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Zambia

Malaria Operational Plan FY 2024

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

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ANC	Antenatal care
ASAQ	Artesunate-amodiaquine
CBV	Community-based volunteer
CCA	Community change agent
CCM	Community case management
CEP	Community engagement plans
CHAZ	Churches Health Association of Zambia
CHW	Community health workers
CSO	Civil society organizations
CY	Calendar year
DHIS2	District Health Information System-2
DHO	District Health Office
DHS	Demographic and Health Survey
eLMIS	Electronic Logistics Management Information System
EMC	End Malaria Council
EPI	Expanded Program on Immunization
EPR	Epidemic Preparedness and Response
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HFCA	Health facility catchment areas
HMIS	Health Management Information System
iCCM	Integrated community case management
ICEMR	International Center for Excellence in Malaria Research
IPC	Interpersonal communication
IPTp	Intermittent preventive treatment for pregnant women
IPTp3	Three doses of intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated net
LSM	Larval source management
MACEPA	Malaria Control and Elimination Partnership
MCH	Maternal and child health
MCI	Malaria case investigation
MDA	Mass drug administration
MIP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MMM	Monitoring, mentoring, and motivation
MOH	Ministry of Health
MOP	Malaria Operational Plan

MRR	Malaria rapid reporting
NHC	Neighborhood health committees
NIH	National Institutes of Health
NMEC	National Malaria Elimination Centre
NMEP	National Malaria Elimination Program
NMESP	National Malaria Elimination Strategic Plan
OR	Operational research
OTSS	Outreach training and supportive supervision
PBO	Piperonyl butoxide
PE	Program evaluation
PEPFAR	President's Emergency Plan for AIDS Relief
PHO	Provincial health office
PMI	U.S. President's Malaria Initiative
RAS	Rectal artesunate suppositories
RDT	Rapid diagnostic test
SBC	Social and behavior change
SLDPQ	Single low-dose primaquine
SM&E	Surveillance, monitoring, and evaluation
SMEO	Surveillance, monitoring, evaluation, and operations research
SP	Sulfadoxine-pyrimethamine
TA	Technical assistance
TBD	To be determined
TES	Therapeutic efficacy studies
TWG	Technical working group
USAID	United States Agency for International Development
WHO	World Health Organization
ZAMMSA	Zambia Medicines and Medical Supplies
ZITG	Zambia Immunization Technical Group

EXECUTIVE SUMMARY

To review specific country context for Zambia, please refer to the country malaria profile located on PMI's country team landing page, which provides an overview of the country's malaria situation, key indicators, the strategic plan of the National Malaria Elimination Program (NMEP), and the partner landscape.

U.S. President's Malaria Initiative

Launched in 2005, the U.S. President's Malaria Initiative (PMI) supports implementation of malaria prevention and treatment measures as well as cross-cutting interventions. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 27 countries in Sub-Saharan Africa and 3 programs across the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Zambia began implementation as a PMI partner country in fiscal year (FY) 2008.

Rationale for PMI's Approach in Zambia

While recognized internationally for its ambitious goal of malaria elimination and for having attained pre-elimination levels in Southern Province, Zambia, as a whole, remains a highly endemic malaria country, with the entire population considered to be at risk of contracting malaria. According to the estimates from Ministry of Health's (MOH's) National Malaria Elimination Centre (NMEC[1]), in 2022, there were over 8,428,920 reported malaria cases; malaria case incidence was 428 per 1,000 population per year; prevalence in children under the age of five was 29 percent (based on rapid diagnostic tests (RDTs); and Zambian hospitals reported 1,337 total deaths from malaria—an incidence of 8 inpatient deaths per 100,000 people (Health Management Information Systems [HMIS] 2022). Malaria transmission occurs year round, with variations in transmission intensity across the country. Parasite prevalence is highest at the end of the peak transmission season in April and May. *Plasmodium falciparum* is the most predominant malaria parasite, causing the most severe form of malaria and accounting for 98 percent of all malaria infections in Zambia. The composition of malaria vector species is heterogeneous at the national level. Overall there are three main vector species, *Anopheles funestus s.s.*, *An. gambiae s.s.*, and *An. arabiensis*; with *An. funestus s.l.* is the primary and *An. gambiae s.l.* is the secondary vector of malaria. There is some geographic variation: in some locations, *An. funestus s.l.* and *An. gambiae s.l.* have an equivalent abundance; in other locations, *An. gambiae s.l.* is more abundant than *An. funestus s.l.*

[1] In 2017, the national malaria program was rebranded from the National Malaria Control Program (NMCP) to the National Malaria Elimination Program (NMEP) during the launch of the national malaria elimination strategic plan (2017–2021) with the goal to eliminate malaria nationwide by 2021. While the term "NMEC" designates the physical center and its MOH staff, in Zambia, the term "National Malaria Elimination Program" is used to signify the wider malaria partnership which is led by NMEC.

Progress in implementation had largely followed positive trends from the early Malaria Indicator Surveys (MIS) of 2006 and 2008 to the 2018 MIS. However, the 2021 MIS revealed a mixed and at times concerning picture of stagnating malaria indicators. In an encouraging trend, malaria risk stratification data show a slow but steady decrease in the proportion of the population who live in areas with a case incidence of >500 per 1,000 population per year for the five-year (2017–2021) period, dropping from 28 percent in 2017 to 19 percent in 2021. Despite this positive trend, the country experienced a difficult malaria season in 2020, with a spike in malaria case incidences across Zambia and throughout much of southern and eastern Africa.

Overview of Planned Interventions

The proposed FY 2024 PMI funding for Zambia is $28 million. PMI will support the following intervention areas with these funds.

1. Vector Monitoring and Control

PMI continues to emphasize purposeful entomological monitoring to better support NMEP's programmatic decisions for vector control implementation and insecticide choice. PMI supports NMEP's approach of universal coverage with piperonyl butoxide (PBO) or dual active ingredient (AI) insecticide-treated nets (ITNs) as the primary vector control strategy. Furthermore, PMI is aligned with NMEP's modified approach to indoor residual spraying (IRS), which involves targeting high-burden IRS-amenable districts where impact can be demonstrated in an apparent reduction of epidemiological and entomological indicators.

Key planned activities in vector monitoring and control include:

- Support of NMEP's decision making with greater emphasis on question-based entomological monitoring, such as understanding the gaps in IRS and ITN protection by assessing the interaction between human and mosquito behavior and assessing the impact of scaled-downed IRS and scaled-up ITNs given the shift in the national strategy from IRS to ITNs as the main vector control strategy.
- Support for the programmatic selection of insecticides through annual insecticide susceptibility testing, assessment of the decay rates of sprayed insecticides on different wall surfaces, and geospatial data visualization and analytics for vector control distribution and coverage.
- Deployment of PBO ITNs in the continuous distribution channels of antenatal care (ANC) clinics, Expanded Program on Immunization (EPI), and school-based channels.
- Support NMEP and its partners to refine and update targeting criteria and operational approaches for IRS and ITNs as complementary vector control strategies. (For details refer to the IRS and ITN sections.)

2. Malaria in Pregnancy

PMI's support for the prevention and treatment of malaria in pregnancy (MIP) aligns with the national approach, which follows World Health Organization (WHO) recommendations through the provision of the following free services:

- ITNs provided via ANC clinics;
- Intermittent preventive treatment for pregnant women (IPTp) with sulfadoxine-pyrimethamine provided via ANC clinics; and
- Prompt and effective diagnosis and treatment of pregnant women with malaria, whether at ANC clinics or other health facilities.

Through the provision of commodities and technical assistance, PMI will continue to support these MIP activities in four provinces with a high malaria burden—Eastern, Luapula, Muchinga, and Northern—including tailored investments in outreach training and supportive supervision (OTSS) in Copperbelt and Central provinces.

3. Drug-Based Prevention

PMI does not fund seasonal malaria chemoprevention or other drug-based prevention in Zambia.

4. Case Management

PMI's support aligns with NMEC's ambitious objective of ensuring that 100 percent of all suspected malaria cases in all districts receive parasitological testing (by microscopy or RDT), and 100 percent of parasitologically confirmed malaria cases receive prompt (within 24 hours) and effective antimalarial treatment. This approach benefits the individual patient by reducing the risk of severe malaria and death, and benefits the wider population by curbing onward transmission.

PMI will continue to provide nationwide commodity support to complement contributions of the government and Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) contributions. This will largely comprise the procurement of malaria RDTs and microscopy supplies, artemisinin-based combination therapy, injectable artesunate, and rectal artesunate suppositories (RAS).

A major thrust for PMI investments in FY 2024 will be for care at the community level. Based on lessons learned and informed by emerging MOH policy on community health worker (CHW) incentives, PMI will continue to mobilize community-based volunteers (CBVs) to conduct community case management (CCM) of malaria at scale in the four provinces of PMI focus: Luapula, Northern, Muchinga, and Eastern. PMI will support CHW training, deployment, supervision, and mentoring, complemented by enablers (e.g., bicycles), monetary compensation (e.g., allowances and potentially stipends), and will be closely coordinated with other CBV funders, including the Global Fund, Malaria Partners International, and the

President's Emergency Plan for AIDS Relief (PEPFAR). Any funding for CBV stipends will be informed by a feasibility assessment and a pilot program prior to implementation.

At the facility level, PMI will continue to support the MOH's OTSS activities in six provinces, supplemented by clinical mentoring. Whereas PMI support in recent years has traditionally focused primarily on outpatient care, in order to reduce case fatality rates, PMI will pay increased attention to the referral of severe malaria and definitive management in inpatient settings according to national guidelines.

5. Health Supply Chain and Pharmaceutical Management

PMI supports seven high-level focus areas that align with the current 2022–2026 National Malaria Elimination Strategic Plan: (1) forecasting and supply planning technical assistance to the MOH; (2) logistics management information systems capacity strengthening; (3) data visibility for assessing and monitoring stock status; (4) Medical Stores Limited warehousing and distribution capabilities; (5) malaria pre-elimination activities; (6) procurement, distribution, and monitoring of ITNs; and (7) procurement of antimalarials, RDTs, and diagnostic commodities. FY 2024 activities will continue to focus on these seven priority areas with special attention to ensuring strong commodity security throughout the supply chain system in line with The anticorruption strategic objectives of the U.S. government.

6. Malaria Vaccine(s)

In light of the 2021 approval of the RTS,S vaccine by WHO for scale up, and by Gavi, the Vaccine Alliance for donor funding, for the first time, Zambia sees a path toward adding a vaccine to its package of malaria control interventions. PMI will provide technical assistance to the MOH with malaria vaccine program development, including coordination between NMEC, immunization teams, and regulatory bodies on vaccine policy, approvals, funding applications, operationalization, and evaluation. Cognizant that vaccine supplies may be severely limited for several years, PMI will assist with adoption of the RTS,S, the R21, and/or other available vaccines to reach priority populations as guided by emerging WHO, PMI, and national policies at the time.

7. Social and Behavior Change

PMI/Zambia continues to emphasize influencing individual and community behavior for the adoption and use of proven malaria interventions while also disseminating key messages on malaria elimination. The PMI approach utilizes four interlinked interventions: (1) mass media targeting the public with the aim of increasing uptake of malaria services and products; (2) community engagement and mobilization to promote the adoption and practice of behaviors; (3) interpersonal communications to influence individuals to adopt desired behaviors; and (4) social and behavior change (SBC) management to improve coordination, supervision, monitoring, and mentorship at provincial and district levels of SBC interventions.

Key planned SBC activities include:

- Support the development of community-owned and community-led engagement plans using evidence from health facilities to develop targeted interventions;
- Engage traditional leaders and faith leaders in malaria control activities to include community-led engagement plans, and help ensure social accountability for malaria services and commodities;
- Support community change agents (CCAs) to conduct interpersonal communication to include community dialogues, household visits, and peer-to-peer learning at the community level; and
- Support mass media to include radio spots, prerecorded radio programs, and live discussion programs, to reach the masses.

8. Surveillance, Monitoring, and Evaluation

PMI shares common surveillance, monitoring, and evaluation (SM&E) objectives with NMEP, as captured in the current national SM&E plan for malaria, namely:

- To strengthen and enhance SM&E systems so that key indicators are reliable and can be accurately tracked and the data are used strategically to inform malaria programming at the national, provincial, district, facility, and community levels; and
- To assess the impact of the national malaria strategic plans and measure successes in reducing the malaria burden.

In providing resources for SM&E activities, PMI coordinates and collaborates with NMEP and several partners, including the Malaria Control and Elimination Partnership in Africa (MACEPA) and the Digital Community Health Initiative, which are funded by the Bill & Melinda Gates Foundation and implemented by PATH, the Global Fund, World Health Organization, and PEPFAR. For its part, PMI will continue to concentrate on building human and technological capacity at the central level and in the four provinces of PMI focus.

To strengthen routine surveillance at all levels, PMI will support training and mentorship in data collection, reporting, and use for decision making at all levels; data quality audits; and review meetings. In appropriate pre-elimination settings, PMI will support malaria case investigation and rapid response (1-3-7 approach). PMI will provide technical assistance to enhance the standardization and interoperability of databases and support the secondment of two data specialists at NMEC. Finally, PMI will support preparations for the anticipated 2026 Zambia Malaria Indicator Survey.

8. Operational Research and Program Evaluation

There are no specific operational research (OR) or program evaluation (PE) activities proposed with FY 2024 funding. PMI implementing partners who are active in Nchelenge District will continue to be guided to collaborate in data sharing with the International Centers for Excellence in Malaria Research. Complementing this approach, PMI will continue to invest in enhanced capacity to triangulate routine entomologic and epidemiologic surveillance data with datasets from implementation and research partners. In light of the wrap up of the ProACT study (CCM) in calendar year (CY) 2023, PMI and NMEC are exploring topics of mutual interest for potential future research activities.

9. Capacity Strengthening

PMI continues to support capacity strengthening and malaria health system improvements at the provincial, district, facility, and community levels, including data-driven decision making at the national and subnational levels. Since 2022, the United States Agency for International Development (USAID) Administrator's office has highlighted Zambia's End Malaria Council (EMC) as part of USAID's Democracy Delivers Initiative. The EMC, which is country-led and country-owned, was launched in 2019 to increase domestic resource mobilization to achieve and sustain malaria elimination. Since its inception, PMI/Zambia has played the role of an enthusiastic "cheerleader" for the EMC and End Malaria Fund. PMI sits on the steering committee and provides technical and programmatic advice.

Key planned activities under capacity strengthening include:

- Strengthening NMEC staff capacity through development activities such as training workshops and participation in regional/global conferences;
- Supporting the EMC with its advocacy role, accountability, and intersectoral mobilization of domestic resources;
- Providing technical assistance to aid the MOH in exploring opportunities to take advantage of innovations in malaria technology and systems, including vaccines;
- Providing technical assistance to strengthen health systems to treat severe malaria, targeting high-volume health facilities;
- Strengthening the organizational capacity of USAID local partners; and
- Supporting Peace Corps activities in malaria control.

10. Staffing and Administration

Four health professionals oversee PMI in Zambia. The interagency team is led by the USAID mission director, although day-to-day oversight has been delegated to the health office director and the deputy health officer director. The PMI interagency team works together to oversee all technical and administrative aspects of PMI.

I. CONTEXT & STRATEGY

1. Introduction

Zambia began implementation as a PMI partner country in fiscal year (FY) 2008. This FY 2024 Malaria Operational Plan (MOP) presents a detailed implementation plan for Zambia, based on the strategies of PMI and the National Malaria Elimination Program (NMEP). It was developed in consultation with NMEP and with the participation of national and international partners. PMI's proposed activities build on investments made by partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). This document provides an overview of the strategies and interventions in Zambia, describes progress to date, identifies challenges and relevant contextual factors, and provides a description of activities that are planned with FY 2024 funding. For more detailed information on the country context, please refer to the Country Malaria Profile, which provides an overview of the country's malaria situation, key indicators, NMEP strategic plan, and the partner landscape.

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

PMI is led by the United States Agency for International Development (USAID) and implemented with the U.S. Centers for Disease Control and Prevention. Launched in 2005, PMI supports the implementation of malaria prevention and treatment measures such as insecticide-treated mosquito nets (ITNs), indoor residual spraying, accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs), intermittent preventive treatment for pregnant women (IPTp), and drug-based prevention, as well as cross-cutting interventions such as surveillance, monitoring, and evaluation (SM&E); social and behavior change (SBC); and capacity strengthening. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria in our generation, with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 27 countries in Sub-Saharan Africa and 3 programs in the Greater Mekong Subregion (GMS) in Southeast Asia to control and eliminate malaria. Over the next five years, PMI aims to save lives, reduce health inequities, and improve disease surveillance and global health security.

Under the strategy, and building on progress already made in PMI-supported countries, PMI will work with national malaria control programs and partners to accomplish the following objectives by 2026:

1. Reduce malaria mortality by 33 percent from 2015 levels in high-burden PMI partner countries, achieving a greater than 80 percent reduction from 2000.
2. Reduce malaria morbidity by 40 percent from 2015 levels in PMI partner countries with high and moderate malaria burden.
3. Bring at least 10 PMI partner countries toward national or subnational elimination and assist at least one country in the Greater Mekong Subregion to eliminate malaria.

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

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

3. Rationale for PMI's Approach in Zambia

3.1. Malaria Overview for Zambia

While recognized internationally for its ambitious goal of malaria elimination and for achieving marked, sustained reductions in Southern Province, as a whole, Zambia remains a highly endemic malaria country, with the entire population considered to be at risk of contracting malaria. According to NMEC, in 2022 there were over 8,428,920 reported malaria cases; malaria case incidence was estimated to be 428 per 1,000 population per year; prevalence in children under the age of five was found to be 29 percent (RDT-based); and Zambian hospitals reported 1,337 total deaths from malaria, which is an incidence of 7 inpatient deaths per 100,000 population (Health Management Information System [HMIS] 2022; Malaria Indicator Survey [MIS] 2021). World Health Organization (WHO) models suggest that Zambia experienced between 7,500 and 8,800 malaria deaths annually from 2010 to 2021 (WHO *World Malaria Report* 2022).

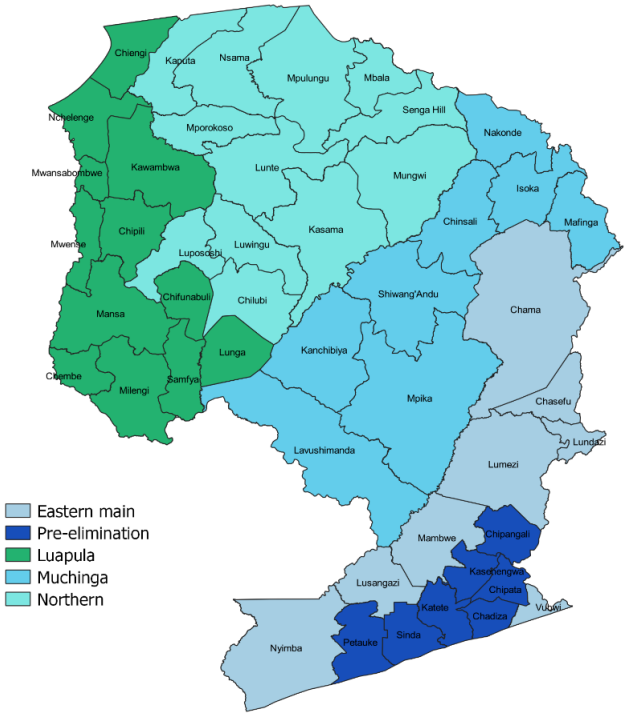
Malaria transmission occurs year-round, with variations in transmission intensity across the country. Parasite prevalence is highest at the end of the peak transmission season in April and May. Among the four types of Plasmodium parasites that can cause malaria in humans, *Plasmodium falciparum* is the most predominant, causing the most severe form of malaria and accounting for 98 percent of all malaria infections in the country. Malaria vector species composition is heterogeneous at the national level with the three species *An. funestus s.s.*, *An. gambiae s.s.*, and *An. arabiensis* as the primary vectors.

Risk is highest in the wetter, rural, impoverished areas of Luapula, Northern, Muchinga, North Western, and Western (40–63 percent prevalence based on rapid diagnostic tests (RDTs) in the 2021 MIS), and in adjacent rural areas of the Copperbelt and Eastern provinces. Risk is lowest in Lusaka and Southern provinces (both 3.3 percent RDT-based prevalence in the 2021 MIS). At the district level, malaria incidence varies widely, from less than 50 cases to over 500 cases per 1,000 population per year.

Zambia is among numerous countries in Sub-Saharan Africa that have recorded a relative stagnation in malaria burden during recent years (WHO World Malaria Report 2022). This is despite the Zambian government having made significant progress in strengthening malaria control capacity in partnership with PMI, the Global Fund, the Bill & Melinda Gates Foundation, nongovernmental organizations such as PATH, the Churches Health Association of Zambia (CHAZ), research institutions, and others. Worrisome findings in routine data characterized all provinces in 2020, including an estimated 30–40 percent worsening of burden indicators from 2018–2019 levels, including the incidence of uncomplicated cases, severe cases, and deaths. Indeed, the year 2020 saw a spike in malaria case incidence across Zambia and throughout much of Southern and Eastern Africa, for reasons which remain poorly elucidated. Nevertheless, Zambia did experience an encouraging slow decrease in the proportion of the population who lived in areas with a case incidence of >500 per 1,000 population per year (dropping from 28 percent in 2017 to 19 percent in 2021) under the last strategic plan (2017 to 2021). Further, the number of health facility catchment areas (HFCAs) in levels 0 and 1 (or with malaria case incidence of less than 50 per 1,000 population) increased from 10 in 2021 to 15 in 2022 (HMIS and Malaria Rapid Reporting System 2023).

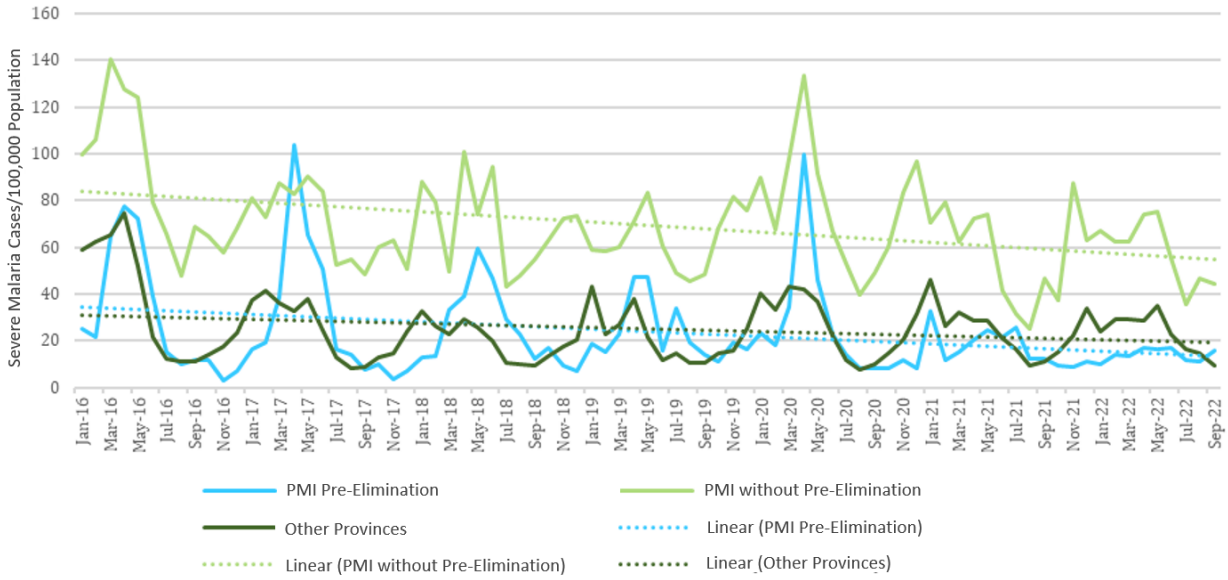
The long-term downward trend in facility-reported severe malaria cases and malaria deaths provide a more encouraging picture (Figures 2 and 3). Favorable trends are seen in Luapula, Northern, Muchinga, and Eastern provinces, which are areas of PMI focus, as well in other provinces. In this comparative analysis, the steepest decline in severe malaria cases was observed in PMI-supported provinces, which, as expected, were experiencing a higher burden at baseline. Figure 1 shows the location of the PMI focus districts, including the seven “pre-elimination program districts.” As explained in section 3.4, PMI provides enhanced investments to saturate malaria control interventions in these seven contiguous districts on the plateau in Eastern Province.

Figure 1. Map of PMI-Supported Provinces and Districts



Note: The seven pre-elimination districts in Eastern Province received enhanced support.

Figure 2. Trends in Reported Severe Malaria Cases per 100,000 Population, by PMI-Supported Pre-Elimination Districts,[1] PMI-Supported Provinces Without Pre-Elimination Districts,[2] and All Other Provinces, January 2016–September 2022[2]

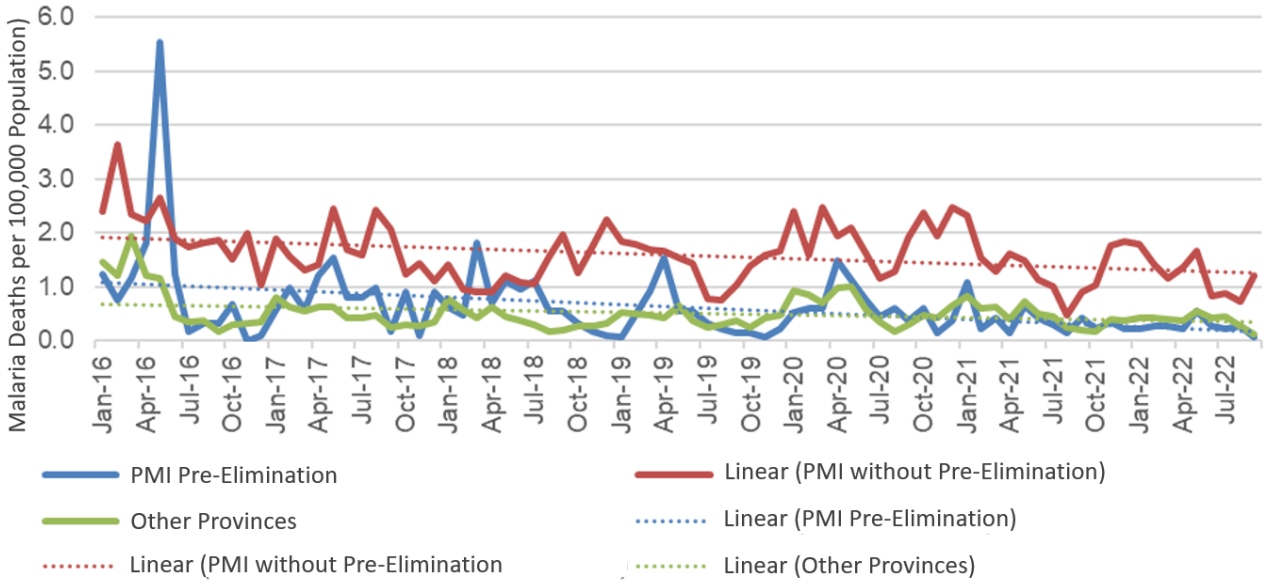


Source: HMIS/PATH.

[1] Chadiza, Chipangali, Chipata, Katete, Kasenengwa, Petauke, and Sinda—all in Eastern Province.

[2] Luapula, Muchinga, Northern, and eight districts in Eastern Province.

Figure 3. Trends in Reported Malaria Deaths per 100,000 Population, by PMI-Supported Pre-Elimination Districts,[1] PMI Provinces Without Pre-Elimination Districts,[2] and All Other Provinces, January 2016–September 2022



Source: HMIS/PATH.
[1] Chadiza, Chipangali, Chipata, Katete, Kasenengwa, Petauke, and Sinda, all in Eastern Province.
[2] Luapula, Muchinga, Northern, and eight districts in Eastern Province.

Progress in implementation largely followed positive trends from the first two Malaria Indicator Surveys in 2006 and 2008 to the 2018 MIS. However, the 2021 MIS revealed a mixed picture.

- The proportion of households who had at least one ITN or had received indoor residual spraying (IRS) in the past 12 months decreased from 84 percent in 2018 to 71 percent in 2021.
- The proportion of children in rural areas, where risk is greatest, who slept under a bed net decreased markedly, from 77 percent in 2018 to 44 percent in 2021.
- In 2018, 68 percent of pregnant women received medication to prevent malaria, showing stability since 2018 (67 percent) and an increase from 61 percent in 2015.
- In 2020, 59 percent of children who reportedly had a recent fever received a finger or heel stick to test for malaria, showing stability from 55 percent in 2018 and an increase from 36 percent in 2015.

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

3.2. Key Challenges and Contextual Factors

The ambitious goal of the previous National Malaria Elimination Strategy (2017–2021), to eliminate malaria nationwide by 2021, was not met. To explain the relative stagnation of many malaria burden indicators, the end-term review of the National Malaria Elimination Strategic Plan (NMESP) highlighted low rates of implementation activity by the National Malaria Elimination Centre (NMEC). Identified issues include:

- Funding was inadequate and disbursement of funds was late for the procurement of commodities, including essential medicines, IRS insecticides, training, and implementation of key malaria activities. In particular, on-time procurement and supply chain disbursement irregularities significantly hampered the program's capacity to deliver timely interventions and conferred negative consequences on key performance indicators.
- Resources were inadequate for scaling up support for high-quality case management at the facility and community level and for systems strengthening, including surveillance, supply chain, and health workforce capacity in high-burden districts.
- The vector control (IRS and ITN) subdistrict "mosaic" approach deployed in 2020 was not well executed and resulted in reduced access to vector control measures. In brief, the Ministry of Health (MOH) prioritized IRS, but the resultant drop in ITN coverage (from 44 to 29 percent ITN ownership) was not compensated for with an increase in IRS coverage, as was expected.
- Human resource gaps in NMEP program management in key areas such as entomology, SBC, and surveillance, monitoring, evaluation, and operations research (SMEO) hindered progress.
- The COVID-19 pandemic caused disruptions in 2020–2021.

However, in 2022–2023 prospects for effective collaboration in malaria control improved in the wake of the peaceful democratic transition of 2021:

- The newly-elected administration started to invest more in health care personnel and essential medicines and to resolve outstanding debts with medical supply vendors. For example, in 2022, the Zambian government recruited about 30,000 health care workers. The new government's stated priorities align with PMI and U.S. foreign assistance strategies, opening up avenues for collaboration in good governance, including commodity security, decentralization and localization, and improved health care service delivery.
- NMEP performed an end-term strategic review in 2021 and 2022, with lessons learned incorporated into the new NMESP 2022–2026, described below.
- There is continued consensus among the MOH and its partners about the need to implement strategies to improve financing levels commensurate with malaria program needs, including strengthening financial management systems, improving commodity security, expanding domestic and external sources of funding, and strengthening NMEP capacity at all levels.

3.3. PMI's Approach for Zambia

Zambia is in its 15th year as a PMI partner country and has averaged $30 million per year in PMI support since FY 2017. The proposed FY 2024 PMI budget for Zambia is $28 million; this will bring the total PMI investment to nearly $436 million.

PMI organizes its investments in line with the Zambia national malaria elimination strategy. The current five-year strategy (2022–2026), launched in August 2022, aims to "reduce malaria-related morbidity and mortality nationally while pursuing subnational malaria elimination." The new strategy includes the subnational goals of: (1) lowering the burden in high-transmission settings; (2) increasing the proportion of the population living in malaria-free HFCAs in low-transmission settings; and (3) preventing reintroduction in malaria-free HFCAs. Through evidence-based interventions, concerted efforts from all partners, and significant resource mobilization, the strategic objectives are to:

- Increase the rate of implementation of interventions from 72 percent in 2021 to 95 percent by 2026.
- Reduce malaria incidence from 340 cases per 1,000 population in 2021 to 201 cases per 1,000 population by 2026.
- Reduce malaria deaths from 8 deaths per 100,000 population in 2021 to 4.7 deaths per 100,000 population by 2026.
- Increase malaria-free HFCAs from 10 (out of the total 3,320 HFCAs) in 2021 to 260 in 2026.

In line with the NMESP (2022–2026), PMI supports a comprehensive package of malaria control interventions, including purchases of commodities and technical assistance (TA) in the key intervention areas outlined in this FY 2024 MOP. The NMESP (2022–2026) promotes a stratified approach to implementation at the level of the HFCA, whereby malaria incidence thresholds will guide the intervention package toward the goal of malaria elimination. Please refer to the Country Malaria Profile for details.

PMI/Zambia will continue to focus most of its TA on the high-burden provinces of Luapula, Northern, Muchinga, and Eastern provinces, including additional modest support in case management TA for Central and Copperbelt provinces. This geographic focus aligns with NMEC's preferences regarding partner coordination and with other USAID health programming and decentralized division arrangements. In 2019, the PMI-funded IRS program incorporated support for rural districts in Copperbelt following discussions and agreement; however, in 2023, PMI withdrew support for IRS in rural Copperbelt in line with a strategic shift to ITNs as the primary vector control strategy while limiting IRS to communities with a high burden.

PMI's investment strategy embraces the national, stratified approach. However, at a more granular level, PMI's strategic approach does not completely align with the national strategy. For example, PMI takes a more cautious view of the cost-effectiveness of mass drug administration (MDA), especially in higher-transmission settings, as the effect is often transient and attaining high population coverage rates has proved challenging. However, PMI may consider collaborating in the future on a trial of MDA in pre-elimination districts in the context of operations research. Similarly, PMI has not previously funded larval source management (LSM). However, in calendar years (CY) 2022 and 2023, PMI/Zambia is supporting an LSM feasibility assessment (specifically larval and adult mosquito surveys; no actual LSM implementation) in select HFCAs in two pre-elimination districts. The goal of this assessment is to collect adequate baseline entomological data to identify, characterize, and quantify the maximal and minimal seasonal extent of Anopheles larval sites. This data will inform NMEP decision making as to whether an LSM implementation pilot is supported or contraindicated by the entomological survey results. Based on the assessment findings, which will be completed in CY 2023 and analyzed in 2024, PMI may consider providing modest support for the LSM implementation pilot in its elimination setting as part of a PMI-supported OR or PE activity.

PMI's approach in Zambia reflects all five of PMI's global strategic focus areas:

1. Supporting the transition away from prioritization of IRS over ITNs to focus on high (>80 percent) national coverage of ITNs with effective insecticide(s) to ensure reaching the unreached, and scaling back IRS to focal areas based on to-be-determined criteria;
2. Reaching full integrated community case management (iCCM) saturation of 1 to 500 community health workers in rural areas and ensuring all CHWs are active in their respective communities and equipped with enablers and appropriate stock levels of malaria commodities;
3. Strengthening malaria commodity security through institutional, supply chain, and monitoring improvements;
4. Investing locally by building technical and financial management capacity in provincial health offices (PHOs) and district health offices (DHOs) to fully own iCCM training and outreach training and supportive supervision (OTSS), providing support to the End Malaria Council (EMC) to mobilize domestic resources, increasing the number of civil society organizations (CSOs) implementing interpersonal SBC to cover all 47 PMI-supported districts, and investing in capacity strengthening of potential new USAID local implementing partners; and
5. Encouraging innovation and exploration of new tools, such as the new RTS,S malaria vaccine and scaling up of the proactive community case management (CCM) model based on the ProACT study findings.

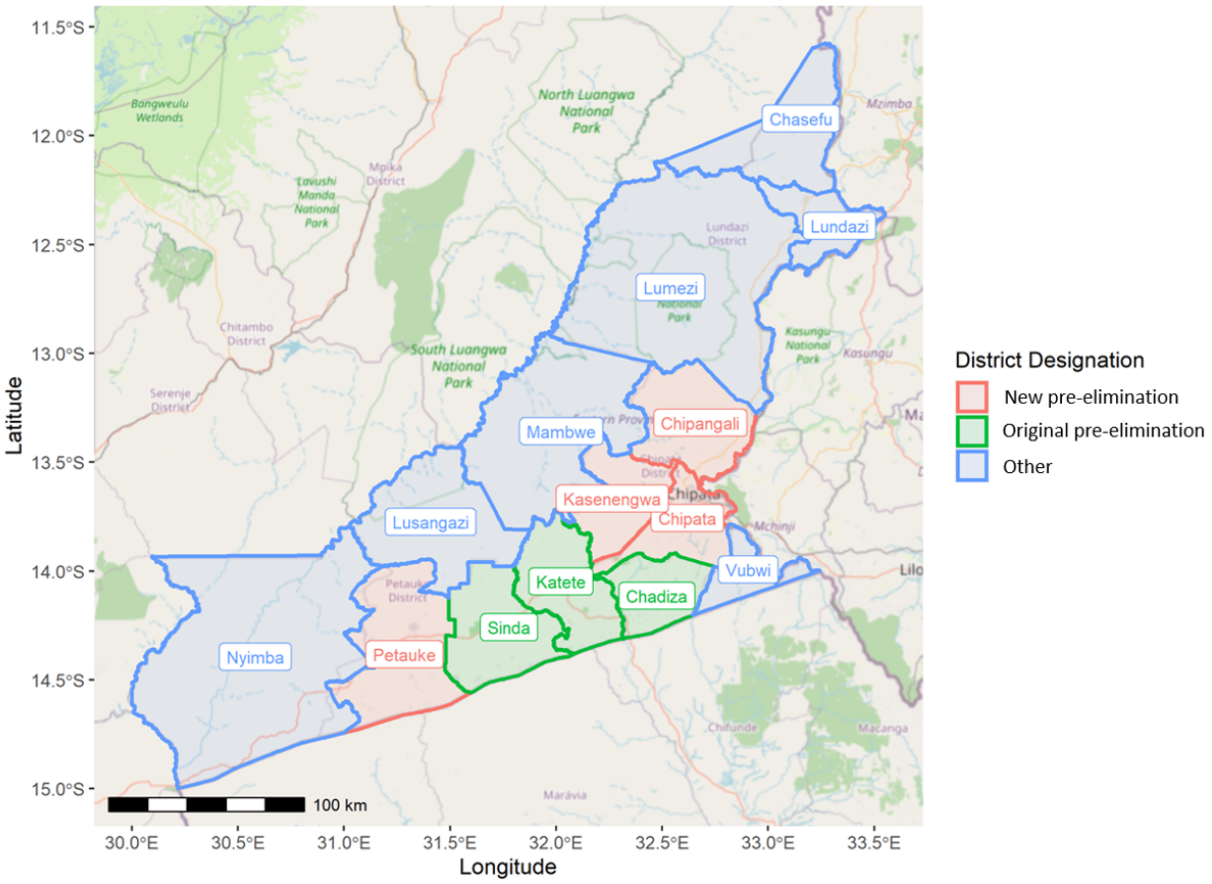
As a major partner of NMEP, PMI aims to help the country accelerate toward its goal of malaria elimination as aggressively as resources, epidemiologic realities, and local constraints allow. In line with the PMI strategy regarding reaching the unreached, PMI/Zambia prioritizes reducing the disease burden in areas of northern Zambia with a high burden while investing a portion of its budget in pre-elimination settings in Eastern Province.

3.4. PMI/Zambia's Designated Funding for Malaria Elimination Activities

Consistent with PMI's technical guidance, WHO guidelines, and Zambia NMESP strategic framework, PMI/Zambia will continue with a phased pre-elimination approach in 7 of the 15 districts in Eastern Province (Chadiza, Katete, Sinda, Chipata, Chipangali, Kasenengwa, and Petauke).

- The initial phase aimed to achieve sustained high coverage of the standard package of interventions, namely universal access to modern vector control (ITNs and/or IRS), universal access to CCM (with community health worker [CHW]-to-population ratio of 1 to 500), and strengthened case management and supply chains at health facilities; robust SBC with strong community engagement; and intensive surveillance. To maximize program learning, this has been accompanied by state-of-the-art mapping and modeling. These "pre-elimination districts," totaling three in 2018 and expanding to seven by 2020, are grouped on the plateau in Eastern Province (Figure 4). Since FY 2017, the PMI pre-elimination districts received approximately $5 million per year in resources designated to saturate the interventions through implementing partner work plans.
- The second phase includes reassessment and introduction of additional or modified approaches, as warranted. This phase was informed by the 2022 pre-elimination program's interim assessment exercise. PMI supports the introduction of single low-dose primaquine (SLDPQ) and the piloting of malaria case investigation (MCI) in eligible pre-elimination settings in Eastern Province, targeting epidemiologic levels 1 and 0, beginning with Sinda district. (In 2022, Sinda had an overall case incidence of 88 per 1,000 population, and as low as 10 per 1,000 incidence in some HFCAs.) Depending on pilot experience, the case incidence threshold for targeting MCI may need to be adjusted downward due to feasibility concerns, in consultation with NMEC. To further inform this process, in late 2022, PMI organized a learning tour of MOH, PMI, and Malaria Control and Elimination Partnership in Africa (MACEPA) staff to three MCI pilot districts in Southern Province. Additionally, PMI is exploring the feasibility of layering LSM based on the findings from the LSM feasibility assessment and would support the implementation of proactive CCM if the findings of the ProACT study are validated and adopted.

Figure 4. PMI-Supported Districts in Eastern Province, by Programmatic Designation



3.5 Key Changes in this MOP

Key changes in the FY 2024 Zambia MOP compared with the FY 2023 MOP are highlighted in table 1.

Table 1. Key Changes in this MOP

Challenge/Opportunity	FY 2024 MOP Investment
Stagnating burden indicators/ seeking sources of further gains	● **Targeted spending:** Support for the current NMESP (2022–2026) focus on epidemiologically stratified interventions for greater impact. ● **Severe malaria:** Increased focus on referral to treatment to reduce case fatality rates. ● **Resource mobilization:** Continue to foster new international and domestic partnerships (e.g., Malaria Partners International, End Malaria Council, and the private sector) ● **Innovation:** Provide digital tools for ITN campaign implementation and vector control mapping, prepare for vaccines, and conduct operational research in "learning lab" districts, among other activities.
"Keeping elimination fires burning"	● **Pre-elimination program in Eastern Province:** Saturate the standard package, layer in malaria case investigation and SLDPQ; include LSM if shown to be feasible; Consider MDA research.
Strategic shift from IRS to ITNs	● Increase funding for ITN continuous distribution and reduce IRS funding by 20 percent compared with FY 2023.
Expanding, sustaining community case management	● Increase investments from PMI and advocate for increased contributions from partners, strike a balance between training and deployment to increase CCM numbers, and offer enablers and stipends to sustain established CHWs.
Commodity availability for health facilities and CHWs	● Strengthen commodity security, supply chains, and monitoring; advocate for continued Zambian government financing of essential medicines.
Expanding private sector engagement	● Work with the End Malaria Council as a USAID Administrator "Democracy Delivers" focus activity to unleash higher-level and meaningful engagement of the private sector in malaria control efforts in Zambia.
Optimizing program management, decentralizing	● **Secondment of staff:** Support training, vehicle maintenance, IT capacity strengthening, and localization.

MDA: mass drug administration

II. OPERATIONAL PLAN FOR FY 2024

1. Vector Monitoring and Control

1.1. PMI Goal and Strategic Approach

In accordance with Zambia's National Malaria Elimination Strategic Plan for 2022–2026, NMEP's vector control strategic objective is to provide universal access to vector control, from a baseline of 57 percent in 2021 to 86 percent by 2026. Universal access to vector control will consist of households having access to one ITN per two people or IRS within the past 12 months. The integrated vector management strategy to achieve this objective will include:

- Mass distribution of ITNs every three years. The last two mass distribution campaigns were in 2017 and 2020/21; the current one is planned for September through December, 2023.
- Continuous distribution of ITNs through antenatal care (ANC) visits, the Expanded Program on Immunization (EPI), and school- and community-based channels.
- Targeted high-quality and judicious IRS at selected sites with 2–4 malaria stratification levels.
- Responsive/reactive IRS in areas with a low malaria burden (0–1 malaria stratification levels) or areas with a high burden that are not recipients of IRS.
- Targeted LSM in line with the PMI FY 2024 technical guidance[2] to accelerate malaria transmission reduction, where feasible.[3]
- Routine entomological monitoring to collect key information on vector bionomics and insecticide-resistance levels to key public health insecticides in the primary vectors in Zambia.

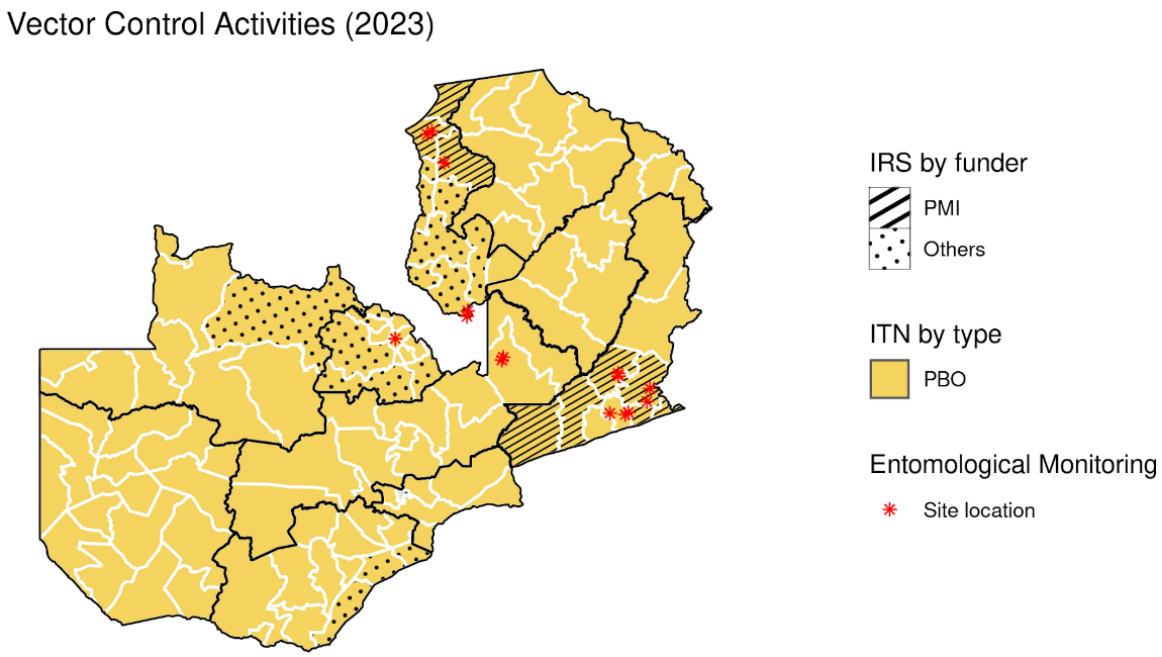
PMI currently supports most NMESP vector control strategies; however, PMI is not currently supporting the implementation of LSM or community-based continuous distribution of ITNs, although it may move into these areas with future MOP funds, as informed by new data points from the LSM feasibility assessment that is being conducted in CY 2023 in Eastern Province.

PMI supports entomological monitoring in 14 sentinel sites in 7 districts, across 4 provinces. The Global Fund supports 23 sentinel sites, although activities have mostly consisted of spot checking with funds that have been underutilized in the past. Both PMI and the Global Fund support mass ITN campaigns every three years and continuous distribution of ITNs via ANC and EPI channels nationwide. Since 2006, PMI (and USAID prior to 2006) has supported annual IRS campaigns in targeted districts, spraying 400,000– 1 million structures. PMI also provides technical assistance to Global Fund-supported IRS areas.

[2] Per PMI FY 2024 guidance, PMI funding may be used to support LSM in the context of elimination in areas where larval habitats can be efficiently located, where high coverage and quality of either ITNs or IRS (at least 85 percent coverage at the household level) is in place, and if it is coupled with high-quality case management and case investigation of transmission foci.
[3] These are areas with a very low malaria incidence of 1–49 cases per 1,000 population per year and where the entire population in the district has been targeted for 100 percent PBO ITN distribution in the 2023 mass campaign.

In 2022–2023, PMI is supporting NMEC to conduct an LSM feasibility assessment (larval and adult mosquito surveys; no actual LSM implementation) in select sites in Eastern Province. This assessment consists of mosquito larval and adult surveys to determine the practicality of using LSM to accelerate to elimination in Eastern Province, where high-quality case management, adequate surveillance, and high coverage of vector control interventions have led to a substantial decrease in the current malaria burden.

Figure 5. Map of Vector Control Activities in Zambia in 2023 Showing IRS Operations and ITNs by Net Type and Entomological Monitoring Sites, by District and Funding Partner



Note: The map colorations should not be taken to imply extensive co-deployment of IRS and ITNs at the household level. The last mass ITN campaign (2020–2021) utilized a subdistrict "mosaic" approach to minimize the co-deployment of ITNs and IRS to households while maximizing access to any form of vector control. Only 22 percent of households reported co-deployment (2021 MIS).

1.2. Recent Progress (June 2022–May 2023)

In Zambia, PMI led with the following focus areas.

Entomologic Monitoring

- PMI supported entomological monitoring at 14 sentinel sites in 4 PMI-supported IRS districts (Nchelenge, Mambwe, Katete, and Lufwanyama) and 3 non-PMI supported IRS districts (Milenge, Chililabombwe, and Serenje; see Figure 5). The program also conducted insecticide-resistance testing and an assessment of vector bionomics at all sites.

- PMI assessed the quality of IRS in seven districts (Nchelenge, Kawambwa, Mambwe, Chipata, Katete, Masaiti, and Lufwanyama) in September/October 2021 during the IRS campaign. Monthly monitoring of the residual efficacy of insecticide on walls was conducted in five districts (Nchelenge, Mambwe, Chipata, Katete, and Lufwanyama). For more information about entomological monitoring, refer to the 2022 Entomological Report.
- PMI provided technical assistance to the Global Fund-supported entomologic monitoring program implemented by NMEC, where activities principally consisted of monitoring at community-based sentinel sites, supplemented by spot checks. Unfortunately, program management challenges continue to result in infrequent community collections and a low burn rate of Global Fund allocations. And the absence of strong leadership in the entomologist position at NMEC has led to limited program delivery.
- PMI funded technical assistance to NMEC in several areas, including:
    - Technical support for data integration, visualization, and analytics to inform decision making including the establishment of a national District Health Information System-2 (DHIS2) entomology database instance/module; and support for an entomology database management committee;
    - Participation and facilitation of technical working groups on entomological monitoring and insecticide resistance;
    - Support for participation in regional training on entomological monitoring; and
    - Assistance in IRS quality assurance assays.
- PMI supported *Anopheles stephensi* surveillance, which currently consists of passive surveillance of the vector during routine entomological monitoring. This involves routine identification of collected larvae and adult female mosquitoes from insecticide-resistance testing activities under a dissecting microscope using mosquito morphology taxonomy keys. Support for molecular identification of *An. stephensi* is also being provided when standard molecular mosquito identification assays do not detect the traditional malaria vectors, such as *An. gambiae s.l.*; nondetection of *An. gambiae s.l.* in molecular identification assays could signal the presence of *An. stephensi*.

Insecticide-treated Mosquito Nets

- PMI supported the procurement and distribution of 600,000 piperonyl butoxide (PBO) ITNs to pregnant women, young children, and school-age children through continuous distribution channels in PMI focus areas.
- PMI supported the prevention of malaria in pregnancy (MIP) through the provision of ITNs to women at their first ANC visit or at subsequent visits if ITNs were not initially available.

- PMI provided TA for the 2023 ITN mass distribution campaign, which will distribute approximately 11.6 million PBO ITNs to approximately 19 million people nationwide (Figure 5). The major donors to the campaign are PMI, Global Fund, and the Against Malaria Foundation. PMI has provided substantial TA to date, including:
    - Finalized and printed 5,000 copies of the revised ITN guidelines for Zambia, developed job aids, and supported ITN campaign planning meetings; and
    - Supported campaign digitalization with the procurement of over 2,000 Android-based smartphones for data capture; and TA plus full funding for the ITN campaign digitization pilot, which was conducted in six districts in April 2023.
- PMI provided TA for continuous distribution, including:
    - Provincial training of trainers workshop on continuous distribution; and
    - Procurement, distribution, and consumption/usage monitoring of ITNs in Eastern, Muchinga, Northern, and Luapula provinces—PMI's areas of focus.
- PMI supported ITN durability monitoring by implementing 24-month data collection and monitoring of PBO ITNs from the CY 2020/2021 campaign cohort in Serenje and Nyimba districts.
- PMI supported national and community-level SBC activities to improve demand for ITNs, increase appropriate use, promote net care, and mitigate against misuse. PMI disseminated findings from a study of ITN misuse to inform interventions, with a focus on mitigating the diversion of ITNs for fishing in PMI's provinces of focus.

Indoor residual spraying

- PMI supported the planning, implementation, and evaluation of the CY 2022 IRS campaign in 18 districts covering 619,328 structures and protecting 2,484,465 people from malaria infection. For more information on IRS, refer to the most recent End of Spray Report.
- PMI provided central-level TA to NMEP on environmental compliance, coordination meetings, entomology surveillance and monitoring, and data visualization.
- PMI trained and engaged community members and other cadres in 18 districts to support IRS mobilization and spray activities.
- PMI continued to collaborate with the National Institutes of Health (NIH)-funded and Johns Hopkins-led International Center for Excellence in Malaria Research (ICEMR) research program in Nchelenge District, Luapula Province, to optimize IRS programming based on research findings. See the OR and PE section for details.

Other vector control

- PMI supported NMEP to conduct a feasibility assessment of LSM implementation in two malaria pre-elimination districts in Eastern Province (Katete and Chipata). This activity consists of larval surveys and the use of geospatial data to assess the practicality of using LSM to accelerate elimination in Eastern Province.

1.3 Plans and Justification for FY 2024 Funding

The FY 2024 funding tables contain a full list of vector monitoring and control activities that PMI proposes to support in Zambia.

1.3.1. Entomological Monitoring

- PMI will continue supporting 14 sentinel sites in districts located in Central, Copperbelt, Eastern, and Luapula provinces to gather information on insecticide resistance and vector bionomics after the PBO ITN distribution campaign of CY 2023 and annual targeted IRS campaigns. Quality of spray and insecticide residual efficacy will also be conducted at select sites.
- The Entomological Surveillance Planning Tool will be used to support NMEC in making entomological monitoring more purposeful. This will be done by tailoring question-based vector monitoring to generate data and analyses that inform vector control implementation decisions. Some specific questions to be addressed in the upcoming work plan are:
    - How does human behavior impact the effectiveness of ITNs and IRS based on indoor vector exposure?
    - Do gaps in protection exist due to outdoor human and vector behavior?
- Tentatively, human behavior data will be collected by observing and recording the location, activities, and ITN use of household residents.
- The result of this monitoring will provide insights into gaps in IRS and ITN effectiveness and will be used to inform appropriate SBC messaging. Other operational questions to be addressed may include impact comparisons of IRS with existing and new insecticides, as they become available to achieve optimized insecticide rotation; IRS withdrawal may also be assessed.
- While *An. stephensi* has not yet been detected in Zambia, PMI will continue to support NMEC in the morphological identification of malaria vectors with updated keys that contain *An. stephens*i. PMI will also conduct molecular tests on samples that do not amplify with standard *An. gambiae s.l.* PCR species identification techniques to determine if they are *An. stephensi.* PMI will continue to work with NMEC and stakeholders during technical working group meetings to determine when/if to switch from passive monitoring of *An. stephensi* (identification during routine surveys) to active monitoring of (planned surveys for the vector in select areas of Zambia).
- PMI may support the implementation of LSM on a limited, pilot scale (e.g., operational research [OR] or program evaluation [PE]), depending on the findings of the LSM feasibility assessment being conducted in CY 2023 in Eastern Province. The objectives would be twofold: to accelerate the reduction in malaria transmission in this area and to strengthen national capacity to implement high-quality LSM interventions.

- Given the limitations of NMEC to consistently conduct entomological monitoring at their Global Fund-supported sites, PMI will make greater efforts to strengthen and support NMEC's capacity. This will involve seconding an entomologist to serve as a mentor to NMEC staff member(s); training more central-, provincial-, and district-level staff to build or reinforce the entomology cadre; assisting with the development and implementation of entomological monitoring standard operating procedures; and supporting the procurement of supplies and equipment, as needed. The secondment of an entomologist is anticipated to last until CY 2026 or beyond, depending on funding and NMEC needs.

Summary of Distribution and Bionomics of Malaria Vectors in Zambia

As of 2022, the primary vector is *Anopheles funestus s.l.*, and the secondary vector is *An. gambiae s.l*. Most of the *An. funestus s.l.* vectors collected during the CY 2021–2022 reporting period were *An. funestus s.s.* (99.1 percent); 0.9 percent were *An. leesoni*. The majority of *An. gambiae s.l.* were *An. gambiae s.s.* (99.2 percent); 0.8 percent were *An. arabiensis* (see Zambia's 2021–2022 entomological monitoring report). While there is a higher overall abundance of the *An. funestus s.l.* vector compared with *An. gambiae s.l.* in PMI-supported sites, there are a few districts at PMI sites where *An. gambiae s.l.* predominate or are comparable to *An. funestus s.l.* Peak malaria transmission season is from December to May, mostly aligning with peak rainfall. Overall, across PMI-monitored sites, the trend in the preferred biting location of *An. funestus s.l.* and *An. gambiae s.l.* is indoors. There was some district variation in this trend where some sites had significantly higher levels of indoor biting and other sites had significantly higher outdoor biting. PMI/Zambia has not yet recorded human behavior to calculate a biting behavior index adjusted to human behavior, but this will be investigated in the subsequent work plan. Currently, data on mosquito resting are only collected indoors, where overall indoor resting density across PMI-monitored sites was 2.8 mosquitoes per house in sprayed sites and 5.1 mosquitoes per house at unsprayed sites. The preferred host is human for both *An. gambiae s.l.* and *An. funestus s.l.*, with a >98 percent human blood index.

Status of Insecticide Resistance in Zambia

As of CY 2022, resistance to all pyrethroid insecticides (alpha-cypermethrin, deltamethrin, and permethrin) continues to persist in *An. funestus s.l.* and *An. gambiae s.l.* in Zambia. Results from monitoring in the PMI-focus areas of Eastern and Luapula provinces using synergist assays showed full restoration (≥98 percent mortality) of susceptibility to the pyrethroids after PBO pre-exposure for both *An. funestus s.l.* and *An. gambiae s.l.* These results suggest that resistance to pyrethroids is oxidase-mediated. Where tests occurred, there was a mix of resistance levels to DDT—*An. funestus s.l.* was resistant at one site in Luapula Province but susceptible at four other sites in Luapula and two sites in Copperbelt; and possible DDT resistance was detected in *An. gambiae s.*l., at one site in the Copperbelt, but not at two sites in Eastern Province. *An. funestus s.l.* and *An. gambiae s.l.* are fully susceptible to clothianidin

and chlorfenapyr in all provinces where the products were tested. (See Zambia's 2021–2022 entomological monitoring report for insecticide resistance data.)

1.3.2. Insecticide-Treated Nets

PMI will continue to support the procurement and distribution of ITNs through continuous distribution. ANC and EPI remain the primary channels, but opportunities to further expand the distribution of ITNs through schools will continue to be explored. TA will be provided to ensure efficient deployment and accountability of the distribution. Given the high resistance to pyrethroids, PMI will procure and distribute PBO ITNs. PMI will also continue to support SBC to improve the use and care of ITNs and to mitigate against misuse.

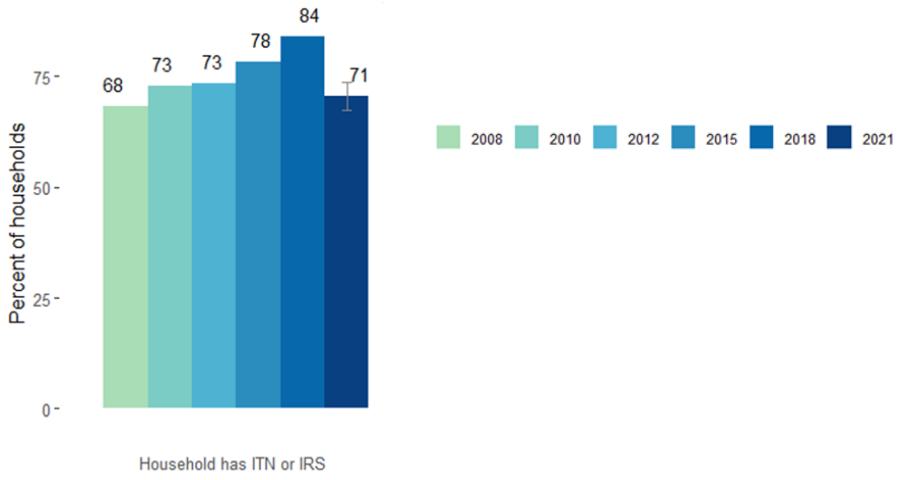
See the SBC section for details on challenges and opportunities to improve intervention uptake and maintenance.

ITN Distribution in Zambia

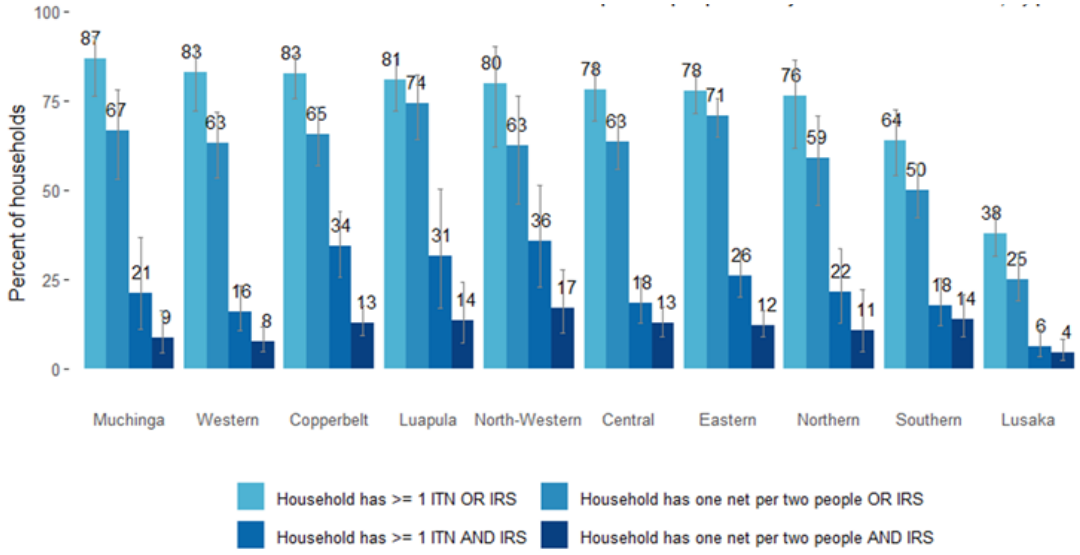
In Zambia, ITNs are distributed via mass campaign every three years. The most recent campaigns took place in CY 2017–2018 and in CY 2020–2021, and the next campaign is planned for the second half of CY 2023. Per NMEC guidance, the CY 2020–2021 campaign was conducted using a "mosaic approach" at the subdistrict level, whereby each settlement was mapped to receive either IRS (based on operational feasibility, burden, past-spraying history, and population density) or ITNs (based on burden and hard-to-reach areas). The goal was 100 percent household access to one of the vector control methods, with allowance for 10 percent co-deployment at the household level. Due to the under-resourcing of ITNs in the CY 2020–2021 campaign (where 50 percent fewer nets were targeted for distribution than in CY 2017 and CY 2023), coupled with operational challenges, the result achieved was 71 percent vector control access (defined as households owning one ITN and/or receiving IRS in the past 12 months). The result was 57 percent access to either IRS or ITNs, if adequate ITN access was defined as owning one net per two persons. National and provincial results are highlighted in Figure 6b.

Figure 6. Household Access to ITNs and/or IRS

(a) National Level in 2008–2021



(b) Provincial Level in 2021



Source: 2021 MIS.

Continuous distribution channels consist largely of distribution to pregnant women at ANC visits nationwide and to children under five years of age at EPI (well-child) clinics nationwide. A few mines and plantations outside of provinces of PMI focus distribute nets to their rural workforces. In a limited number of PMI-supported districts, ITNs are provided to grades 1–4 every year via school-based distribution. The new NMESP calls for increased deployment of school-based distribution and piloting of community-based distributions with the aid of community health workers to assist with SBC messaging and limited deployment logistics, as feasible. To align with the current national strategy, PMI will support school-based distribution in provinces of PMI focus with FY 2024 funding.

The country distributed a mix of standard and PBO nets during its CY 2020–2021 mass distribution campaign, after which only PBO nets have been deployed due to widespread pyrethroid resistance. The CY 2023 ITN campaign is planned as a PBO-only distribution, but there is interest in considering dual active ingredient (AI) nets in subsequent years. A technical advisory committee that meets annually to review insecticide resistance and other indicators will continue to provide guidance on ITN product types.

In light of the worrisome CY 2021 MIS findings, PMI maintained robust support for ITN distributions. In the FY 2021 and FY 2022 MOPs, comprehensive support was provided in partnership with the MOH, Global Fund, Against Malaria Foundation, EMC, and others to ensure the 2023 campaign would achieve universal coverage with PBO ITNs in most of the country; Lusaka district and settlements were prioritized with IRS). To maintain this universal coverage, in the FY 2023 MOP, PMI provided support for the procurement and distribution of 1.2 million PBO ITNs through routine distribution channels and will scale up this support in FY 2024, covering most of the needs of the four provinces of PMI focus. As approved in the FY 2023 MOP for CY 2024 implementation, PMI will continue to deploy geospatial tools in CY 2025 to support the planning and implementation of the national strategy for ITNs and other vector control methods based on earlier award-winning GIS work in Zambia. The objectives of geospatial tool deployment include maximizing vector control access at the household level through efficient targeting of ITNs and IRS and possibly LSM based on the findings of the feasibility assessment. The tools are also expected to have spillover public health benefits, including in vaccine deployment.

With FY 2024 funding, PMI will invest in the procurement of digital tools (smartphones) for the digitization of the CY 2026 ITN mass campaign. PMI will also provide direct technical assistance to NMEC to aid resource mobilization for the CY 2026 ITN distribution campaign. It is anticipated that the overall ITN gap needs of the country will be filled by Global Fund and MOH contributions.

Refer to the ITN gap table in the annex for more details on planned quantities and distribution channels.

Table 2. Status of Standard Durability Monitoring

Campaign Date	Site	Brand	Baseline	12-month	24-month	36-month
2017/2018	Katete	Olyset (standard)	Completed Sep 2018	Completed July 2019	Completed July 2020	Not done[1]
2017/2018	Lundazi	PermaNet 2.0 (standard)	Completed Sep 2018	Completed July 2019	Completed July 2020	Not done[1]
2020/2021	Nyimba	Olyset Plus (PBO ITN)	Completed Sep 2021	Completed Feb 2022	Completed Feb 2023	Planned Feb 2024
2020/2021	Serenje	Veeralin (PBO ITN)	Completed Sep 2021	Not done[2]	Completed Nov 2022	Planned Nov 2023

[1] Because the 36-month data collection point overlapped with the 2020/21 ITN campaign, no collection was done; [2] Given that the baseline collection in Serenje occurred nine months after receiving their ITNs in November/December 2020, this collection will not be done, and the next collection will be done at 24 months. ITN: insecticide-treated net; PBO: piperonyl butoxide.

1.3.3. Indoor Residual Spraying

- In CY 2025, PMI will continue to shift a portion of its funding from IRS to ITNs, reducing funding for directly-supported operations by 20 percent from FY 2023 levels. This is in line with the country's well-received decision (at PMI's urging) to revert to ITNs as the primary vector control strategy, and allows PMI to maximize its investment through the ITN continuous distribution channels and mass campaigns. With FY 2024 funding, PMI will continue to offer technical assistance to the Zambian government for responsive IRS in areas with lower malaria burdens and urban districts, where surveillance indicates the emergence of high transmission. It will be important for this approach to be deemed technically feasible and beneficial, and for resources to be available before support is provided.
- PMI will continue to support the approach of subnational tailoring of vector control, giving primacy to ITNs. PMI will support the planning, implementation, and evaluation of IRS operations, targeting at least 240,000 structures in select districts to be determined in consultation with NMEC and in coordination with partners such as mining operations, plantations, and potentially the Global Fund. The geographic areas are expected to provide continuity from the CY 2024 campaign. PMI will also provide technical assistance in IRS program design and oversight to maximize the impact of IRS resources throughout the country while minimizing overlap with ITN campaigns. The intention is to continue to maximize learning through collaboration with the research program in Nchelenge; however, the expiration of the NIH grant in CY 2024 may limit options.

Table 3. PMI-Supported IRS Coverage

Calendar Year	District[1]	Structures Sprayed (#)	Coverage Rate (%)	Population Protected (#)	Insecticide
2022	Eastern (14 districts); Copperbelt (3 districts); Luapula (1 study district)	619,328	99.6%	2,484,465	Neonicotinoids (SumiShield, Klypson, Fludora Fusion, and 2GARD)
2023	Eastern (9 districts); Luapula (3 districts)	429,734[4]	>90% (targeted)	1,670,806[3]	Neonicotinoids (clothianidin plus deltamethrin)
2024[2]	Eastern (9 districts); Luapula (3 districts)	429,734	>90% (targeted)	1,670,806[3]	Neonicotinoids (clothianidin plus deltamethrin)
2025[2]	Eastern and other provinces, TBD	240,000	>90% (targeted)	933,120[3]	TBD

[1] If more than 10 districts, list regions/provinces. [2] Planned. [3] Assuming a spray coverage of 90 percent with approximately 4.32 people per structure. TBD: To be determined.

IRS Insecticide Residual Efficacy in Zambia

Monthly cone bioassays were conducted in five of the seven districts where the quality of spray was assessed to monitor the residual efficacy of the insecticides on walls. In all houses and on both surface types (mud and cement), 100 percent mortality of *An. gambiae s.s*. Kisumu strain was observed 24 hours post-exposure in all seven districts where the quality of spray was evaluated at the time of the 2022 IRS campaign. As of August 2022, based on longitudinal data collected on the residual efficacy of the two insecticides deployed in the 2022 IRS campaign on sprayed surfaces, the effective duration of both clothianidin only and clothianidin + deltamethrin insecticides is at least 10 months.

1.3.4 Other Vector Control: Larval Source Management

Recent PMI-supported entomologic surveillance reports highlight the stagnated impact of PMI-funded IRS campaigns on vector densities and biting rates and recommend complementary interventions. LSM has a long history in Zambia, supported for years by mining companies and plantations. LSM has been featured in national strategic plans over the years, but due to lack of funding, it has been implemented on a very limited scale by the Zambian government, such as in Lusaka and other urban districts. The NMESP 2022–2026 calls for the targeting of LSM to eligible urban and peri-urban HFCAs at epidemiologic levels 0 or 1 (<50 cases per 1,000 population per year) where larval habitats are “few, fixed, and findable.”

[4] PMI will increase the number of target structures in CY 2023 and 2024 from the MOP target of 300,000 to 439,734 based on the cost-sharing agreement between PMI/Zambia and NMEP where NMEC will provide insecticides from its existing stock while PMI will fund operational costs. This is to aid absorption of leftover insecticide procured by the Zambian government from the 2022 spray season prior to its expiration.

As mentioned above, in CY 2022, PMI supported larval and adult mosquito surveys to assess the feasibility of piloting LSM implementation within the pre-elimination program areas in Eastern Province for the first time. This activity will continue in CY 2023 and will be assessed in CY 2024 with a decision to be made on whether there should be PMI-supported pilot implementation (OR or PE) or not in CY 2025. At this time, no funding for LSM implementation has been allocated in this FY 2024 MOP (No LSM item in Table 2). While future funding through reprogramming might be considered, this would be pending completion of the feasibility assessment, review of findings, and consideration of the technical and programmatic implications.

2. Malaria in Pregnancy

2.1. PMI Goal and Strategic Approach

National MIP Approach

For over 10 years, Zambia has implemented IPTp with antimalarial medication (currently sulfadoxine-pyrimethamine [SP]) for improved birth outcomes. The five-year NMESP 2022–2026 reiterated the importance of malaria prevention and prompt diagnosis and treatment during pregnancy. According to Zambia's current policies and guidelines:

- All pregnant women shall have access to cost-effective preventive interventions, including the provision of ITNs at the first ANC visit and a minimum of four doses of IPTp starting at 13 weeks gestational age.
- All pregnant women who present with suspected malaria shall receive prompt diagnosis and effective treatment using antimalarial medicines according to the current WHO guidelines. By the end of 2023, it is anticipated that Zambia will adopt the use of ACTs during any trimester (including now the first trimester) for the treatment of malaria during pregnancy.

To improve the uptake of IPTp by eligible pregnant women, the NMESP calls for the MOH and partners to:

- Ensure adequate supply of commodities for MIP; and
- Strengthen collaboration with the maternal reproductive health unit (ANC) to increase early booking for pregnant women and increased uptake of this intervention.

At the national level, the reproductive, maternal, newborn, child, and adolescent health and nutrition directorates at MOH deal with all issues related to maternal health, including MIP. A safe motherhood technical working group (TWG) meets every month.

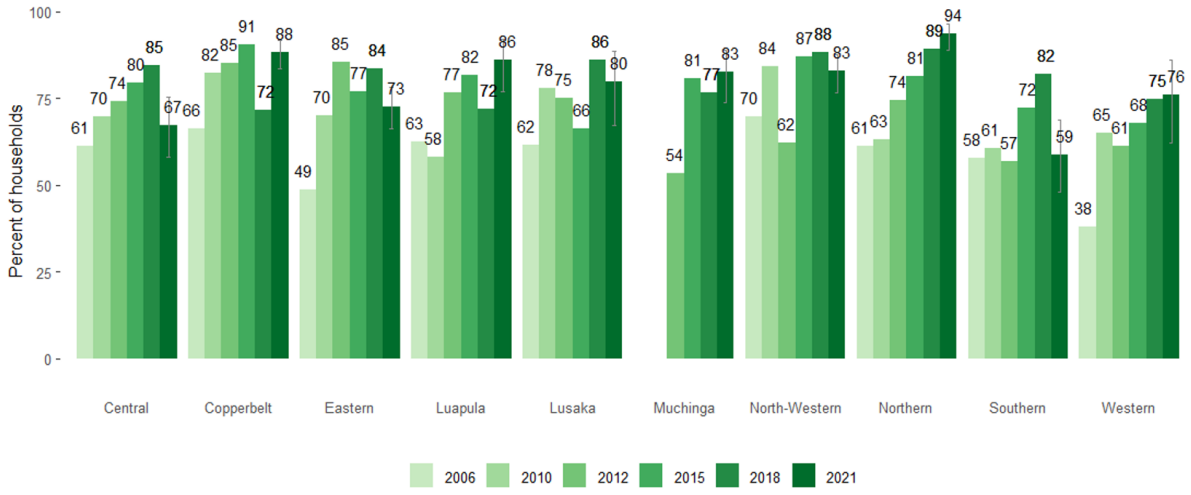
PMI's support of MIP aligns with NMEC's national approach, with activities aimed at increasing access to free IPTp, one free ITN at ANC visits, and prompt diagnosis and treatment. Most of PMI's MIP support takes place in the four provinces with a high malaria burden: Luapula,

Northern, Muchinga, and Eastern. In Central and Copperbelt provinces, modest support is provided in the form of the MIP module in the OTSS program.

Trends in ANC Preventive Service Coverages

The Malaria Indicator Surveys conducted since 2006 have shown steady progress in IPTp coverage as reported by women surveyed at the household level. In 2021, 68 percent of pregnant women reported receiving medication to prevent malaria, which was stable from 2018 (67 percent)—an increase from 61 percent in 2015. The next MIS will be in 2024.

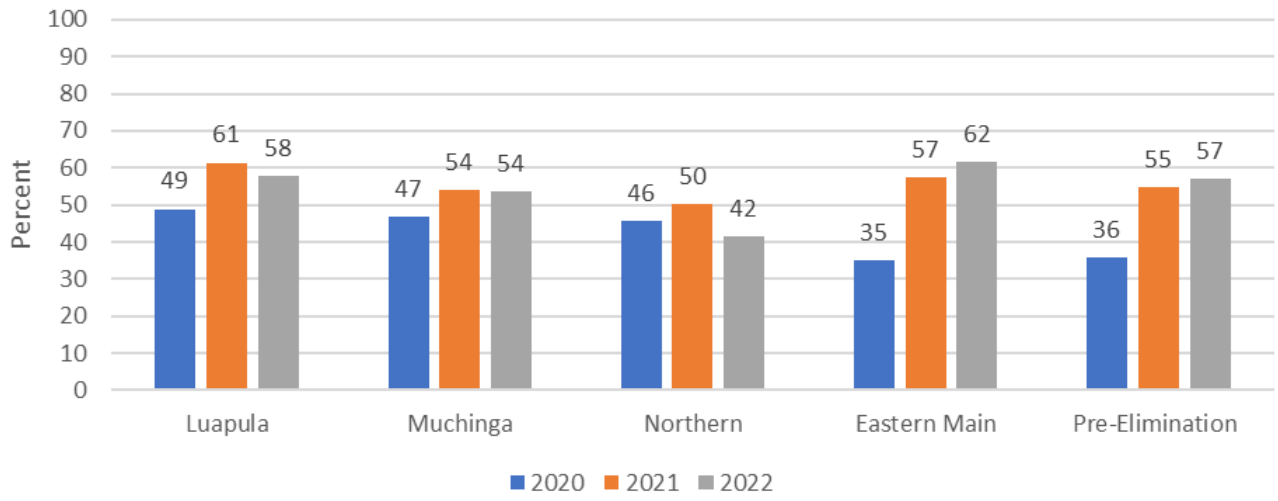
Figure 7. Percentage of Pregnant Women Who Received at Least Two Doses of IPTp, by Province



Source: Zambia 2021 MIS.

Complementing periodic MIS survey data, the HMIS provides monthly reports on the provision of IPTp at in the country's ANC clinics. Figure 8 shows the trends in 2020–2022 for the four provinces of PMI focus. Steady improvement is noted only in Eastern Province (both the main program and pre-elimination program districts). Overall uptake of the third dose of IPTp (IPTp3) in PMI-supported provinces was 54 percent in 2022, below the target of 65 percent.

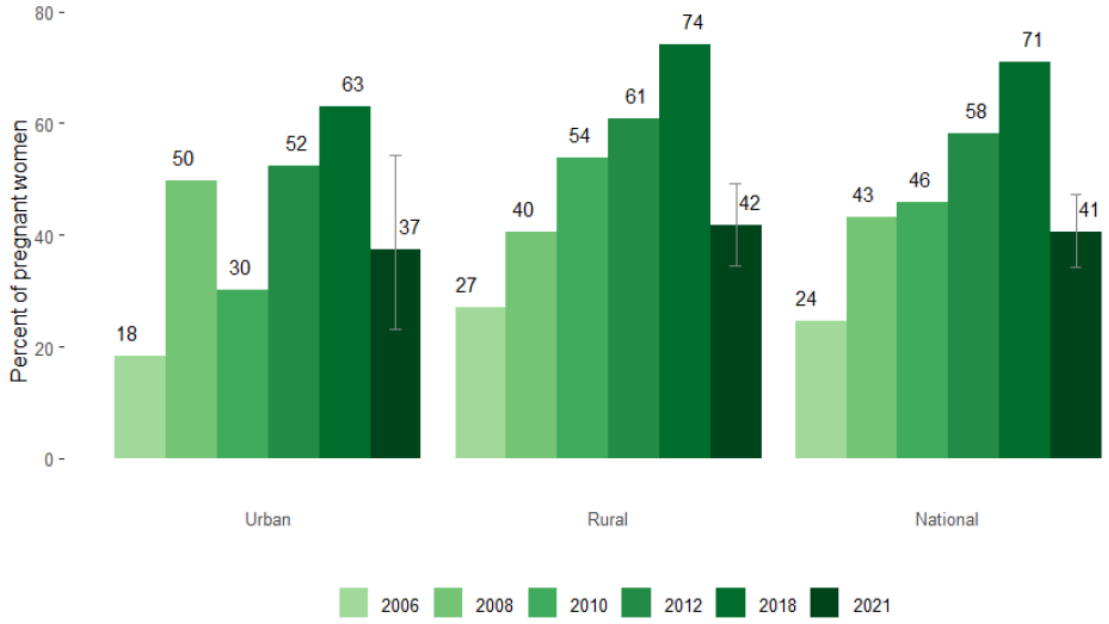
Figure 8. IPTp3 Coverage Among ANC Clients, PMI-Supported Provinces, by Province, 2020–2022



Source: HMIS.

Regarding ITN use among pregnant women, MIS survey data show a steady improvement from 2006 to 2018, followed by a sharp 30-point decline in 2021 (from 74 percent in 2018 to 42 percent in 2021 among rural women), as shown in Figure 9. This mirrors the generalized drop-off in ITN access among all populations, associated with the national under-resourcing of the 2020–2021 ITN campaign in favor of IRS, compounded by operational challenges related to the subdistrict mosaic approach to target ITNs over IRS. For further discussion of ITN issues, see the vector control section above.

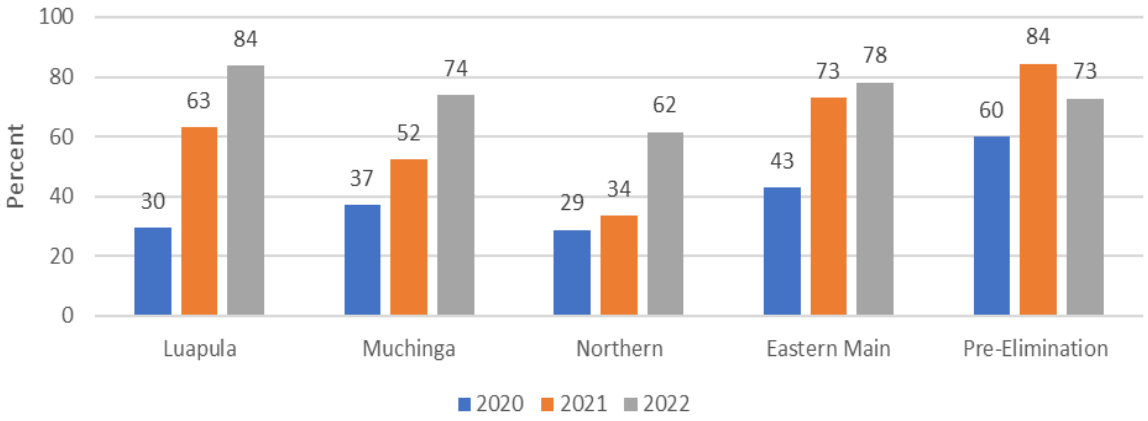
Figure 9. Percentage of Pregnant Women Who Reported Sleeping Under an ITN



Source: Zambia MIS 2006–2021.

Encouragingly, recent HMIS data reveal notable improvements in the distribution of ITNs at ANC clinics in PMI-supported provinces since 2020 (Figure 10). As national attention shifted from the mass campaign back to continuous distribution channels and bottlenecks were addressed, the proportion of first-time ANC attendees receiving an ITN improved greatly, from 39 percent in 2020 to 74 percent in 2022. In Luapula, the gains were especially pronounced (from 30 to 84 percent).

Figure 10. Proportion of ANC Attendees Receiving an ITN at the First Visit of their Pregnancy at ANC Clinics in PMI-Supported Provinces



Source: HMIS.

Barriers and Missed Opportunities

Actionable factors that explain the low coverage of pregnant women receiving IPTp3 include late ANC booking among pregnant women and stockouts of SP. Poor recordkeeping was identified as another reason for low IPTp3 coverage, as health workers provided SP but did not clearly record whether it was the first, second, or third dose. ITN uptake at ANC visits reached 74 percent in 2022, which was above the target of 65 percent.

According to the 2021 MIS, more systemic factors underlying low IPTp coverage include wealth and education levels among pregnant women. Pregnant women with an education level greater than secondary school recorded the highest IPTp uptake for at least two, three, and four doses (91, 89, and 15 percent, respectively). Pregnant women with no formal school recorded lower IPTp uptake at 66, 58, and 11 percent, respectively. IPTp uptake of at least two, three, and four doses among the highest wealth cohort was 83, 74, and 21 percent, respectively, compared with the poorest cohort at 79, 66, and 13 percent, respectively.

The main actionable factor related to ITN use by pregnant women is limited access due to inadequate distribution through the 2020–2021 mass campaign and, to a lesser degree, through routine channels in 2020 and 2021.

Opportunities and Challenges

In recent years, continued erratic supply of SP and folic acid affected the implementation of MIP interventions. However, given the New Dawn government's increased expenditure on essential commodities and strengthened supply chain and commodity security, MIP commodities are becoming increasingly available on a consistent basis to support successful implementation of the MIP strategy. The new NMESP stresses the importance of improving the availability of adequate supplies and strengthening coordination with other reproductive health stakeholders.

Zambia has experienced a fairly high level of ANC participation for decades, with 97 percent of women who have given birth reporting receiving ANC from a skilled provider, 64 percent reporting four or more ANC visits, and 37 percent reporting having an ANC visit in the first trimester (Zambia Demographic and Health Survey [DHS] 2018). HMIS data from 2022 show a 94 percent ANC attendance rate based on expected pregnancies. However, the tendency to present late affects both the number of times a pregnant woman will access IPTp as well as her opportunities to access an ITN. PMI has therefore enhanced SBC activities to promote early ANC attendance to encourage full IPTp coverage through an integrated SBC approach with reproductive, maternal, and child health programs. This approach makes sense because ANC visits have been identified as a successful medium for malaria messaging. PMI will continue to support ANC through service communication with a focus on behavioral determinants in pregnant women. Early ANC visits are also a key priority under USAID maternal and child health activities.

Recent Progress

PMI supported NMEC to implement MIP activities in line with the national MIP guidelines:

- PMI funded the procurement of 1,543,333 doses of SP in FY 2022 to fill procurement gaps of the Zambian government and the Global Fund and continuously monitored stock levels of SP and ITNs.
- PMI procured 600,000 ITNs through continuous distribution channels and ANC and EPI visits in FY 2022.
- PMI trained and supervised health care workers at the provincial, district, and health facility level on the implementation of NMEC IPTp guidelines. In 2022, this included training of 881 ANC providers through the eLearning platform and in-person orientations of 1,405 Safe Motherhood Action Group volunteers on the importance of IPTp, early ANC attendance, and consistent ITN use.
- PMI supported implementation of an MIP module in the OTSS program in six provinces (see case management section). MIS performance scores averaged 85 percent in 2022, exceeding the acceptable benchmark score of 75 percent.
- In 2021, PMI evaluated systemic barriers to continuous ITN distribution, including through ANC. PMI supported NMEC to conduct an assessment sampling 39 health facilities across 16 districts in 5 provinces. The assessment found that there were significant supply chain and operational challenges across all districts visited, including commodity stockouts, last-mile distribution, and forecasting and quantification challenges. In 2022, PMI facilitated the revision and dissemination of national insecticide-treated bednet guidelines, which addressed the findings.
- PMI supported district nurses and pharmacists to institute a biannual stock monitoring and troubleshooting exercise for IPTp and ITNs in four provinces. During the baseline exercises in 2022, 309 health facility visits were conducted. Against a target of 100 percent of facilities having stocks available to provide to visiting mothers, 79 percent of the visited facilities had SP at the time of the visit. Eastern Province had the highest availability rate at 97 percent, and Northern Province had the lowest at just 30 percent. Similar trends were observed with ITN stocks: 73 percent of facilities had ITNs, with Muchinga Province having the highest rate at 98 percent of visited facilities, and Northern Province the lowest at 46 percent. In 2023, Northern Province was prioritized for commodities and supply chain technical supportive supervision support.
- The success of recent interventions to improve ITN access in ANC is suggested by Figure 10. With PMI support, health facilities received clearer direction with the new guidelines, improved ITN access through increased procurements, better data, and improved skills for monitoring and troubleshooting supply chain issues. As of mid-2023, all stakeholders were committed to preparing for a robust ITN mass campaign later in the year, which, if successful, is expected to yield much improved ITN use indicators for the upcoming 2024 MIS.

Plans and Justification for FY 2024 Funding

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

PMI will continue to support MIP activities as described in the recent progress section, with a primary focus on procurement of SP and ITNs, health care worker training, SBC, and prompt case management of pregnant women in PMI's four focal provinces, as well as modest investments through OTSS in Copperbelt and Central provinces.

- PMI will procure approximately 1.3 million courses of SP for the prevention of MIP, out of the country's need of 4 million courses (45 percent). Financial responsibility for additional IPTp procurement is expected to transition to the Zambian government in CY 2022–2023, with the Global Fund grant covering any gaps from CY 2024. PMI will routinely monitor stock status to gauge the level of PMI support needed, with the option of potentially reprogramming PMI funds to increase or decrease funding. Refer to the SP gap table in the annex for more details on planned quantities and distribution channels.
- PMI will support the training and supervision of provincial-, district-, and health facility-level health workers on the implementation of MIP and IPTp guidelines in four provinces with a high malaria burden (Eastern, Luapula, Muchinga, and Northern). This will include quality assurance through the continued use of a MIP module in OTSS.
- PMI will continue to provide TA and commodities to support and strengthen the routine distribution of ITNs through ANC and EPI clinics, benefiting pregnant women and new mothers.
- Based on the findings from the ANC-based surveillance pilot in Chadiza, PMI will scale up ANC surveillance to additional provinces and districts, potentially leading to cost-effective monitoring of intervention access and malaria infection rates among pregnant women. Refer to the operations research section for details.
- To improve demand for the prevention and treatment of MIP, PMI will continue to support national and community-level SBC activities. See the SBC section for details on challenges and opportunities to improve intervention uptake and maintenance.
- PMI will help to strengthen collaboration on MIP with reproductive, maternal, newborn, child, and adolescent health and nutrition and NMEC through the safe motherhood TWG.
- In Zambia, therapeutic efficacy studies (TES) is currently supported by the Global Fund through NMEC, and no SP resistance monitoring has been conducted. However, with FY 2024 funds, PMI will resume TES funding in Zambia and will consider including SP resistance monitoring. See the case management section for details.

Given the absence of a national policy on the community-based delivery of IPTp and ITNs, there are no plans for PMI support of implementation in these areas.

3. Drug-Based Prevention

PMI does not fund seasonal malaria chemoprevention or other drug-based prevention in Zambia.

4. Case Management

4.1. PMI Goal and Strategic Approach

NMEC's objective is to ensure that 100 percent of all suspected malaria cases in all districts receive parasitological (microscopy or RDT) analysis, and 100 percent of parasitologically confirmed malaria cases receive prompt (within 24 hours) and effective antimalarial treatment. Universal coverage, namely service for anyone who requires it with early diagnosis and effective treatment, is a key strategy for reducing morbidity and mortality. Microscopy is generally used in outpatient settings when patient flow considerations allow and in cases of return visits, as well as in inpatient settings to confirm diagnosis and assess parasite density. Microscopy should be considered where there is a properly functioning laboratory with staff well trained in malaria diagnostics. RDTs are to be used in health facilities where there is no microscopy or no well-trained laboratory staff, when a laboratory is closed or too busy to handle the workload, and at the community level by CHWs trained in CCM of malaria (which in Zambia, targets all ages). PMI supports all aspects of this approach, including national-level policy and programmatic activities, commodity procurement, and improvement of facility- and community-level health worker performance. PMI supports the procurement of malaria RDTs, ACTs, and injectable and rectal artesunate to meet nationwide needs, in addition to OTSS activities in six provinces. While CHWs are trained in the diagnosis and treatment of malaria, pneumonia, and diarrheal diseases under iCCM, there is an inconsistent supply of commodities to manage pneumonia and diarrhea. Under the 2024–2026 Global Fund grant, the country hopes to secure regular funding for pneumonia and diarrhea in select geographies.

To continue to make progress in reducing severe and fatal cases of malaria despite the overall stagnation in Zambia's malaria case incidence since 2017, improving the quality of care in the country's health facilities takes on heightened importance. Whereas, prior to CY 2022, PMI support focused primarily on outpatient care, since CY 2023, the inpatient setting has received increased attention. Given the well recognized impact of strengthened referral systems on the prevention of mortality associated with severe malaria, PMI will continue to build on and expand investments in improved clinical decision making and service delivery around referrals, both from CHWs to health facilities and from lower-level health facilities to higher-level facilities. For example, the OTSS program for health facilities will incorporate an inpatient module going forward; the inclusion of private facilities in OTSS will be expanded; and the monitoring, mentoring, and motivation (MMM) program for CHWs will reinforce clinical skills around detection and referral of several cases.

These PMI investments are consistent with the new NMESP (2022–2026), which calls for universal access to quality treatment of both uncomplicated and complicated malaria, including ensuring adequate supply and use of recommended, first-line treatments for uncomplicated and complicated malaria at all facilities for all epidemiologic strata. Strategic objectives include regular training and mentoring of all individuals involved in complicated malaria treatment according to national guidelines. This approach will leverage the significant new hiring and posting of health care workers across the country. (The Zambian government's updated target is to reach 40,000 CHWs nationwide by the end of 2023.)

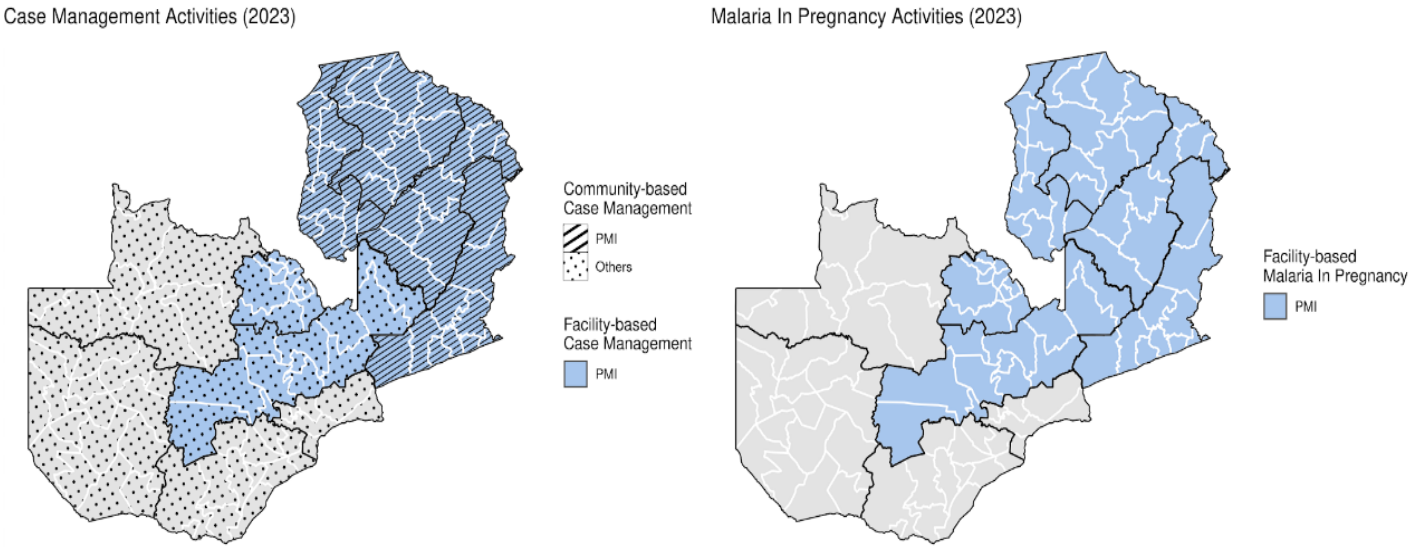
Community case management of malaria is a national priority.[5] CCM expands access to prompt and effective treatment of uncomplicated malaria, as well as timely detection and referral of severe malaria. The new NMESP 2022–2026 calls for increased access to malaria diagnosis and treatment, "especially in underserved and hard-to-reach areas." The NMESP's strategic objectives include:

- Train community health workers to manage malaria cases within their communities according to national guidelines;
- Provide regular supervision and mentoring of community health workers on malaria case management; and
- Ensure the provision of malaria commodities to CHWs.

NMEC and partners continue to prioritize further expansion of CCM to improve access to prompt diagnosis and treatment, especially in Zambia's vast rural areas. Out of the national target of 40,000 (ratio of 1:500 population) by 2022, over 20,000 CHW had been trained according to the harmonized national curriculum, deployed, and registered in the DHIS2, of which PMI had supported over 28 percent. Per MOH policy, endorsed by PMI to promote rational resource use, in epidemiologic levels 3 and 4, the CHWs are supposed to conduct CCM only—i.e., passive case detection and treatment. At levels 1 and 2, the CHWs are encouraged to conduct active case detection, whereby asymptomatic household members and neighbors of an index case are tested and if RDT-positive, treated. Both activities target all ages.

[5] In Zambia, iCCM (passive case detection) and reactive case detection (RCD) are two distinct subactivities under what is commonly called *community case managemen*t (CCM) of malaria.

Figure 11. Map of Case Management, Community Health, and MIP Service Delivery Activities in Zambia



4.2. Recent Progress (2021–2022)

National-Level Case Management Activities

- PMI continued to help disseminate the new (2022) national case management guidelines.
- PMI developed national training and supervision capacity, including enhancing and maintaining the national slide bank and supporting External Competency Certification for laboratory supervisors.
- PMI supported quarterly national case management technical working group meetings and monthly commodity stakeholders meetings focused primarily on malaria medications and RDTs.

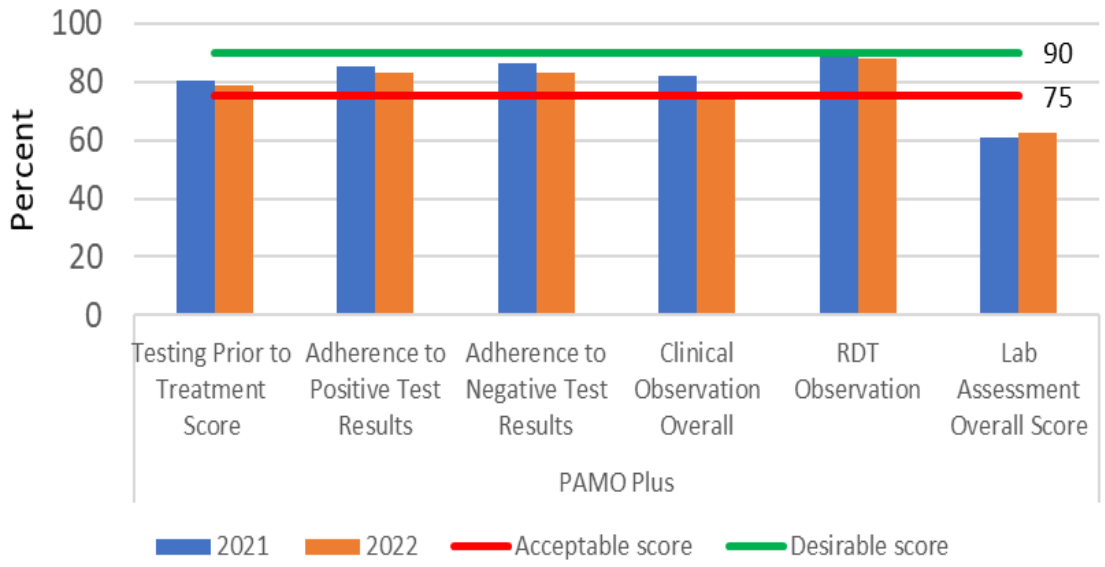
Commodities

- PMI supported the procurement and national distribution of 8,025,000 malaria RDTs for nationwide administration, accounting for approximately 22.4 percent of need.
- PMI supported the procurement and distribution of 7,478,700 ACTs for nationwide administration, accounting for approximately 65 percent of need.
- PNU supported the procurement and distribution of 477,400 vials of parenteral artesunate for nationwide distribution, accounting for approximately 41 percent of need.
- PMI supported the procurement and distribution of 30,000 rectal artesunate suppositories (RAS) for nationwide administration, accounting for approximately 18 percent of need.

Facility Level

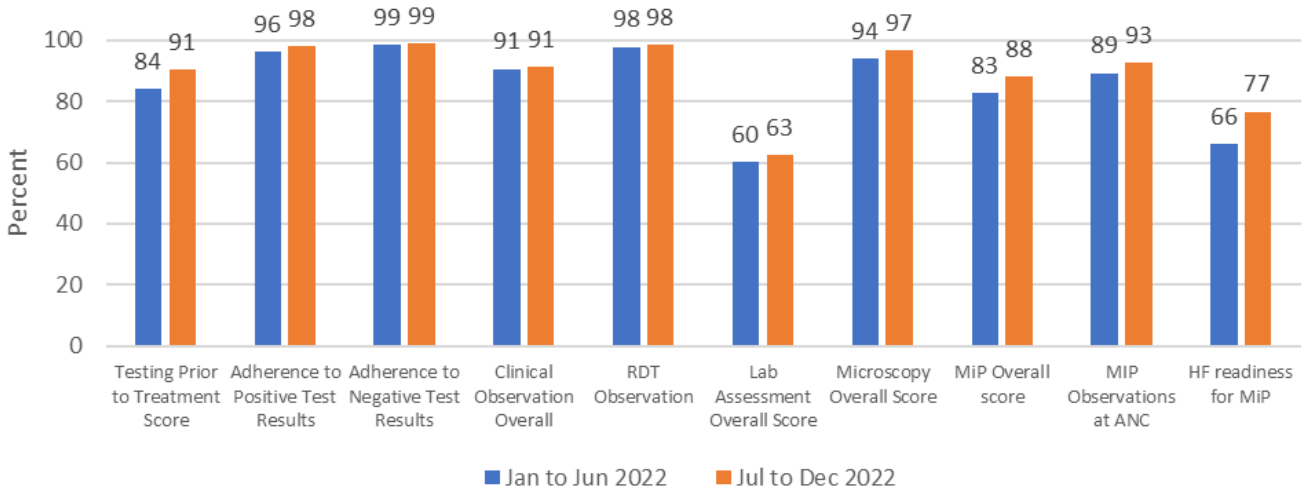
- PMI continued to strengthen malaria diagnosis (with RDTs and microscopy) and treatment by supporting one or two rounds of OTSS in six provinces in 2022, reaching 735 public-sector health facilities. The coverage rate was 100 percent at the 165 microscopy sites and 62 percent at the 913 nonmicroscopy sites.
- Key case management indicators during supportive supervision in the 2022 rounds indicated sustained acceptable or desirable performance (>75 percent or >90 percent) for all metrics, including adherence to clinical observation, testing prior to treatment, and adherence to RDT results. An exception was the average laboratory assessment in microscopy facilities, which fell below the minimum (see Figures 12 and 13). In other words, in microscopy and nonmicroscopy facilities, health care worker adherence to prescribed case management standards was reasonably high, but there is room for improvement.

Figure 12. OTSS Composite Score Results in Microscopy Facilities



Source: PATH.

Figure 13. Quality of Care Scores, Nonmicroscopy Facilities, Pre-elimination Districts, Rounds 1 and 2, 2022



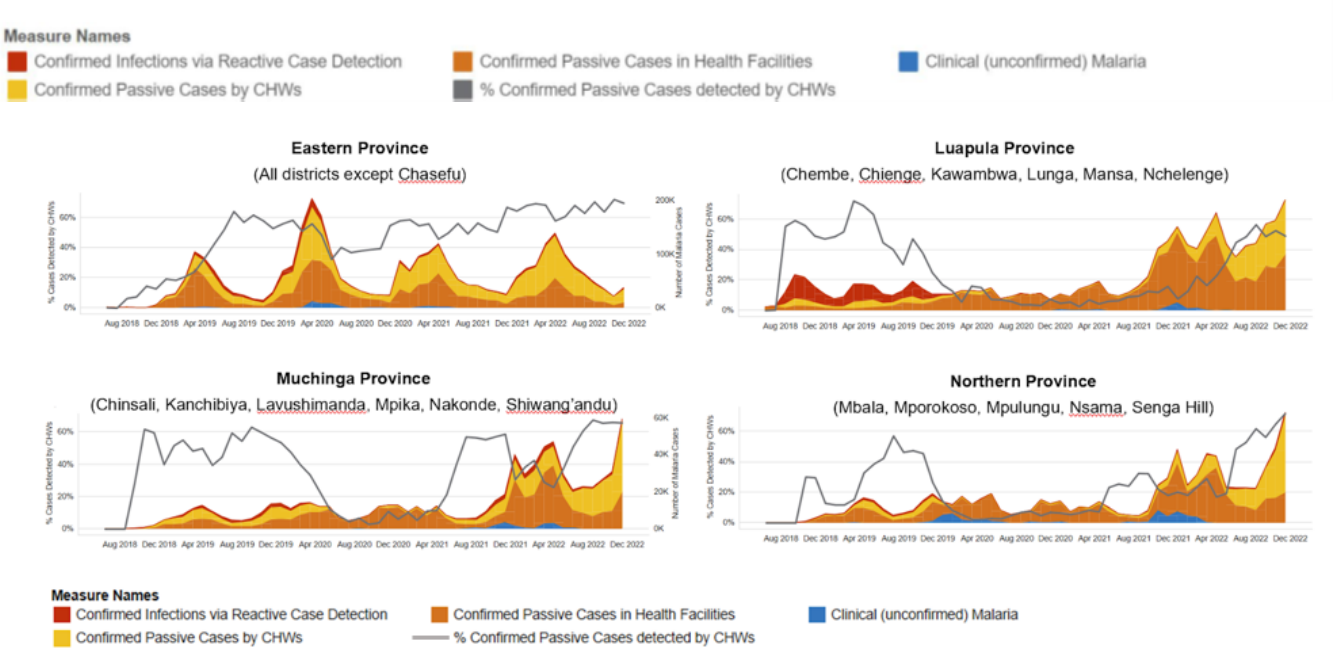
Source: PATH.

- In large hospitals, OTSS was found during review meetings to have limited impact. OTSS aims at improving case management of malaria by health facilities at different points, including out-patient departments, labs, intensive-care units, blood banks, in-patient wards, and pharmacies. These various points have staff with varying levels of competencies. The larger the institution, the more complex the points that need addressing and the smaller proportion of staff who can participate. Therefore, even a well implemented OTSS program, which is a one-day activity with a team of four supervisors mentoring staff individually, is less likely to effectively reach all the areas at larger institutions and less likely to have an impact on overall hospital malaria case management. Moreover, staff at higher-level institutions tend to have a greater level of expertise in malaria case management than OTSS supervisors. PMI, along with NMEC, is adjusting its approach in several ways: (1) prioritizing hospitals with high malaria death rates; (2) supporting expert staff to provide five days of mentorship instead of one OTSS day; and (3) for the largest hospitals, conducting malaria death audits and clinical meetings that will enhance severe malaria case management skills. The pre-elimination districts piloted the approach, conducting malaria clinical meetings in four level 1–3 hospitals with 377 participants. This was complemented by conducting OTSS in 155 small (nonmicroscopy) facilities.

Community Level

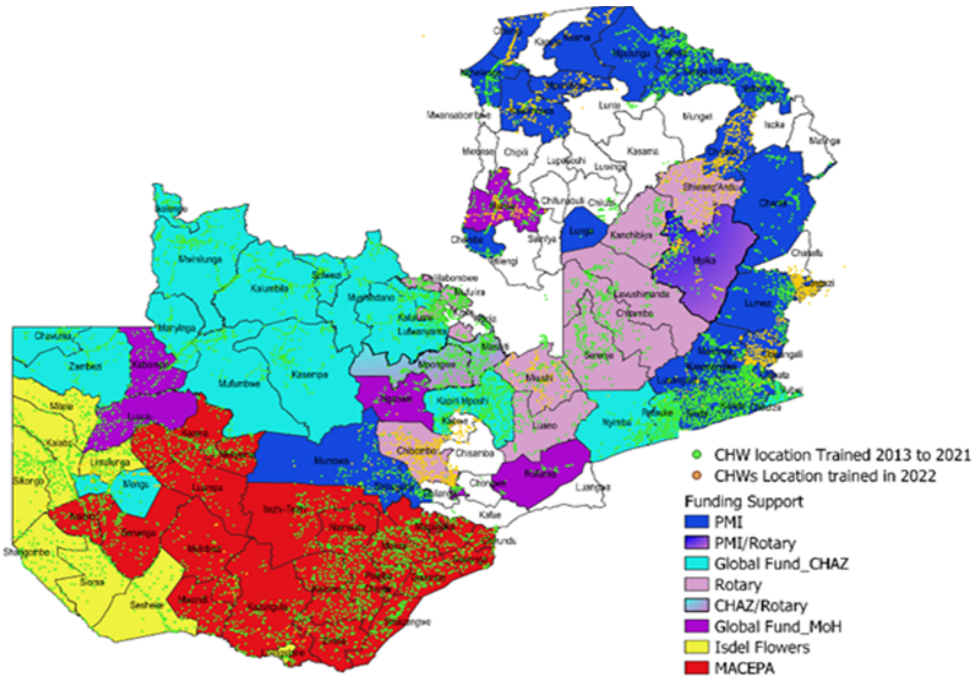
- PMI strengthened malaria diagnosis and treatment at the community level through the training and deployment of 1,723 CHWs in CY 2022, meeting targets. To support CHWs in performing their duties, PMI also trained 139 CHW supervisors; distributed enablers; and conducted mentoring, monitoring, and motivation visits to CHWs. The PMI-supported CHWs tested and treated over 1 million people in four provinces in 2022.
- In the districts where PMI supported CHWs, the majority of passive malaria cases (58 percent) were identified by CHWs. In the seven pre-elimination districts in 2022, this rose to 71 percent of passive malaria cases detected by CHWs. This remarkable accomplishment reflects Zambia's consistent ability to establish CCM rapidly and at scale in supported districts. CHWs have the proven capacity to reduce the caseloads of local health facilities while increasing access to care on a sustained basis. As shown in Figure 13, the desired pattern has been seen, where following the rapid scale up of CCM, health facility caseloads decrease while total district cases increase transiently.
- PMI resource allocations prioritized helping maintain CHW activity levels, through activities such as increased supervision, monitoring, and support. PMI supported Zambia's innovative MMM program to enhance and sustain the performance of CHWs and their health-facility-based supervisors in six provinces. PMI provided bicycles, shirts, aprons, caps, boots, and other CHW enablers to enhance performance and motivation. (To date, PMI has not supported CHW compensation, but this is proposed for future investment.)
- There was a gratifying, sustained restoration of commodity flows to CHWs in 2022, boosting activity levels (Figure 14). In many provinces ACT and RDT supplies had become erratic in 2020 and 2021, rendering health facilities in Luapula, Northern, and Muchinga provinces unwilling or unable to supply CHWs. Eastern Province has been the most resilient throughout in terms of maintaining high levels of CHW activity, likely due primarily to a combination of strong buy-in from MOH staff at all levels (PHO, DHO, and health facility) coupled with enhanced support for supply chains from PMI and the Global Fund/CHAZ. Urban health facility catchment areas tended to face the greatest challenges sustaining the activity of CHWs because most of the urban population uses health facilities.
- As per NMEC policy, PMI continued to support the linkage of the Malaria Rapid Reporting System for CHW data capture in districts where CCM is being scaled up (see the SM&E section).

Figure 14. Malaria Case Detection by CHWs Versus Health Facilities in Four Provinces (2018–2022); CHW Activity Levels Rebounded in 2022



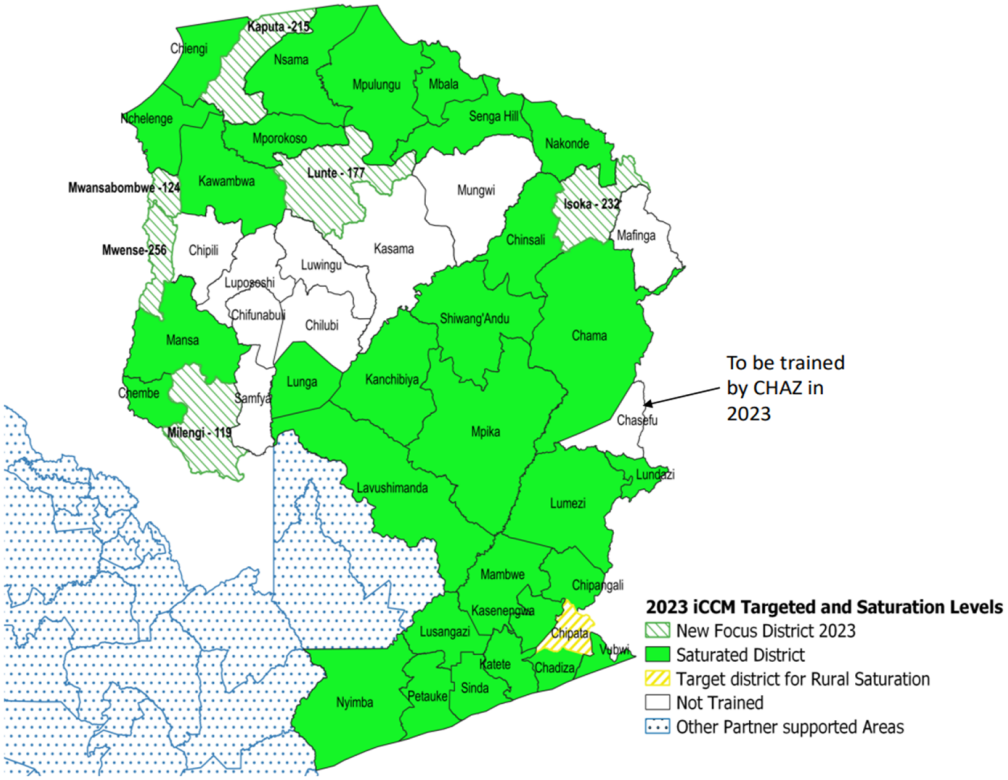
- Nationally, NMEP plans to train 40,000 CHWs. By the end of 2025, 20,448 workers (56.8 percent) had been trained. Figure 15 shows the national rollout of CHWs by various partners. A total of 6,254 had been trained and deployed by PMI, representing over 30 percent of the national achievement, with the rest supported by Bill & Melinda Gates Foundation/PATH/MACEPA, Global Fund, Rotary, Isdell:Flowers Foundation, and the recent and highly promising contribution of the Malaria Partners International in Muchinga and Central Provinces (consortium of Rotary/World Vision/Bill & Melinda Gates Foundation under the $6 million, two-year “Programs of Scale” pilot). Under NMEC guidance, PMI and these other partners have adopted a strategy for saturating a select district at the national target level of 1 CHW per 500 population in rural areas.
- By the end of CY 2023, 37 out of 47 districts in the four provinces of PMI focus will be saturated with CHWs based on projected partner investments from PMI, Malaria Partners International, and Global Fund/CHAZ. The remaining 10 districts will require about 3,000 CHWs to reach saturation.

Figure 15. Status of National Rollout of CHWs, Late 2022, by Partner



Source: NMEC/PATH.

Figure 16. CHW Saturation Status and the Districts Planned for Saturation by the End of the CY 2023 in Provinces of PMI Focus



- Evidence of CCM impact in Zambia continued to accumulate with the March 2023 publication of a MACEPA/Tulane University study, which found that "after accounting for covariates, an increase of one malaria service point per 1,000 population was associated with a 19 percent reduction in severe malaria admissions among children under five (incidence rate ratio [IRR] 0.81, 95 percent confidence interval [CI] 0.75–0.87, $p < 0.001$) and 23 percent reduction in malaria deaths among under-fives (IRR 0.77, 5 percent CI 0.66–0.91)."[6] The authors recommend continued investment in CCM scale-up efforts to improve access to malaria diagnosis and treatment.
- Early 2023 also saw the publication of the MOH's national *Community Health Work Incentives Guidelines*. While commended for its objectives of improving sustainability, promoting equity, and harmonizing approaches across disease areas, there is concern that the current guidelines do not sufficiently address malaria testing and treatment needs at the community level. Questions have been raised around several provisions, including:
    - **Acceptability:** CBVs are expected to sign a detailed six-page contract in English that includes legal language regarding prohibitions, indemnification, and other matters;
    - **Compatibility with the CCM model:** The roles and responsibilities of CBVs are outlined for other program areas (e.g., HIV, tuberculosis, and reproductive health), but not for malaria, and the recommended cap of 20 hours per week year-round seems difficult to reconcile with the passive case detection approach and the seasonality of malaria;
    - **Feasibility:** The recommended monthly stipend of $40 per month would have enormous financial implications for malaria programming and raises operational challenges. As of mid-2023, policy and practice implications for malaria partners were just beginning to be explored, and NMEC guidance was pending.

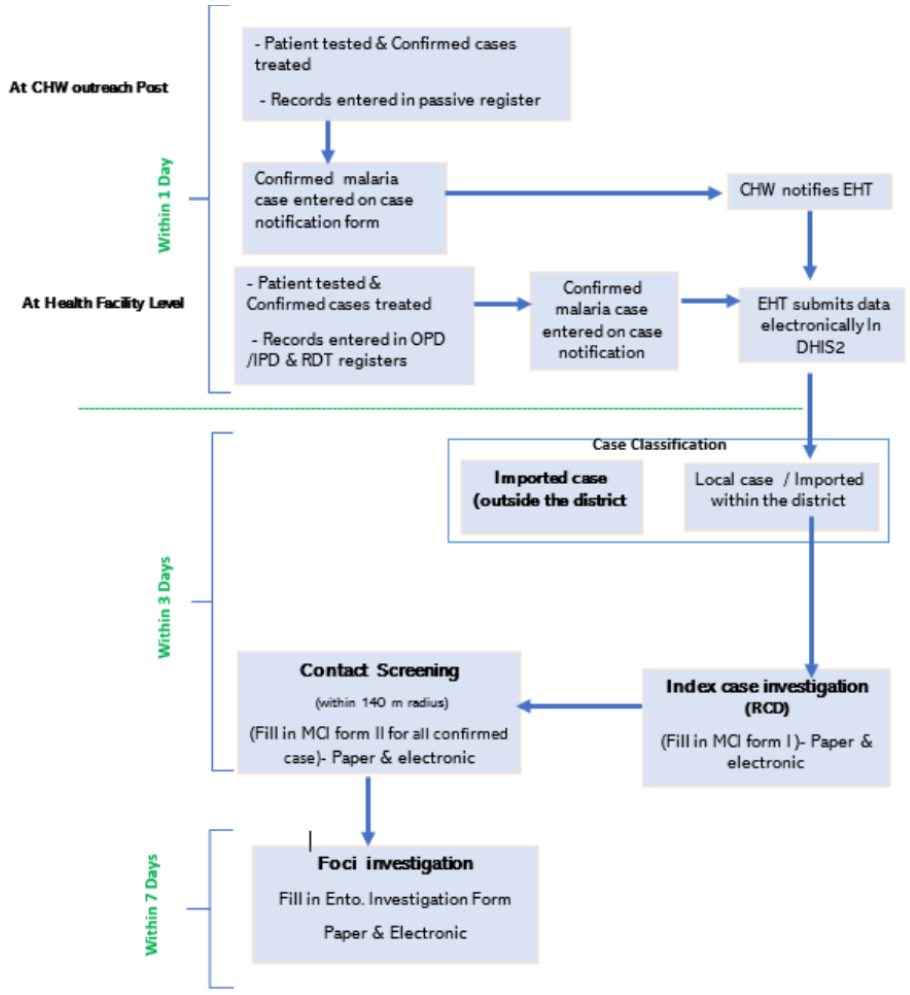
Elimination Settings

- Zambia continued to increase its capacity to deploy MCI as a tool for further reduction of transmission in pre-elimination settings, utilizing the "1-3-7" approach. While operationally challenging, the program has a well-established track record in China and Southeast Asia. Zambia's MCI protocols call for reporting confirmed malaria cases within one day, investigating specific cases within three days, and where an active foci is identified, implementing targeted control measures to prevent further transmission within seven days. From 2021 to 2023, NMEP, with major support from MACEPA, piloted MCI using the 1-3-7 approach in Chikankata and Mazabuka districts. From April 2022, the Macha Research Trust has been conducting a trial of enhanced case surveillance in Choma District, also in Southern Province.

[6] Ashton, Hamainza, et al. 2023. "Effectiveness of Community Case Management of Malaria on Severe Malaria and Inpatient Malaria Deaths in Zambia: A Dose-Response Study Using Routine Health Information System Data" *Malaria Journal* 22: 96.

- To inform plans to roll out 1-3-7 in suitable settings in Eastern Province, in September 2022, PMI organized a learning tour to the Southern Province pilot districts. Protocols were largely understood by staff at all levels (Figure 17). Systems were maturing, and stakeholder engagement was strong. However, at that time, only 22 percent of eligible cases had received follow up with reactive case detection (RCD), and implementation of Day 7 responses were hampered by a lack of reserve supplies of commodities.

Figure 17. Flow Chart for Malaria Case Investigation in Zambia



Recent progress on monitoring antimalarial efficacy and the TES approach is presented in the plans and justification for FY 2024 funding section below.

4.3. Plans and Justification for FY 2024 Funding

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

National-Level Case Management Activities

- PMI will continue to develop national training and supervision capacity in case management and support the dissemination of the updated national case management guidelines.
- In order to sustain and improve capacity in malaria microscopy, PMI will continue to support quality assurance/quality control activities, slide bank maintenance, microscopy technician assessments, and certification.
- PMI will continue to support the national case management technical working groups and the monthly commodity stakeholders' meetings.

Commodities

PMI will maintain similar commodity procurement levels of ACTs, RDTs, and artesunate suppositories as in the FY 2023 MOP. Over the past year, the Zambian government has increased malaria commodity procurement. The Global Fund 2024–2027 grant will also likely increase funding for malaria commodities, thus helping to further fill any projected commodity gaps in CY 2024. PMI's focus includes not only procurement of the life-saving commodities but a greater focus on accurately quantifying the total commodity needs to make sure they get to all of the people who need them.

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

Facility Level

PMI's planned facility-level targeting in FY 2024 include the following:

- **Severe malaria.** PMI will provide technical assistance to improve the definitive management of malaria in inpatient settings to reduce case fatality rates at facilities. NMEC has become increasingly concerned about persistently high malaria deaths in certain districts and health facilities, including in provinces of PMI focus. PMI will support activities to strengthen diagnosis, referral, and definitive treatment of severe malaria as a medical emergency, prioritizing high-volume facilities and high-burden geographies. Areas of concern include erratic supply of injectable medications, especially of blood for transfusion in cases of several malaria anemia, substandard management of severe malaria cases, and unreliable data on malaria as a cause of admissions and deaths.

    - Informed by the pending PMI-sponsored national blood supply assessment in 2022–2023, activities may include targeted technical assistance for blood supply system strengthening to improve treatment of severe malaria anemia, in partnership with other stakeholders, in four provinces with a high malaria burden (Luapula, Northern, Muchinga, and Eastern).
    - Given the well-recognized impact of strengthened referral systems on reducing malaria mortality, PMI will build on and expand investments in improved clinical decision making and service delivery around referrals, both from CHW to health facility and from lower-level health facility to higher-level facility.
- **OTSS, death audits, and clinical meetings.** To improve case management in health facilities and to decentralize the strengthening of diagnostic and clinical capabilities at all levels, PMI will continue to support OTSS activities. Consistent with NMEC guidance and operational factors, activities will ensure the continuity of implementation in PMI's six historic OTSS provinces: Luapula, Northern, Muchinga, Eastern, Central, and Copperbelt.
    - A minimum of two rounds of OTSS will continue to be conducted each year, covering health facilities with and without microscopy. In the Copperbelt Province, in recognition of the relatively high level of care-seeking behavior in the private sector, the OTSS program will include private clinics among targeted facilities.
    - For large hospitals, PMI support will continue to transition to the provision of malaria death audits and clinical meetings to reach a higher proportion of health care workers to enhance their case management skills for severe malaria.

Community Level

Key partners in CCM currently and for the foreseeable future include the Global Fund, CHAZ, Bill & Melinda Gates Foundation/PATH/MACEPA, Malaria Partners International (Bill & Melinda Gates Foundation/Rotary/World Vision), and the Isdell:Flowers foundation. As of mid-2022, PMI-supported CCM efforts had become well established across most of Eastern Province. However, by 2023, numerous districts in other provinces of PMI focus had yet to see CCM scale up, especially in Luapula and Northern provinces, as indicated in Figures 15 and 16. However, experience from recent years demonstrates that future scale-up investments should be coupled with investments to sustain CHW activity over time. Partners aim to build on previous years' investments, sustaining CCM where it has been introduced through supervision, mentoring of CHWs, replacement of CHWs lost due to attrition, and expansion of CHW incentives.

The foregoing provides the rationale for continued, substantial PMI investments in CCM in FY 2024, coordinating closely with the other partners. The following activities are planned:

- **Continue to scale up CCM in PMI's four provinces of focus.** To move toward saturated coverage of CHWs in all districts, PMI will continue to seek expanded partnership with other funders, such as Global Fund/CHAZ in Eastern Province and the Bill & Melinda Gates Foundation/Rotary Fund/World Vision in Central, Muchinga,

and potentially Luapula and Northern provinces. Appropriate modalities of support for district-level staff will be adapted in alignment with the implementation of the health sector decentralization strategies. Consistent with national policy, where epidemiologically and programmatically appropriate, CCM activities will incorporate: (1) rectal artesunate suppositories (RAS) with emergency transport systems/schemes for community referral of severe malaria cases; (2) reactive case detection; (3) malaria case investigation; and/or (4) treatment of children under the age of five for pneumonia and diarrhea (where commodities are available, non-PMI funded). Proactive CCM They might be incorporated, informed by evolving national policy and research findings.

- **Shift investments to assure sustained CHW activity.**
    - **Strengthen CHW support systems:** PMI will support expanded implementation of the MMM program for CHWs as well as cross-cutting system strengthening activities described elsewhere in this MOP, namely: further strengthening of supply chain and commodity security, which will increase community confidence that the needed ACTs and RDTs will be available when they seek care; strengthened systems to capture and utilize community-level case management data; and SBC investments to improve the population's knowledge and practices regarding the recognition of fever and the dangers of malaria.
    - **Enhance CHW incentives:** To promote sustainable CCM, PMI will provide partial funding for incentives to CBVs in supported geographies. Depending on resource availability, partner mapping, and priority needs, these may include CHWs enablers (e.g., bicycles, tote bags, lights, identification badges, shirts, and stationery), allowances, and/or monthly stipends. Operationalization is to be guided by evolving Zambian government/NMEC guidance and practice and will be informed by the CY 2023–2024 Global Fund "CHW22" pilot. Program design and operationalization will be consistent with emerging MOH policies and with U.S. government policies and best practices, and will be closely coordinated with other CBV funders, including the President's Emergency Plan for AIDS Relief (PEPFAR) partners. Any PMI funding to support CBV stipends will be preceded by a feasibility assessment and pilot program in PMI-supported districts prior to implementation of this MOP. (Note: PMI is expecting that other partners will increase their support by 2025, which will complement PMI's investments and increase the investment in CCM overall. However, PMI will continue to track this and respond to any gaps as necessary.)
- **RAS implementation for prereferral treatment of severe malaria.** PMI will continue to invest in measured scale-up of RAS, as requested by NMEC. Given the long history of poor uptake of RAS in many country settings and the recent WHO cautionary information note, PMI will continue to support linkage of RAS supply to districts where there is adequate training, supervision, and emergency transportation options to support safe, effective use of rectal artesunate.

Case Management Elimination Activities

Facility Level in Pre-Elimination Settings

- **SLDPQ in pre-elimination settings:** Administration of SLDPQ has recently been incorporated into key national policy documents, including the newly drafted NMESP 2022–2026 and the case management guidelines (revised in 2022). Primaquine is to be deployed in HFCAs with an annual incidence of <125 per 1,000 population (including epidemiologic levels 0, 1, and the "lower half" of 2). NMEC requests partner support to roll out SLDPQ to eligible HFCAs in Southern Province, Eastern Province, and elsewhere, prioritizing rural districts. PMI proposes to pilot SLDPQ in CY 2023 in Sinda district, whose HFCAs are nearly all at level 1. With FY2024 funds, and informed by the pilot and local epidemiologic status, PMI would support the roll out of SLDPQ in rural HFCAs in selected pre-elimination program districts. PMI investment will include the provision of technical assistance and procurement of modest quantities of the medication. Following the establishment of SLDPQ at the health-facility level, there will presumably be opportunities to begin deployment of SLDPQ by CHWs under the supervision of the health facilities.

Community Level in Pre-Elimination Settings

- **Enhanced support for CCM in the pre-elimination program areas:** Enabled by a higher intensity of investments by PMI and CHAZ, and bolstered by strong PHO support, CCM was well established in Eastern Province by CY 2022. FY 2024 investments will be deployed to complete the process of saturating all pre-elimination districts to a standard of one active CHW per 500 population, filling gaps. Passive case management (e.g., iCCM) will increasingly be complemented by CHW participation in surveillance and response activities that are appropriate to the local epidemiologic level, including expanded engagement in RCD. As per the national stratified approach, RCD will be limited to HFCAs with case incidence under <200 cases per 1,000 population per year.
- **Malaria case investigation:** Consistent with the NMESP's strategy to eliminate malaria in the lowest-burden HFCAs, PMI will support the scaling up of the 1-3-7 approach[7] to malaria case investigation, limited to selected rural HFCAs with case incidence of <50 cases per 1,000 population per year. As mentioned, in Zambia, the approach was rolled out in 2021 in select districts of Southern Province, including Mazabuka, Chikankata, and Choma, with support from MACEPA and ICEMR, providing lessons learned and tools to build on during PMI-supported expansion into Eastern Province. Activities will include planning exercises for maximal feasibility and impact; training of CHWs and supervisors to implement MCI protocols, including epidemiologic and entomologic surveillance; supervision, mentoring, and monitoring; and supply chain

[7] The 1-3-7 approach involves malaria surveillance and response activities implemented in low-malaria-endemic settings where the goal is to eliminate malaria/prevent resurgence by reporting every new case within 1 day; conducting foci investigation of confirmed cases within 3 days after diagnosis; and mounting an appropriate response within 7 days.

strengthening. To permit the desired day seven responses to active foci identified, provision will be made for readily accessible reserve supplies of vector control commodities. In 2022, Sinda had an overall case incidence of 88 per 1,000 population, and as low as 10 per 1,000 incidence in some HFCAs. Depending on pilot experience, the case incidence threshold for targeting MCI may need to be adjusted downward due to feasibility concerns, in consultation with NMEC.

- Additionally, PMI is exploring the feasibility of layering LSM based on the findings from the LSM feasibility assessment and would support the implementation of proactive CCM if the findings of the ProACT study are validated and adopted.

Monitoring Antimalarial Efficacy

Table 4. Ongoing and Planned Therapeutic Efficacy Studies

Year	Sites	Treatment Arm(s)	Plan for Laboratory Sample Testing
Ongoing Studies			
2021	Serenje, Kaoma, Mpongwe, Mansa, Isoka[1]	AL, ASAQ, DP	TBD
Planned Studies Funded Under Previous or Current MOP			
2022	Kasama and Solwezi	TBD	TBD
2024	TBD (3 sites)	TBD	TBD

[1]Sites are funded by the Global Fund. AL: artemether-lumefantrine; ASAQ: artesunate-amodiaquine; DP: dihydroartemisinin-piperaquine; TBD: to be determined.

In FY 2024, PMI will resume TES funding in Zambia, including for SP resistance monitoring. Sites and arms will be determined in consultation with NMEP. As listed in Table 4, NMEP is currently monitoring the efficacy of the three malaria first-line treatment drugs—artemether-lumefantrine (AL), artesunate-amodiaquine (ASAQ), and DP—but does not have immediate plans to conduct TES for SP.

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

5. Health Supply Chain and Pharmaceutical Management

5.1. PMI Goal and Strategic Approach

PMI supports seven high-level focus areas that align with the current 2022–2026 NMESP: (1) forecasting and supply planning TA to the MOH; (2) logistics management information systems capacity strengthening; (3) data visibility for assessing and monitoring stock status; (4) Medical Stores Limited warehousing and distribution capabilities; (5) malaria pre-elimination activities; (6) procurement, distribution, and monitoring of ITNs; and (7) procurement of antimalarials, ITNs, RDTs, and diagnostic commodities. These focus areas align very well with the national supply chain strategy functional areas of forecasting,

procurement, and rational use; storage and distribution; strategic data; and finance and resources.

An overview of the health supply chain system can be found in the Zambia country profile.

Recent Progress (April 2022–April 2023)

PMI's principal supply chain investments are aimed at improving malaria commodity availability and commodity security at service delivery sites, including forecasting and supply planning, logistics management information systems capacity strengthening, data visibility for assessing and monitoring stock status, strengthening the central medical stores warehousing and distribution systems, and commodity procurement. Unfortunately, according to the Electronic Logistics Management Information System (eLMIS), stockouts of ACTs increased from 35 percent in April 2022 to 43 percent in March 2023. This is likely due to the delayed receipt of ACTs procured by the Zambian government, which were originally due to arrive in Zambia in October 2022. PMI, through both cross-cutting USAID supply chain activities and the PMI stock redistribution strategy and tools, is actively working to improve stock availability and thereby reduce stockout rates in Zambia, including day-to-day monitoring of issues from the central warehouse and facility consumption data as well as additional support for third-party distribution and monitoring.

Forecasting and Supply Planning TA to the MOH

- PMI promoted ownership of supply planning to institutionalize the commodity pipeline monitoring and sharing of procurement and shipping information among the relevant stakeholders.
- There has been a history in Zambia of over-quantifying commodities through the use of insufficiently backed assumptions. PMI has been actively working to address this issue, and this year brought in two consultants from Roll Back Malaria and Procurement and Supply Management to support the FAQ in getting more accurate estimates of ACT needs in Zambia this year. PMI supported monthly stakeholder meetings to discuss stock status trends of key antimalarial commodities, reviewed supply plans and funding gaps, flagged areas of concern associated with commodity gaps, and identified mitigation measures. Through these continued collaborations, PMI will continue to improve quantification inputs and ultimately have more accurate forecasts of ACT needs.
- PMI expedited ACT shipments to help bridge the gap created by delayed Zambian government shipments to ensure continued service provision.
- PMI supported enhanced capacity strengthening of the control tower (coordination unit). MOH and Zambia Medicines and Medical Supplies (ZAMMSA) forecasting and supply planning members were deployed from various levels of supply chain management to promote ownership and sustainability of forecasting, quantification, and procurement planning for malaria commodities.

Logistics Management Information Systems Capacity Strengthening

- PMI strengthened capacity in logistics system management through training and supervision in the Essential Medicine Logistics Improvement Program to MOH staff and CHWs. PMI also provided ongoing training and supportive visits to MOH staff on the use of eLMIS to enhance antimalarial commodity security.
- PMI enhanced the stock redistribution tool—a geographic-information-system-based tool that uses color coding and other visual cues to redistribute stock as needed.
- PMI assessed and monitored stock status for antimalarial drugs and malaria RDTs on a monthly basis at the provincial, district, health center, and health post levels using data analytic tools.
- PMI conducted the biannual end-use verification surveys at the beginning of FY 2023 to improve data visibility for decision making in malaria case management at service delivery points.

ZAMMSA Warehousing and Distribution Capabilities

- PMI provided TA in inventory management procedures, inventory management policies, product security procedures, warehouse management system use, workplace organization processes, and distribution and fleet management. PMI supported the roll out of a warehouse expert to all seven provincial hubs, which allows for increased stock control and visibility through real-time data presented through the NetLog reporting tool.
- PMI deployed the route optimization tool at the ZAMMSA central warehouse, which is now used as an integral tool for vehicle and route planning and is included in instructions for approving purchase orders for third-party logistics truck requests.
- PMI supported further roll out of an order-routing portal and integrated it with the warehouse management system to ensure that orders are managed at a hub level based on product inventory levels.

Strengthened Commodity Security and Risk Management

- In 2022, PMI conducted an agreed-on procedures activity for ACT that identified the likely diversion of $1.9 million worth of ACTs procured by PMI and the Global Fund between September 1, 2020, and December 31, 2021. In response to the findings, the minister of health developed an action plan to reduce the risk of ACT diversion, which is being tracked through a small core group that includes NMEC, ZAMMSA, and PMI.
- USAID/Zambia has a supply chain commodity security and risk management plan that serves as a guide to mitigate risks related to supporting Zambia with commodity donations and supply chain systems strengthening to serve public health programs. The plan addresses governance challenges and opportunities, programmatic threats and mitigation measures, anticorruption solutions, and other key vulnerabilities.
- The plan is being implemented by the USAID Mission's technical staff and support offices. In particular, the Democracy and Governance Office provided guidance to align the plan with a larger anticorruption framework to ensure an integrated approach, and

proposed activities focused on understanding the greatest risks in the commodity supply chain system, including the economic and sociopolitical dynamics that may enable corruption.

- To strengthen commodity security, PMI is funding last-mile distribution of malaria commodities to focal provinces and has budgeted for regular spot checks of all malaria commodities as well as third-party monitoring of last-mile distribution. Track and trace technologies, such as Electronic Proof of Delivery (ePOD) have also been introduced at ZAMMSA and in the seven provincial hubs to help identify if products are not reaching their intended destinations. PMI may pilot the use of “not for resale” labels on ACT packaging as a way to help mitigate diversion.
- The USAID Mission has developed a robust supply chain risk management plan that PMI continues to support under commodity security activities.

5.2. Plans and Justification with FY 2024 Funding

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

In the FY 2024 MOP, Zambia will continue to support: (1) forecasting and supply planning TA to the MOH; (2) logistics management information systems capacity strengthening; (3) data visibility for assessing and monitoring stock status; (4) Medical Stores Limited warehousing and distribution capabilities; (5) malaria pre-elimination activities; (6) procurement, distribution, and monitoring of ITNs; and (7) procurement of antimalarials, ITNs, RDTs, and diagnostic commodities. Continued emphasis will be placed on strengthening commodity security activities at all levels of the supply chain.

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

6. Malaria Vaccine

6.1. PMI Goal and Strategic Approach

In light of the 2021 approval of the RTS,S vaccine by WHO for scale up, and by Gavi for donor funding, Zambia for the first time sees a path toward adding a vaccine to its package of malaria control interventions.

The following background and rationale underlie this interest by PMI and the MOH. In November 2021, NMEC first met with its EPI counterparts to begin charting a way forward through what was recognized as a long and laborious process. NMEP has incorporated malaria vaccine technology into the new draft NMESP 2022–2026. Under its strategy to “adopt and adapt future innovations and technologies in all key thematic area as made available and programmatically relevant,” the NMESP has the specific objective to “operationalize delivery of malaria vaccines to target populations as they become available by way of engagement with

key national and international stakeholders e.g., Zambia Immunization Technical Group, EPI, GAVI, and UNICEF."

Zambian stakeholders recognize that vaccine resources are severely limited in the near term, and that allocation criteria would presumably prioritize the participants in the recent vaccine trials (Ghana, Malawi, and Kenya) and in countries with a high malaria burden . However, stakeholders see that Zambia, with its strong track record in malaria surveillance, research, and innovation, its strong reputation for achievements in childhood vaccines, and its high malaria burden at the subnational level (e.g., Luapula Province), would be well positioned to help address issues around vaccine operationalization in rural Sub-Saharan African settings in the early stages.

PMI's goal for the malaria vaccine in Zambia is to support the MOH to strategically deploy this intervention as a complementary tool to existing core interventions.

6.2. Recent Progress (April 2022–April 2023)

- In April 2022, the MOH EPI unit requested that cooperating partners provide technical assistance to explore opportunities, including in preparation for a Gavi funding application later that year.
- In March 2023, NMEC confirmed that, although there had been little recent movement on this in Zambia, given leadership changes in the EPI program and competing MOH priorities, interest in future adoption remained. A group of stakeholders was planning to reconvene in mid-2023 to develop a roadmap that would capture plans to apply for Gavi funding later in CY2023 and engage the various national regulatory and oversight bodies. In this process, the maternal and child health (MCH)/EPI units of the MOH would be in the lead, with NMEC playing a supportive, technical role.

6.3. Plans and Justification for FY 2024 Funding

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

- With FY 2024 funding, PMI will work with the MCH/EPI units and NMEC to provide complementary support in the planning, delivery, and monitoring of vaccine deployment, including technical assistance to NMEC as it engages the MCH/EPI units to strategically use data to decide where to introduce the vaccine.
- Cognizant that vaccine supplies may be severely limited for several years, PMI will assist with the adoption of the RTS,S, R21, and/or other available vaccines to reach priority populations as guided by emerging WHO, PMI, and national policies at the time. This includes support to maximize the uptake of the vaccine without adversely affecting coverage of other malaria interventions.

Given that the country has not yet submitted a Gavi application, although that is planned for CY 2023, PMI will not allocate funding to this until the vaccine deployment timeline and specific resource requirements have been determined.

7. Social and Behavior Change

7.1. PMI Goal and Strategic Approach

In alignment with the country's national malaria control and elimination communication strategy, PMI targets SBC interventions to support the adoption and maintenance of select key malaria prevention and treatment behaviors, thereby improving the overall quality of malaria control efforts that will contribute to reductions in malaria-related morbidity and mortality.

NMEP's objectives for the National Communication Strategy for Malaria Elimination 2017–2021 are to: (1) increase knowledge of malaria; (2) improve uptake and correct use of key malaria interventions; (3) arm influencers, health workers, and communities with the tools required to achieve elimination; (4) promote the recognition and celebration of communities that attain malaria-free status; and (5) provide guidance to communities on the messages and SBC materials/tools needed to maintain malaria-free status and remain vigilant about imported infections and the potential for resurgence. The creation of a new NMEP National Communication Strategy has been delayed, with the target completion date set for the end of 2023.

PMI supports data-informed, coordinated SBC interventions deployed across PMI geographic focus areas. Through partnerships with community-based organizations and the training of community change agents (CCAs), PMI supports NMEP to conduct community-level interpersonal communication, mass media, and other activities aimed at increasing correct and consistent ITN use and care, prompt care seeking for fever, uptake of IPTp, and acceptance of IRS. At the national level, PMI provides technical assistance; supports capacity strengthening activities, including coordination; and seconds an SBC advisor to NMEC. PMI continues to support efforts to revise the communication strategy to encompass a broader and more holistic SBC approach while still highlighting key communication components.

The National Communication Strategy for Malaria Elimination 2017–2021 has increased the MOH's capacity to more effectively plan and oversee SBC activities in the country. Currently, all institutions working in malaria (public and private organizations, nongovernmental organizations, the Global Fund, and PMI) are required to follow the national strategy. All malaria partners in Zambia are expected to align program activities with the National Communication Strategy for Malaria Elimination. The largest donors include PMI and the Global Fund. The Global Fund supports the implementation of community-level SBC activities through CHAZ, including the implementation of champion communities and engagement with traditional and religious leaders.

7.2. Recent Progress (January 2021–December 2022)

PMI supports NMEP to implement evidence-based and targeted SBC interventions in Luapula, Northern, Muchinga, and Eastern Provinces. To expand the reach of SBC activities, PMI has subcontracted 11 local CSOs, including 6 community-based organizations and 5 faith-based organizations, covering 26 districts out of the targeted 47 districts. The PMI SBC approach emphasizes overcoming barriers to help individuals and communities increase uptake and maintenance of key malaria behaviors while also disseminating key messages on malaria elimination. The PMI SBC approach in Zambia utilizes four interlinked interventions:

1. Mass media targeting the public with the aim of increasing uptake of malaria services and products.
2. Community engagement and mobilization to promote adoption and practice of behaviors.
3. Interpersonal communications to influence individuals to adopt desired behaviors.
4. SBC management to improve coordination, supervision, monitoring, and mentorship at provincial and district levels of SBC interventions.

Community Mobilization and Engagement

In 2022, PMI employed three community mobilization and engagement activities:
(1) strengthening community participation in the implementation of community engagement plans; (2) engaging traditional and faith leaders to integrate malaria messages into religious services; and (3) mobilizing youth for sustained malaria activities at the community level.

Implementing Community Engagement Plans

PMI supported health facilities to facilitate neighborhood health committees (NHCs) to develop and implement community engagement plans that outlined community actions to support the uptake of proven malaria interventions. These plans were informed by HMIS facility data analyzed by different NHC catchment areas. Community engagement plans are being implemented by 696 NHCs in 109 health facilities in all PMI-supported provinces.

Engaging Traditional and Faith Leaders

In 2022, PMI piloted a chiefdom-led initiative in Kanyembo Chiefdom of Nchelenge District to mobilize the chief and all headmen and headwomen under her to engage their villages and families to develop a local SBC program. Working with the Provincial Chiefs Affairs Department, the PHO, the District Chiefs Affairs Office, and Nchelenge DHOs, PMI supported meetings attended by 54 village headmen and headwomen that included the development of community engagement plans.

Engagement of Faith Leaders for Malaria Control and Elimination

In 2022, PMI provided a grant to the Zambia Interfaith Networking Organization to integrate malaria messages into religious services, including Muslim, Christian, and Baha'i faith communities. This support resulted in a cascade training of trainers at the national level, the orientation of 80 religious leaders at the provincial level, and 400 faith trainees across the PAMO Plus target districts.

Interpersonal Communication

PMI is using interpersonal communication (IPC) to encourage and support the adoption of malaria preventive and early care-seeking behaviors. In 2022, PMI trained and deployed 2,423 CCAs in addition to the 814 trained and deployed in the first year, bringing the total CCAs trained to 3,237. CCAs conduct IPC activities that include household visits, peer education, and community dialogues where individuals are encouraged to reflect on the barriers that hinder access and the use of proven interventions and how communities and individuals can overcome those barriers.

Mass Media

In 2022, PMI utilized radio to reach the masses with key malaria messages through radio spots, prerecorded radio programs, and live discussion programs. Contracted radio stations aired 1,286 radio spots, 606 prerecorded radio programs, and 227 live radio programs. The various radio spots and programs that were prepared with NMEC and focused on the benefits of using available malaria interventions, services, and products (ITNs, IRS, case management, and MIP).

SBC Management to Improve Coordination, Supervision, Monitoring, and Mentorship

PMI supported NMEP to hold three provincial SBC coordination meetings in Northern, Luapula, and Eastern provinces. The meetings were attended by 44 people that included health promotions officers from respective DHOs, senior health education officers from PHOs, and staff from CSOs. The key outcome of the meetings was the dissemination of SBC management tools.

Barrier Analysis

To strengthen the focus of the SBC interventions, PMI conducted a barrier analysis in 2022 to further explore behavioral determinants. Once the report has been finalized, PMI will utilize the findings to continue to revise its SBC strategic approach and support NMEP to develop the national SBC Strategy.

Pre-Elimination Activities

SBC activities in pre-elimination districts in Eastern Province follow the same SBC strategic approach using CCAs as the main community-based operatives for supporting behavior change at the NHC level. SBC activities from non-pre-elimination districts are adapted and scaled-up for greater saturation in pre-elimination areas.

Despite the progress to date, the following technical areas present significant challenges for which greater SBC investment or attention is needed to improve the uptake and/or maintenance of behaviors.

Insecticide-Treated Mosquito Nets

In PMI-supported provinces, ITN ownership was reduced from 80 percent (MIS 2018) to 53 percent (MIS 2021), partly attributable to the “mosaic” distribution described earlier in the vector Control section. The use of ITNs among those with access (households with at least one ITN) also decreased from 75 percent (MIS 2018) to 68 percent (MIS 2021). Misconceptions about infertility, suffocation, and lack of malaria-carrying mosquitoes in the “cold season” persist.

Malaria in Pregnancy

In 2021, IPTp3 coverage in PMI-supported provinces increased from 42 percent (HMIS, 2020) to 58 percent (HMIS, 2021). However, cultural beliefs, including fears regarding early disclosure of pregnancy, remain and must be addressed to increase early ANC bookings and IPTp uptake.

Care Seeking

According to results from the 2021 MIS, in PMI-supported provinces, only 29 percent of caregivers of children under five years of age with fever sought treatment within 24 hours of the onset of the symptoms. Cost and distance to health facilities in remote areas remains a challenge, as do cultural beliefs and a preference for home treatment, as well as lack of knowledge about CHW services.

Provider Behaviors

According to Zambia’s treatment guidelines, only confirmed malaria cases should receive an antimalarial drug. However, 2021 OTSS data revealed that 79 percent of microscopy and 95 percent of nonmicroscopy sites adhere to positive test results. Additional training of health care providers is needed to ensure improved adherence, especially to microscopy test results.

SBC Approaches for Elimination Areas

PMI strives to saturate all pre-elimination areas with the SBC approaches used in other districts and provinces. In time, surveillance data and findings from the 2022 barrier analysis will help focus SBC activities to ensure that communities with a low malaria burden maintain high levels of use of prevention interventions.

7.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of SBC activities that PMI proposes to support in Zambia.

Community Engagement Plans

Moving forward, PMI will work with health facilities and NHCs to continue implementing the community engagement plans (CEPs). This will be done by: (1) supporting the community review of progress made in implementing the current plans to share lessons and experiences; (2) using evidence from health facilities to develop targeted interventions to be implemented where the need is highest in the NHC catchment area; and (3) supporting NHCs to create linkages with existing community structures to implement the revised CEPs, such as CHWs, CCAs, and religious and traditional leaders.

Engagement of Faith Leaders for Malaria Control and Elimination

PMI will collaborate with other subgranted CSOs to directly engage the Zambia Conference of Catholic Bishops, the Evangelical Fellowship of Zambia, the Christian Council of Zambia, Independent Churches of Zambia, and the Islamic Council of Zambia. The other subgranted CSOs will incorporate the engagement of religious leaders for malaria control and elimination in their scope of work in 2024.

Chiefdom-Led Initiative to Engage Traditional Leaders for Malaria Control and Elimination

PMI will continue to roll out the chiefdom-led initiative, the aim of which is to mobilize chiefs and all the headmen and headwomen under them to engage their villages and families to actively engage in adopting healthy behaviors to reduce malaria burden and death. This program includes the development of village action plans outlining specific activities to promote the adoption and use of malaria interventions, ensuring social accountability for malaria services and commodities.

Interpersonal Communication

PMI will provide intensive guidance for mapping, selection, and subsequent deployment of CCAs for efficiency and effectiveness. PMI will conduct quarterly mentorship visits to CCAs. During the visits, CCAs will undergo a one-day refresher training in IPC skills, including an introduction to the new reporting system and tools. CCA data will also be reviewed during these visits.

In addition to onsite capacity strengthening and stronger SBC tools, PMI will make deliberate efforts to provide continual but comprehensive CSO capacity assessments in implementing malaria SBC interventions. The assessments will identify critical gaps in skills and competences for facilitating the PMI SBC approach. Based on the identified gaps, PMI will strengthen appropriate CSO capacities that will improve the quality of SBC interventions.

Mass Media

PMI will continue to utilize radio to reach the masses with key malaria messages through radio spots, prerecorded radio programs, and live discussion programs. The various radio spots and programs will be prepared with NMEC and pretested before airing. The radio spots will focus on the benefits of using available malaria interventions, services, and products (ITNs, IRS, case management, and MIP).

Priorities

While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, the three behaviors outlined in Table 5 will be prioritized with FY 2024 funds

Table 5. Priority Behaviors to Address

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Prompt care seeking for fever for children under five years of age	Caregivers of children under five years of age and health care providers	All four provinces of PMI focus	● Conduct community- and household-level interpersonal communication informed by malaria barrier analysis and a malaria behavior survey, and through community dialogues. ● Enhance training and mentorship of CCAs. ● Introduce and integrate interpersonal communication in the OTSS module at health facilities.
Early ANC attendance and uptake of IPTp3	Women of childbearing age and their partners	All four provinces of PMI focus	● Promote engagement of traditional leaders in MIP activities to enforce early ANC attendance and uptake of IPTp. ● Train Safe Motherhood Action groups in effective interpersonal communication approaches. ● Conduct counseling during ANC and other key touchpoints to encourage consistent uptake of IPTp.
Correct and consistent net use and proper net care	General population	All four provinces of PMI focus	● Promote effective engagement and empowerment of traditional leaders, especially during mass ITN distribution campaigns. ● Conduct individual, household, and community interpersonal communication through CCAs to encourage nightly net use and proper net care.

ANC: antenatal care; CCA: community change agent; MIP: malaria in pregnancy; IPTp: intermittent preventive treatment for pregnant women; OTSS: outreach training and supportive supervision.

Additional Support Activities

In support of adaptive management, PMI will continue to collect routine SBC data. A Malaria Behavior Survey is planned for May 2024.

There is a need for continued SBC capacity strengthening at both the national and subnational levels. To bolster NMEC and provincial 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 and technical capacity of the SBC TWG.
- Funding for a seconded SBC advisor at NMEC who will support the development and implementation of the upcoming new national SBC strategy in addition to other key SBC activities.
- Provincial malaria SBC coordination in the four focal provinces by helping to resurrect the SBC coordination mechanism and by supporting the quarterly SBC coordination meetings.

- Continued development of evidence-based SBC materials that address leading determinants to the adoption of proven malaria interventions. PMI will support the design, development, and production processes for these SBC tools and materials.
- Strengthening the capacity of key players and stakeholders for effective SBC design, implementation, and evaluation.

8. Surveillance, Monitoring, and Evaluation

8.1. PMI Goal and Strategic Approach

PMI shares the following SM&E objectives in common with NMEP, as captured in the current national SM&E plan for malaria:

- To strengthen and enhance SM&E systems so that key indicators are reliable; can be accurately tracked; and the data are used strategically to inform malaria programming at the national, provincial, district, facility, and community level; and
- To assess the impact of the national malaria strategic plans and measure successes in reducing the malaria burden.

PMI coordinates and collaborates with NMEP and several partners, including the Bill & Melinda Gates Foundation/PATH/MACEPA, the Global Fund, WHO, Akros, and PEPFAR programs, to provide TA and resources for SM&E activities, including data system strengthening. Zambia exhibits a strong culture of data tracking and disease mapping at all levels.

PMI aims to continue strengthening routine malaria data collection at the community, health facility, district, provincial, and national level. A description of the routine health system can be found in the country malaria profile.

PMI also works to ensure high-quality periodic surveys to aid in PE and, most importantly, the national MIS. Zambia has implemented the MIS every two to three years since 2006, with data collection consistently timed at peak malaria season (April–May). The most recent MIS was in 2021; the next is planned for 2024.

8.2. Recent Progress (May 2022–April 2023)

Data for Decision Making (All Levels):

- In collaboration with the EMC, PMI promoted the institutionalization of the African Leaders Malaria Alliance/NMEC malaria scorecard. PMI supported the development and use of data visualization tools, including the national Tableau dashboard; the harmonized work plan; and vector control dashboards. These tools are presented and reviewed routinely in national forums such as NMEP monthly directorate meetings, provincial work planning meetings, TWG meetings, and the national insecticide resistance technical advisory group's meetings. Zambian President Hakainde Hichilema accepted an award at the February 2023 African Union Summit for the continent's most successful implementation of the African Leaders Malaria Alliance dashboard.

- PMI-supported training to build SM&E capacity at all levels. For example, 25 MOH staff and NMEP partner staff continued to participate in R open-source programming software training in collaboration with MACEPA.
- PMI continued to provide logistical support and TA to the SMEO TWG, which meets quarterly to provide national-level coordination and leadership in this area.

Strengthening of Routine Surveillance Systems, Including Data Quality Improvement

- **Malaria data quality audits:** In 2022, PMI supported NMEC to conduct data quality audits covering 577 HFCAs in four provinces, focusing on the four parameters of reporting rates, timeliness, completeness, and data quality. (Data in electronic systems are the same as data in health facility service-delivery registers.) Assessing data from health facilities and CHWs, the audit found that reporting and completeness rates remain high, ranging from 69 to 100 percent. However, data accuracy rates were low, and required intervention and follow up to improve. As part of the action plans to improve malaria data quality, in addition to regular follow up to facilities and CHWs, PMI continues to conduct data review meetings coupled with mentorship and technical supportive supervision to health facility staff and CHWs.
- **Data management and mentorship training:** PMI facilitated an annual data management and mentorship training for NMEP and PMI implementing partner staff, which covered topics on data access, verification, audits, analysis, and visualization using DHIS2, Tableau, and data quality assessment tools. The training was aimed at strengthening the capacity of NMEP and PMI implementing partner staff for providing regular support at the national and subnational levels to improve data management and the use of data for decision making.
- **Strengthening the interoperability of malaria data systems:** At the national level, PMI continued to provide TA to MOH's monitoring and evaluation unit and NMEC's SMEO unit. Objectives included improving the interoperability of the HMIS, MRR, Integrated Disease Surveillance and Response, and eLMIS database systems, and ensuring enhanced data quality in terms of completeness and consistency of data at both the health facility and community level.
    - PMI continued to support the collaboration between NMEC and multiple partners to harmonize malaria indicators across reporting systems, such as the VectorLink Collect database from the IRS program and the EDS database from the OTSS program.
    - Activities are informed by the rapid assessment at all administrative levels that was conducted in 2020 to provide baseline information, which was followed by a comparative systems analysis that identified inconsistencies in systems data elements and provided recommendations for harmonizing malaria data reporting. The key milestone in these database integration efforts will be the merging of functionality, such that the malaria data that end-users enter into MRR will automatically populate the HMIS, improving accuracy and saving labor.

    - In 2022, with PMI support, NMEC piloted this MRR-to-HMIS process in three districts: Mumbwa, Lusaka, and Nchelenge. At the same time, PMI supported NMEC/MOH to expand MRR coverage from the current 85 percent of districts to the targeted 100 percent. The overall interoperability objective of the MOH is to make the Malaria Rapid Reporting System the main source of malaria data across the country.
- **Digitization of the 2023 ITN mass distribution campaign:** In early 2023, PMI procured 1,154 Android-based smartphones and associated accessories and software in support of the digitization of the 2023 ITN mass campaign. Complementing similar Global Fund investments, PMI will procure 2,400 smartphones to facilitate electronic data capture and profiling of vital statistics at the household level for an effective campaign. The smartphones were configured with the DHIS2 tracker system and successfully utilized in the pilot that was successfully completed in April 2023; plans for the main campaign are underway. Other activities implemented to support the campaign include developing micro-planning and training of staff at the national, provincial, district, and facility on the digital data capture tool. Under NMEC guidance, following the campaign, these phones are to be deployed to strengthen data capture in CCM.

Digital Community Health Initiative

- PMI, in collaboration with the Bill & Melinda Gates Foundation/PATH/MACEPA, supported the launch of the Digital Community Health Initiative in Zambia. PMI funded the first stages of the initiative in 2021–2022, including conducting a Rapid Ecosystem Assessment and facilitating a stakeholders' working group. The final stage of PMI support, which concluded in April 2023, was the implementation of the CHW inventory training of trainers, including CBV registration and verification in four provinces, namely Eastern, Luapula, Central, and Southern. The goal is to optimize digital tools and systems to increase the effectiveness of CHWs and other community-level actors who work in malaria control, to enhance their integration into the health system, and to ensure that Zambia is well positioned to pilot innovations in this area.

Enhanced SM&E in Pre-Elimination Areas

- In the pre-elimination program area in Eastern province, PMI continues to build capacity to confirm every suspected case through the timely acquisition of data, which is enabled by an efficient logistics management information system and improved staff skills in managing data. As malaria cases decline, data quality becomes increasingly important for making informed decisions to further reduce case incidence. PMI has continued to support intensified activities focused on data quality improvement, including capacity strengthening through training in surveillance and DHIS2 reporting for health facility staff and CHWs and the provision of tools for data capturing, analysis, reporting, and utilization for decision making. It has focused on capacity strengthening in HMIS/DHIS2-related issues, including MRR and RCD reporting.

- To improve malaria elimination capacity, PMI continued to support the establishment and management of a dedicated server at the MOH data center to house and process data for malaria case-based surveillance (1-3-7 approach). This data platform was piloted for use in Southern Province for later adaptation to the pre-elimination program in Eastern Province.

Field Epidemiology Training Program

- PMI currently supports three Field Epidemiology Training Program residents in collaboration with the Zambian National Public Health Institute and the U.S. Centers for Disease Control and Prevention country office. Two residents are embedded in the SMEO unit of NMEC in Lusaka, and the third is embedded in the Luapula PHO in Mansa. Recent projects include: (1) epidemiologic investigation of residual malaria in selected settings, following WHO protocols; (2) incorporation of COVID-19 surveillance into an existing ANC platform for malaria surveillance in Chadiza district, Eastern Province; and (3) assessment of risk factors for low IPTp uptake among respondents in the 2018 MIS.

8.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of SM&E activities that PMI proposes to support in Zambia.

PMI/Zambia will continue to support SM&E activities as described in the recent progress section above, with a continued focus on the subareas of data for decision making, strengthening of routine surveillance systems, data quality improvement, enhanced SM&E in pre-elimination areas, and the Field Epidemiology Training Program.

- **Surveillance:** PMI will continue to strengthen routine malaria data reporting at the community, health facility, district, and provincial level in the four provinces with a high malaria burden, including support for training and mentorship of CHWs, health facility staff, and district health offices in data collection, reporting, and use for decision making. PMI will also support data quality audits and data review meetings, including resources for central-level NMEP personnel participation and follow-up.
    - As described in the OR and PE section below, PMI would be ready to support the rollout of the ANC-based approach to surveillance in targeted districts, following the conclusion of the pilot program in Chadiza and a policy review by the MOH.
    - As described in the case management section, passive case management (iCCM) will increasingly be complemented by CHW participation in surveillance and response activities that are appropriate to the local epidemiologic level, including expanded engagement in reactive case detection (HFCAs <200 cases per 1,000 population per year) and the introduction of the 1-3-7 approach (rural HFCAs with <50 cases per population per year).

- **Data system strengthening:** Support national-level HMIS and MRR system strengthening, coordinating with partners such as NMEC, the MOH's monitoring and evaluation unit, the Bill & Melinda Gates Foundation's Digital Community Health Initiative, Zenisys, and ICEMR. Provide technical assistance to enhance standardization and interoperability of databases. Continue to support the secondment of the Systems Administrator and the Malaria Data Analyst at NMEC to backstop the management of databases and support data integration and visualization. Enhance the capacity to triangulate routine, entomologic, and epidemiologic surveillance data with datasets from implementation and research partners, including the Nchelenge Malaria Learning Lab.
- **2026 MIS:** Zambia has been a pace-setter in its early and regular implementation of national malaria indicator surveys, conducted every 2–3 years since 2006. The malaria community makes extensive use of MIS findings. For example, the 2021 MIS provided essential data to inform the malaria program review, notably on intervention coverage at the household level and parasitemia rates among children under five years of age. These data informed the development of the National Malaria Elimination Strategic Plan 2022–2026. The NMESP calls for an MIS in CY 2024 to inform a mid-term evaluation, and another MIS in 2026 to inform the end-term review and development of the next NMESP (2027–2031). With FY 2024 funds, PMI will provide partial initial funding for the anticipated 2026 Zambia Malaria Indicator Survey toward supporting early preparations for the survey, including the provision of TA for planning and the procurement of supplies. As for past surveys, the cost of the 2026 survey is expected to be shared by MACEPA and the Global Fund.

Of note, although the new NMESP calls for a program in epidemic preparedness and response (EPR), this thematic area is not currently a funding priority for PMI/Zambia, which focuses on endemic settings. However, planned PMI support to strengthen real-time surveillance and response capabilities in pre-elimination districts (e.g., the 1-3-7 approach) is expected to contribute to NMEC's nascent EPR program. Moreover, as Zambia makes progress toward subnational and national elimination, a justification for direct investments in EPR by PMI would be expected to emerge in future years.

Table 6. Available Malaria Surveillance Sources

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Household Surveys	Demographic Health Survey				P[3]		
Household Surveys	Malaria Indicator Survey (MIS)		X			P	
Household Surveys	Multiple Indicator Cluster Survey (MICS)						
Household Surveys	EPI survey		X (Chadiza)		P (Chadiza)		
Health Facility Surveys	Service Provision Assessment						
Health Facility Surveys	Service Availability Readiness Assessment (SARA) survey						
Health Facility Surveys	Other Health Facility Survey						
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies	[1]		[1]		P	
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System						
Malaria Surveillance and Routine System Support	Support to HMIS	X	X	X	P	P	P[2]
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response (IDSR)						
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System (eLMIS)	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Malaria Rapid Reporting System	X	X	X	P	P	P[2]
Other	End Use Verification Survey	X	X	X	P	P	P
Other	School-based Malaria Survey						
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey					P	

Other	Malaria Impact Evaluation					P	
Other	Entomologic Monitoring Surveys	X	X	X	P	P	P

[1] Non-PMI funded activities. [2] With PMI support, the MRR is intended to become integrated with HMIS, when CHWs will enter data into MRR and automatically populate HMIS, both running on the NMEC instance of DHIS2. [3] PMI does not support the DHS, which is typically supported by USAID maternal and child health and family planning activities and multiple cooperating partners. X denotes completed activities; P denotes planned activities.

9. Operational Research and Program Evaluation

9.1. PMI Goal and Strategic Approach

The Zambian 2022–2026 NMESP highlights "harnessing innovation through focused research" as a key aspect of health system strengthening. NMEP conducts an annual consultative exercise, supported by the Global Fund and with PMI participation, during which research priorities are updated. NMEP's SMEO unit and the SMEO TWG vet research proposals, guide research implementation, and disseminate findings. PMI coordinates with other major sponsors of malaria research, including the Bill & Melinda Gates Foundation/PATH/MACEPA and NIH, to identify areas that would benefit from PMI support. Recent examples are described in the following section.

9.2. Recent Progress (May 2022–April 2023)

Over the past year, PMI/Zambia continued to support a set of ongoing OR activities in Chadiza district and PE activities in Nchelenge district—the two designated "learning lab" districts. The activities in Nchelenge continue to be conducted in collaboration with ICEMR. Data collection and analysis are ongoing. The activities are detailed in the FY 2023 Malaria Operational Plan. Table 8 presents brief status updates.

Table 8. PMI-Funded OR and PE Studies in Zambia

Recently Completed Studies	Status of Dissemination	Start Date	End Date
Zambia Antenatal Surveillance Pilot: Assessing Coverage and Prevalence from Routine Antenatal Care Visits in Chadiza District, Eastern Province	• Completed first phase; results shared with NMEP • Resumed data collection in Q1 2023 • Awaiting endline survey data from ProACT study for further validation analysis	March 2020	Q3 2023
Ongoing or Planned Studies	**Status**	**Start Date**	**End Date**
A Cluster Randomized Controlled Trial of Proactive Community Case Management for Malaria in Chadiza District, Eastern Province (ProACT study)	• Intervention conducted November 2021 to April–May 2021 • Endline survey conducted April–May 2023 • Data analysis pending	March 2021	Q4 2023

NMEP: National Malaria Elimination Program; OR: operational research; PE: program evaluation.

Table 9. Non-PMI-Funded Planned and Ongoing OR and PE Studies in Zambia

Source of Funding	Implementing institution	Research Question/Topic	Current Status/ Time Line
NIH (PMI-funded IRS operations and residual efficacy as part of standard implementation)	ICEMR for Southern and Central Africa; led by Johns Hopkins University	Impact of IRS at the end of the rainy season in Nchelenge district: A demonstration project (PMI-supported IRS operations)	Completion expected in 2023; began March 2022, data collected through the end of 2022; data analysis is ongoing.
NIH	ICEMR for Southern and Central Africa. Led by Johns Hopkins University	Longitudinal impact monitoring of malaria control measures in Nchelenge and Choma districts	Ongoing, monthly sampling of household parasitologic and entomologic indices, complemented by health facility caseloads; ongoing correlation with malaria control intervention implementation; ongoing studies of risk factors for severe malaria and death, including blood stockouts; ICEMR research activities started in 2010 in Choma district and in 2012 in Nchelenge district.
World Health Organization (AFRO II Project)	MOH	Assessment of feasibility and impact of window screening compared with ITNs alone on malaria prevalence	Nyimba district; completion is expected in 2023; baseline survey conducted in August 2019; implementation began in October 2019.
Bill & Melinda Gates Foundation	PATH/MACEPA, MOH	Attractive target sugar baits, entomologic validation, epidemiologic evaluation	Ongoing in Kaoma district; began in February 2020.

ICEMR: International Centers for Excellence in Malaria Research; MACEPA: Malaria Control and Elimination Partnership; MOH: Ministry of Health; NIH: National Institutes of Health.

9.3. Plans and Justification with FY 2024 Funding

There are no specific OR or PE activities proposed with FY 2024 MOP funding at this time. PMI implementing partners who are active in Nchelenge District will continue to be guided to collaborate in data sharing with the ICEMR. Complementing this, PMI will continue to invest in enhanced capacity to triangulate routine entomologic and epidemiologic surveillance data with datasets from implementation and research partners. In light of the completion of the ProACT study (CCM) in CY 2023, PMI and NMEC are exploring topics of mutual interest for potential future research activities.

10. Capacity Strengthening

10.1. PMI Goal and Strategic Approach

PMI supports capacity strengthening and malaria health system improvements at the provincial, district, facility, and community level, including data-driven decision making at the national and subnational level.

In alignment with NMEP's 2030 goals, PMI advocates for further saturation of proven interventions and for increased focus and funding toward malaria by the Zambian government. PMI will continue to complement these efforts by advocating for increased integration of nongovernmental cooperating partners.

10.2. Recent Progress (April 2022–April 2023)

During the period under consideration, PMI provided capacity-strengthening support to NMEC through professional development activities as well as secondment of staff in key positions, including malaria data analyst, systems administrator, and SBC advisor. In addition to providing direct technical assistance to support the 2021–2022 Malaria Program Review and the development of the new NMESP (2022–2026), PMI supported the printing, launch, and distribution of seven data-driven strategic documents to guide malaria control interventions, including the National Malaria Elimination Strategic Plan (NMESP 2022–2026); Malaria Indicator Survey (MIS 2021); Malaria Program Review; Malaria Operational Plan; Monitoring and Evaluation Plan; National Insecticide Treated Bednet Guidelines; and National Malaria Diagnosis and Treatment Guidelines. Due to the COVID 19 pandemic, Peace Corps activities were on hold in Zambia, and PMI did not provide any support through this activity.

To ensure maximum program impact, PMI has continued to ensure collaborative integration within the USAID health sector, as well as across the MOH. For example, PMI has continued to strengthen collaboration with the USAID Family Health team as well as the Maternal Reproductive Health Unit at the MOH to increase early ANC attendance and improve IPTp uptake. PMI worked across sectors within the USAID Zambia Mission to develop an integrated supply chain commodity security and risk management plan. (See the supply chain section for details.)

PMI has continued to strengthen staff capacity at the provincial, district, and health facility level to implement select malaria activities that include CHW training and OTSS visits through an implementing partner. To facilitate SBC activities at the community level, PMI has continued to engage with local CSOs, particularly community and faith-based organizations, and has provided mentoring, training, and supervision support to the CSOs.

In line with the USAID Mission's localization and private sector engagement priorities, PMI continues to engage with the private sector at multiple levels. For example, PMI continues to leverage the longstanding investments by Zambian mining companies in spray campaigns for mosquito control through participation in national-level training and planning exercises.

Since 2022, the USAID Administrator's office has highlighted Zambia's End Malaria Council as part of USAID's Democracy Delivers Initiative. The EMC was launched in 2019 to increase domestic resource mobilization to achieve and sustain malaria elimination. Zambia's EMC convenes senior-level, multisectoral stakeholders, including government, business, faith-based, and traditional leaders. The EMC is country-led and country-owned. Since its inception, PMI/Zambia has played the role of an enthusiastic "cheerleader" for the EMC and the End Malaria Fund. PMI has provided modest financial and in-kind support to the EMC secretariat. PMI sits on the steering committee and provides technical and programmatic advice.

In 2021, PMI commissioned an inventory of Zambia's private sector involvement in malaria control, which was finalized in February 2023. The inventory will help inform future investments by the national EMC as well as USAID activities. Both PMI and the EMC share the goal of avoiding EMC/End Malaria Fund dependency on international donors.

10.3. Plans and Justification with FY 2024 Funding

The FY 2024 funding tables contain a full list of capacity-strengthening activities that PMI proposes to support in Zambia.

In FY 2024, PMI will continue to support capacity strengthening and malaria health system improvements at the provincial, district, facility, and community level, including data-driven decision making at the national and subnational level. Key planned activities under capacity strengthening include: support to the Peace Corps activities in malaria control; capacity strengthening of NMEC staff through development activities such as training workshops and participation in regional/global conferences; support of light vehicle maintenance and repairs as allowable under USAID rules and regulations; direct technical assistance to aid the MOH in exploring opportunities to take advantage of innovations in malaria technology and systems, including vaccines; and investing in technology to strengthen health systems for treating severe malaria, targeting high-volume health facilities.

To ensure local capacity strengthening, in CY 2025 PMI will continue to provide time-limited support to the EMC in its role of advocacy, accountability, and intersectoral mobilization of domestic resources. This support will be scaled down from previous years' investments. It is intended to aid the EMC to implement high-impact activities, including the engagement of communications specialist(s), coupled with modest resources for SBC implementation, to engage the private sector more effectively. Illustrative subactivities would include developing material and programming to "make the business case" for malaria control; convening private sector roundtables at the provincial level; supporting learning tours of successful examples of private sector malaria programs (e.g. mines and plantations); and strengthening EMC/End Malaria Fund satellite programs at the provincial level.

In addition, PMI will support the capacity strengthening of potential new USAID local partners to implement select malaria interventions, including training CHWs, SBC activities, and entomological monitoring in some provinces of PMI focus. These efforts will be informed by assessments to be conducted in CY 2024. Following the outcome of these assessments, PMI will provide organizational capacity-strengthening support.

In CY 2022, PMI supported a learning tour to Southern Province, which has seen substantial decreases in malaria, to build the MCI capacity of the MOH staff in pre-elimination districts of Eastern Province. In CY 2025 funding, PMI will continue to strengthen the capacity of the pre-elimination districts in the level 1 strata to implement MCI. For more information refer to the case management section.

11. Staffing and Administration

Four health professionals oversee PMI in Zambia. The interagency team is led by the USAID Mission Director, although day-to-day oversight has been delegated to the health office director and the deputy health officer director. The PMI in-country team consists of a resident advisor representing USAID, a resident advisor representing the U.S. Centers for Disease Control and Prevention, and two locally hired staff known as foreign service nationals. The PMI interagency team works together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

ANNEX: GAP ANALYSIS TABLES

Table A-1. ITN Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	24,948,932	25,647,502	26,365,632
Total population at risk for malaria	24,948,932	25,647,502	26,365,632
PMI-targeted at-risk population	24,948,932	25,647,502	26,365,632
Population targeted for ITNs	24,948,932	25,647,502	26,365,632
Continuous distribution needs			
Channel 1: ANC	1,347,242	1,384,965	1,423,744
Channel 1: ANC type of ITN	PBO	PBO	PBO
Channel 2: EPI	1,297,344	1,333,670	1,371,013
Channel 2: EPI type of ITN	PBO	PBO	PBO
Channel 3: School			50,000
Channel 3: School type of ITN			PBO
Channel 4: Community			
Channel 4: Community type of ITN			
Channel 5:			
Channel 5: Type of ITN			
Estimated total need for continuous channels	2,644,587	2,718,635	2,844,757
Mass campaign distribution needs			
Mass distribution campaigns	11,636,635	0	0
Mass distribution ITN type	PBO		
Estimated total need for campaigns	11,636,635	0	0
Total ITN need: Continuous and campaign	14,281,222	2,718,635	2,844,757
Partner contributions			
ITNs carried over from previous year	0	0	0
ITNs from government	0	0	0
Type of ITNs from government			
ITNs from Global Fund	5,643,787	0	0
Type of ITNs from Global Fund	PBO	PBO	PBO

ITNs from other donors	6,229,001	0	0
Type of ITNs from other donors	PBO	PBO	PBO
ITNs planned with PMI funding	600,000	1,200,000	1,083,086
Type of ITNs with PMI funding	PBO	PBO	PBO
Total ITNs contribution per calendar year	12,472,788	1,200,000	1,033,086
Total ITN surplus (gap)	**(1,808,434)**	**(1,518,635)**	**(1,811,671)**

Table A-2. RDT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	20,277,535	20,966,971	21,679,848
Population at risk for malaria	20,277,535	20,966,971	21,679,848
PMI-targeted at-risk population	20,277,535	20,966,971	21,679,848
RDT needs			
Total number of projected suspected malaria cases	34,643,114	40,860,434	42,249,688
Percent of suspected malaria cases tested with an RDT	100%	100%	100%
RDT needs (tests)	36,812,559	37,991,020	33,673,741
Needs estimated based on other (specify in comments)			
Partner contributions (tests)			
RDTs from government	25,500,000	0	0
RDTs from Global Fund	0	0	0
RDTs from other donors	0	0	0
RDTs planned with PMI funding	4,565,975	5,150,000	5,789,474
Total RDT contributions per calendar year	30,065,975	5,150,000	5,789,474
Stock balance (tests)			
Beginning balance	25,471,675	18,725,091	0
- Product need	36,812,559	37,991,020	33,673,741
+ Total contributions (received/expected)	30,065,975	5,150,000	5,789,474
Ending balance	**18,725,091**	**(14,115,929)**	**(27,884,267)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	18,406,280	18,995,510	16,836,871
Total surplus (gap)	**318,812**	**(33,111,439)**	**(44,721,138)**

Table A-3. ACT Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	20,277,535	20,966,971	21,679,848
Population at risk for malaria	20,277,535	20,966,971	21,679,848
PMI-targeted at-risk population	20,277,535	20,966,971	21,679,848
ACT needs			
Total projected number of malaria cases	12,901,096	13,314,372	10,837,045
Total ACT needs (treatments)	**12,901,096**	**13,314,372**	**10,837,045**
Needs estimated based on other (specify in comments)			
Partner contributions (treatments)			
ACTs from government	20,574,810	0	0
ACTs from Global Fund	1,157,370	0	0
ACTs from other donors	0	0	0
ACTs planned with PMI funding	4,212,300	3,066,667	2,591,549
Total ACTs contributions per calendar year	**25,944,480**	**3,066,667**	**2,591,549**
Stock balance (treatments)			
Beginning balance	1,731,900	14,775,284	4,527,579
- Product need	*12,901,096*	*13,314,372*	*10,837,045*
+ Total contributions (received/expected)	25,944,480	3,066,667	2,591,549
Ending balance	**14,775,284**	**4,527,579**	**(3,717,917)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	6,450,548	6,657,186	5,418,523
Total surplus (gap)	**8,324,736**	**(2,129,607)**	**(9,136,440)**

Table A-4. Inj. Artesunate Gap Analysis Table

Calendar Year	2023	2024	2025
Injectable artesunate needs			
Projected number of severe cases	114,339	118,002	96,046
Projected number of severe cases among children	0	0	0
Average number of vials required for severe cases among children	0	0	0
Projected number of severe cases among adults	0	0	0
Average number of vials required for severe cases among adults	0	0	0
Total injectable artesunate needs (vials)	**347,588**	**350,009**	**408,451**
Needs estimated based on other (specify in comments)			
Partner contributions (vials)			
Injectable artesunate from government	700,000	0	0
Injectable artesunate from Global Fund	0	0	0
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding	270,000	358,852	0
Total injectable artesunate contributions per calendar year	**970,000**	**358,852**	**0**
Stock balance (vials)			
Beginning balance	851,262	1,473,674	1,482,517
- Product need	347,588	350,009	408,451
+ Total contributions (received/expected)	970,000	358,852	0
Ending balance	**1,473,674**	**1,482,517**	**1,074,066**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	173,794	175,005	204,226
Total surplus (gap)	**1,299,880**	**1,307,513**	**869,841**

Table A-5. RAS Gap Analysis Table

Calendar Year	2023	2024	2025
Artesunate suppositories needs			
IPD cases (HMIS)	67,676	66,094	64,510
Malaria cases (community) - A*24% Malaria Rapid Reporting System contribution	16,242	15,862	15,482
Malaria cases (out-patient department) - B*3% (97% HMIS reporting)	487	476	464
Adjusting for variances from the source document to the HIA form - B *15%	2,436	2,379	2,322
Adjusting for variances from the HIA form to DHIS2 - B *5%	812	793	774
Subtotal 1 (B+C+D+E)	71,413	69,742	68,071
Under 5 proportion F* 51%	36,420	35,568	34,716
Adjusting for 4500 CHW Training - 4500* 2	9,000	9,000	9,000
Adjusting for uncaptured malaria cases at the community level - G*2%	728	711	694
Total adjusted malaria cases: G+H+I	**46,149**	**45,280**	**44,411**
Total artesunate rectal need (suppositories)	**69,852**	**67,548**	**65,928**
Partner contributions (vials)			
Rectal artesunate from government	23,400	0	0
Rectal artesunate from Global Fund	0	0	0
Rectal artesunate from other donors	0	0	0
Rectal artesunate planned with PMI funding	117,000	79,365	72,464
Total rectal artesunate contributions per calendar year	**140,400**	**79,365**	**72,464**
Stock balance (vials)			
Beginning balance	10,072	80,620	92,437
- Product need	69,852	67,548	65,928
+ Total contributions (received/expected)	140,400	79,365	72,464
Ending balance	**80,620**	**92,437**	**98,973**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	34,926	33,774	32,964

Table A-6. SP Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	20,277,535	20,966,971	21,679,848
Total population at risk for malaria	20,277,535	20,966,971	21,679,848
PMI targeted at risk population	20,277,535	20,966,971	21,679,848
SP needs			
Total number of pregnant women	944,536	1,028,053	1,063,006
Percent of pregnant women expected to receive IPTp1	89%	92%	95%
Percent of pregnant women expected to receive IPTp2	79%	79%	79%
Percent of pregnant women expected to receive IPTp3	68%	68%	68%
Percent of pregnant women expected to receive IPTp4	16%	16%	16%
Total SP needs (doses)	**2,380,231**	**2,621,535**	**2,742,555**
Needs estimated based on other (specify in comments)			
Partner contributions (doses)			
SP from government	2,604,333	0	0
SP from Global Fund	0	0	0
SP from other donors	0	0	0
SP planned with PMI funding	2,083,333	1,774,193	1,309,524
Total SP contributions per calendar year	**4,687,666**	**1,774,193**	**1,309,524**
Stock balance (doses)			
Beginning balance	179,333	2,486,768	1,639,426
- Product need	2,380,231	2,621,535	2,742,555
+ Total contributions (received/expected)	4,687,666	1,774,193	1,309,524
Ending balance	**2,486,768**	**1,639,426**	**206,395**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	1,190,115	1,310,768	1,371,278
Total surplus (gap)	**1,296,653**	**328,659**	**(1,164,883)**

Table A-7. Primaquine Gap Analysis Table

Calendar Year	2023	2024	2025
Total country population	20,277,535	20,966,971	21,679,848
Total population at risk for malaria	20,277,535	20,966,971	21,679,848
PMI-targeted at-risk population	20,277,535	20,966,971	21,679,848
Primaquine needs			
Total projected number of malaria cases	12,901,096	13,314,372	10,837,045
Total projected number of Pf cases	0	0	0
Total projected number of Pv cases	0	0	0
Total projected number of mixed cases (Pf + Pv)	0	0	0
Total primaquine needs (tablets)	**884,481**	**912,815**	**742,973**
Select data source			
Partner contributions (tablets)			
Primaquine from government	940,000	0	0
Primaquine from Global Fund	0	0	0
Primaquine from other donors	0	0	0
Primaquine planned with PMI funding	0	200,000	250,000
Total primaquine contributions per calendar year	**940,000**	**200,000**	**250,000**
Stock balance (tablets)			
Beginning balance	0	55,519	0
- Product need	884,481	912,815	742,973
+ Total contributions (received/expected)	940,000	200,000	250,000
Ending balance	**55,519**	**(657,296)**	**(492,973)**
Desired end of year stock (months of stock)	6	6	6
Desired end of year stock (quantities)	442,241	456,408	371,487
Total surplus (gap)	**(386,722)**	**(1,113,704)**	**(864,460)**