN Need: Continuous and Campaign	**1,627,545**	**1,691,426**	**20,156,420**
Partner Contributions			
ITNs carried over from previous year	1,979,584	2,539,292	1,647,866
ITNs from Government			
Type of ITNs from Government			
ITNs from Global Fund			12,650,968
Type of ITNs from Global Fund			PBO and Single Pyrethroid
ITNs from other donors			
Type of ITNs from other donors			
ITNs planned with PMI funding	2,187,253	800,000	5,582,006
Type of ITNs with PMI funding	PBO and Single Pyrethroid	PBO	PBO
Total ITNs Contribution Per Calendar Year	**4,166,837**	**3,339,292**	**19,880,840**
Total ITN Surplus (Gap)	**2,539,292**	**1,647,866**	**(275,580)**

Table A-2. RDT Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	50,274,755	51,701,503	53,178,555
Population at risk for malaria	15,082,427	15,510,451	15,953,566
PMI-targeted at-risk population	15,082,427	15,510,451	15,953,566
RDT Needs			
Total number of projected suspected malaria cases	20,550,051	24,381,665	25,118,745
Percent of suspected malaria cases tested with an RDT	45%	45%	45%
RDT Needs (tests)	6,935,642	8,503,106	9,042,748
Needs Estimated based on a Combination of HMIS and Consumption Data			
Partner Contributions (tests)			
RDTs from Government	0	500,000	3,000,000
RDTs from Global Fund	2,700,000	3,137,837	0
RDTs from other donors			
RDTs planned with PMI funding	5,700,000	4,000,000	6,000,000
Total RDT Contributions per Calendar Year	**8,400,000**	**7,637,837**	**9,000,000**
Stock Balance (tests)			
Beginning Balance	5,908,080	7,372,438	6,507,169
- Product Need	6,935,642	8,503,106	9,042,748
+ Total Contributions (received/expected)	8,400,000	7,637,837	9,000,000
Ending Balance	**7,372,438**	**6,507,169**	**6,464,421**
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	5,201,732	6,377,329	6,782,061
Total Surplus (Gap)	**2,170,706**	**129,840**	**(317,640)**

Table A-3. ACT Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	50,274,755	51,701,503	53,178,555
Population at risk for malaria	15,082,427	15,510,451	15,953,566
PMI-targeted at-risk population	15,082,427	15,510,451	15,953,566
ACT Needs			
Total projected number of malaria cases	5,086,138	5,668,737	5,626,599
Total ACT Needs (treatments)	5,628,145	6,149,056	6,080,746
Needs Estimated based on a Combination of HMIS and Consumption Data			
Partner Contributions (treatments)			
ACTs from Government	410,000	720,000	0
ACTs from Global Fund	3,970,000	3,580,000	2,820,000
ACTs from other donors			
ACTs planned with PMI funding	900,000	0	2,600,000
Total ACTs Contributions per Calendar Year	**5,280,000**	**4,300,000**	**5,420,000**
Stock Balance (treatments)			
Beginning Balance	7,893,206	7,545,061	5,696,005
- Product Need	5,628,145	6,149,056	6,080,746
+ Total Contributions (received/expected)	5,280,000	4,300,000	5,420,000
Ending Balance	**7,545,061**	**5,696,005**	**5,035,259**
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	4,221,109	4,611,792	4,560,559
Total Surplus (Gap)	**3,323,952**	**1,084,213**	**474,700**

Table A-4. Inj. Artesunate Gap Analysis Table

Calendar Year	2022	2023	2024
Injectable Artesunate Needs			
Projected number of severe cases	184,965	202,103	195,649
Projected number of severe cases among children (< 5 years of age)	73,986	80,841	78,260
Average number of vials required for severe cases among children	4	4	4
Projected number of severe cases among children (5 – 15 years of age)	66,588	72,757	70,434
Average number of vials required for severe cases among children	5	5	5
Projected number of severe cases among adults (≥ 15 years of age)	44,392	48,505	46,956
Average number of vials required for severe cases among adults	9	9	9
Total Injectable Artesunate Needs (vials)	**1,028,408**	**1,123,693**	**1,087,808**
Needs Estimated based on a Combination of HMIS and Consumption Data			
Partner Contributions (vials)			
Injectable artesunate from Government	150,000	340,000	550,000
Injectable artesunate from Global Fund	510,000	490,000	0
Injectable artesunate from other donors			
Injectable artesunate planned with PMI funding	590,000	613,500	300,000
Total Injectable Artesunate Contributions per Calendar Year	**1,250,000**	**1,443,500**	**850,000**
Stock Balance (vials)			
Beginning Balance	596,515	818,107	1,137,914
- Product Need	1,028,408	1,123,693	1,087,808
+ Total Contributions (received/expected)	1,250,000	1,443,500	850,000
Ending Balance	**818,107**	**1,137,914**	**900,106**
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	771,306	842,770	815,856
Total Surplus (Gap)	**46,801**	**295,144**	**84,251**

Table A-5. SP Gap Analysis Table

Calendar Year	2022	2023	2024
Total Country Population	50,274,755	51,701,503	53,178,555
Total Population at Risk for Malaria	15,082,427	15,510,451	15,953,566
PMI Targeted at Risk Population	15,082,427	15,510,451	15,953,566
SP Needs			
Total Number of Pregnant Women	474,377	486,336	498,625
Percent of pregnant women expected to receive IPTp1	82.5%	85.0%	87.5%
Percent of pregnant women expected to receive IPTp2	67.5%	70.0%	72.5%
Percent of pregnant women expected to receive IPTp3	50.0%	52.5%	55.0%
Percent of pregnant women expected to receive IPTp4	30.0%	32.5%	35.0%
Total SP Needs (doses)	**1,091,068**	**1,167,206**	**1,246,563**
Needs Estimated based on Other (specify in comments)			
Partner Contributions (doses)			
SP from Government	500,000	1,500,000	1,166,667
SP from Global Fund			
SP from other donors			
SP planned with PMI funding			
Total SP Contributions per Calendar Year	**500,000**	**1,500,000**	**1,166,667**
Stock Balance (doses)			
Beginning balance	846,275	255,207	588,001
- Product Need	1,091,068	1,167,206	1,246,563
+ Total Contributions (Received/expected)	500,000	1,500,000	1,166,667
Ending Balance	**255,207**	**588,001**	**508,104**
Desired End of Year Stock (months of stock)	9	9	9
Desired End of Year Stock (quantities)	818,301	875,405	934,922
Total Surplus (Gap)	**(563,094)**	**(287,404)**	**(426,818)**