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Zambia

Malaria Operational Plan FY 2023

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

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

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based Combination Therapy
ANC	Antenatal Care
BMGF	Bill & Melinda Gates Foundation
CBV	Community-based Volunteers
CCA	Community Change Agent
CCM	Community Case Management
CDC	U.S. Centers for Disease Control and Prevention
CHAZ	Churches Health Association of Zambia
CHW	Community Health Worker
CSO	Civil Society Organization
CY	Calendar Year
DDT	Dichlorodiphenyltrichloroethane
DHIS2	District Health Information Software 2
DHO	District Health Office
DQA	Data Quality Audit
EDS	Electronic Data System
eLMIS	Electronic Logistics Management Information System
EMC	End Malaria Council
EPI	Expanded Program on Immunization
EPR	Epidemic Preparedness and Response
FY	Fiscal Year
G2G	Government-to-Government
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GRZ	Government of the Republic of Zambia
HFCA	Health Facility Catchment Area
HMIS	Health Management Information System
iCCM	Integrated Community Case Management
ICEMR	International Center of Excellence in Malaria Research
IPTp	Intermittent Preventive Treatment in Pregnancy
IRS	Indoor Residual Spraying
ITN	Insecticide-Treated Mosquito Net
LSM	Larval Source Management
MACEPA	Malaria Control and Elimination Partnership in Africa
MDA	Mass Drug Administration
MIP	Malaria in Pregnancy
MIS	Malaria Indicator Survey
MOH	Ministry of Health
MOP	Malaria Operational Plan
MRR	Malaria Rapid Reporting

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
RCD	Reactive Case Detection
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
TES	Therapeutic Efficacy Study
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization
ZAMMSA	Zambia Medicines and Medical Supplies Agency

EXECUTIVE SUMMARY

To review specific country context for Zambia, please refer to the Zambia Country Malaria Profile, which provides an overview of the country malaria situation, key indicators, the National Malaria Elimination Strategic Plan (NMESP), and the partner landscape.

U.S. President's Malaria Initiative

Launched in 2005, the U.S. President's Malaria Initiative (PMI) supports implementation of malaria prevention and treatment measures as well as cross-cutting interventions. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 24 countries in sub-Saharan Africa and three programs across the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. 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 Ministry of Health's (MOH) National Malaria Elimination Centre (NMEC),[1] in 2021 there were over 7,050,000 reported malaria cases; malaria case incidence was estimated to be 340 per 1,000 population/year; prevalence in children under five years of age was found to be 29 percent (rapid diagnostic test [RDT]-based); and Zambian hospitals reported 1,503 total deaths from malaria, an incidence of eight inpatient deaths per 100,000 population (Health Management Information System 2021; Malaria Indicator Survey [MIS] 2021). Malaria transmission occurs all 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 parasite, causing the most severe form of malaria and accounting for 98 percent of all malaria infections in Zambia. Malaria vector species composition is heterogeneous at the national level with the three

[1] In 2017, the national malaria program was rebranded from the National Malaria Control Program (NMCP) to the National Malaria Elimination Centre (NMEC) 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" (NMEP) is used to signify the wider malaria partnership which is led by the NMEC.

species, *Anopheles funestus s.s, An. gambiae s.s,* and *An. arabiensis*, as the primary vectors of malaria.

Progress in implementation had largely followed positive trends from the first MIS in 2006 and 2008 through the MIS in 2018. However, the 2021 MIS revealed a mixed 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 lived in areas with 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), with the exception of 2020, which saw a spike in malaria case incidences across Zambia and throughout much of southern and eastern Africa.

Overview of Planned Interventions

The proposed FY 2023 PMI funding for Zambia is $28 million. PMI will support the following intervention areas with these funds:

1. Vector Monitoring and Control

PMI is moving toward more purposeful entomological monitoring to better support the National Malaria Elimination Program's (NMEP) programmatic choices in regards to vector control implementation and choice of insecticide. PMI supports NMEP's approach of universal coverage with piperonyl butoxide (PBO) or dual active ingredient insecticide-treated mosquito nets (ITNs) as the primary vector control strategy. In addition, PMI is aligned with the NMEP's modified approach to indoor residual spraying (IRS), which involves targeting districts where impact can be demonstrated and there is high transmission.

Key planned activities in vector monitoring and control include:

- Support of the NMEP's decision-making with greater emphasis on question-based entomological monitoring with the immediate question cluster: What is the interaction between human behavior and mosquito biting? What is the risk of being bitten indoors and outdoors? What are the gaps in IRS and ITN implementation?
- Programmatic choice of insecticides will continue to be supported by annual insecticide susceptibility testing and monthly cone wall bioassays to assess the decay rate of sprayed insecticides on different wall surfaces.
- Deployment of PBO ITNs in the continuous distribution channels of antenatal care (ANC) clinics, Expanded Program on Immunization (EPI), and school-based channels.
- Support for criteria development for targeting IRS and implementation of the targeting strategy.

2. Malaria in Pregnancy

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

- ITNs provided via ANC clinics
- Intermittent preventive treatment (IPTp) with sulfadoxine-pyrimethamine
- Prompt and effective diagnosis and treatment of pregnant women with malaria

PMI will continue to support these MIP activities in four high-burden PMI focus provinces (Eastern, Luapula, Muchinga, and Northern), including modest investments in outreach training and supportive supervision (OTSS) in Copperbelt and Central provinces.

3. Drug-Based Prevention

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

4. Case Management

PMI supports nationwide procurement of malaria RDTs, artemisinin-based combination therapy, and injectable and rectal artesunate suppositories (RAS), as well as OTSS activities in six provinces.

PMI's support falls in line with the NMEC's case management objective 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. Based on lessons learned and consistent with emerging MOH policy on harmonization of community health worker (CHW) incentives, PMI will mobilize community-based volunteers (CBVs) in targeted geographies to conduct community case management of malaria. Program design and operationalization will be consistent with the emerging MOH policies in provisioning CBV incentive harmonization and with U.S. government policies and best practices, and will be closely coordinated with other CBV funders including President's Emergency Plan for AIDS Relief (PEPFAR) partners. Any funding for CBV stipends will be informed by a feasibility assessment and a pilot program prior to implementation of this Malaria Operational Plan (MOP).

Whereas PMI support in recent years has focused primarily on outpatient care, going forward the inpatient setting will receive increased attention. This is consistent with the priorities of the new five-year 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 in all facilities, in all epidemiologic strata. Strategic objectives include regular training and mentoring of all individuals involved in complicated malaria treatment according to national guidelines.

5. Health Supply Chain and Pharmaceutical Management

Overall, PMI's support for health supply chain and pharmaceutical management—forecasting and quantification, logistics management, and information systems—aligns well with the current 2022–2026 NMESP. Mass drug administration is the one NMESP pharmaceutical management intervention area that PMI does not support currently.

In the FY 2023 MOP, PMI will focus on: forecasting and supply planning technical assistance (TA) to the MOH; logistics management information systems capacity-building; data visibility for assessing and monitoring stock status; and strengthened commodity security and risk management.

6. Social and Behavior Change

In alignment with the country's national malaria control/elimination communication strategy, PMI utilizes targeted social and behavior change (SBC) interventions that 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.

With FY 2023 funds, PMI will focus on: contracting with civil society organizations to conduct SBC through interpersonal communication at the community level; training and mentoring of Community Change Agents; and developing SBC community engagement plans.

7. Surveillance, Monitoring, and Evaluation

PMI shares common surveillance, monitoring, and evaluation (SM&E) objectives with the 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.
- To assess the impact of the national malaria strategic plans and measure successes in reducing malaria burden.

PMI coordinates and collaborates with the NMEP and several partners, including the Malaria Control and Elimination Partnership in Africa, which is funded by the Bill and Melinda Gates Foundation and implemented by PATH; the Global Fund to Fight AIDS, Tuberculosis and Malaria; WHO; and PEPFAR programs, in providing TA and

resources for SM&E activities, including data system strengthening. PMI also aims to strengthen routine malaria data collection at the community, health facility, district, provincial, and national levels.

PMI/Zambia will continue to support SM&E activities with continued focus on the sub-areas 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.

8. Operational Research

No specific OR/PE activities are proposed with FY 2023 funding. However, PMI implementing partners funded in FY 2023 who are active in Nchelenge 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

9. Capacity Strengthening

PMI supports 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.

In the FY 2023 MOP, PMI will continue to support Peace Corps activities in malaria control and will strengthen NMEC staff capacity through development activities such as training workshops and participation in regional/global meetings. PMI will also support a malaria orientation for advocacy leaders; light refurbishment of the NMEC and vehicle repair as allowable under U.S. Agency for International Development rules and regulations; TA to aid the MOH in exploring opportunities to take advantage of innovations in malaria technology and systems, including vaccines; and, pending completion of a blood supply assessment, TA to strengthen health systems for treating severe malaria.

I. CONTEXT AND STRATEGY

1. Introduction

Zambia began implementation as a U.S. President's Malaria Initiative (PMI) partner country in fiscal year (FY) 2008. This FY 2023 Malaria Operational Plan (MOP) presents a detailed implementation plan for Zambia, based on the strategies of PMI and the National Malaria Elimination Program (NMEP), developed in consultation with the NMEP and national and international partners. PMI is proposing activities that build on partner investments to improve and expand malaria-related services, including investments by the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund). This document provides an overview of the strategies and interventions in Zambia, progress to date, challenges and relevant contextual factors, and a description of activities planned with FY 2023 funding. For more detailed information on country context, please refer to the Zambia Country Malaria Profile, which provides an overview of the country's malaria situation, key indicators, the NMEP strategic plan, and the partner landscape.

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

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

Under the strategy, and building upon the progress to date in PMI-supported countries, PMI will work with national malaria control programs (NMCPs) 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 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 National Malaria Elimination Centre (NMEC), in 2021 there were over 7,050,000 reported malaria cases; malaria case incidence was estimated to be 340 per 1,000 population per year; prevalence in children under five years of age was found to be 29 percent (rapid diagnostic test [RDT]-based); and Zambian hospitals reported 1,503 total deaths from malaria, an incidence of eight inpatient deaths per 100,000 population (Health Management Information System [HMIS] 2021; Malaria Indicator Survey [MIS] 2021).

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, *Anopheles funestus* s.s*, An. gambiae* s.s, and *An. arabiensis*, as the primary vectors of malaria.

Risk is highest in the wetter, rural, impoverished areas of Luapula, Northern, Muchinga, North Western and Western (40–63 percent RDT-based prevalence 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 in the 2021 MIS). At the district level, malaria incidence varies widely, from fewer 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 alleviating malaria burden during recent years (World Health Organization [WHO] Malaria Report 2021). This is despite the Government of the Republic of Zambia (GRZ) having made significant progress in strengthening malaria control capacity in partnership with PMI, the Global Fund, the Bill & Melinda Gates Foundation (BMGF), nongovernmental organizations such as PATH, the Churches Health Association of Zambia (CHAZ), research institutions, and others. Worrisome findings in routine data characterized all provinces 2020, including an approximate 30–40 percent worsening of burden indicators from 2018–2019 levels, including incidence of uncomplicated cases, severe cases, and deaths. Indeed, 2020 saw a spike in malaria case incidence across Zambia and throughout much of southern and eastern Africa, for reasons which remain poorly elucidated. However, if 2020 may be set aside as an outlier, under the last strategic plan (2017 to 2021), Zambia did experience an encouraging slow decrease in the proportion of the population who lived in areas with case incidence of >500 per 1,000 population per year (dropping from 28 percent in 2017 to 19 percent in 2021).

Progress in implementation had largely followed positive trends from the first MIS in 2006, in 2008, and through the MIS in 2018. However, the 2021 MIS revealed a mixed picture.

- The proportion of households that had at least one ITN or had received 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.
- 68 percent of pregnant women in 2021 received medications to prevent malaria, which was stable from 2018 (67 percent) and had increased from 61 percent in 2015.
- 59 percent of children reported to have recent fever had received a finger or heel stick to test for malaria, which was stable from 55 percent in 2018 and had increased from 36 percent in 2015.

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

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 National Malaria Elimination Strategic Plan (NMESP) End Term Review highlighted low rates of NMEC activity implementation. Among the issues identified:

- Inadequate funding and late disbursement of funds for 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 have posed a great risk to the program's capacity to deliver timely interventions and conferred negative consequences on key performance indicators.
- Inadequate resources for scaling up support for high-quality case management at both facility and community levels, and for systems strengthening including surveillance, supply chain, and health workforce capacity in high burden districts.
- The vector control (IRS and ITN) sub-district "mosaic" approach deployed in 2020 was not well executed and resulted in reduced access to vector control. In brief, the Ministry of Health (MOH) prioritized IRS, but the resultant drop in ITN coverage (from 44 percent to 29 percent ITN ownership) was not compensated for by an increase in IRS coverage, as had been expected.
- Hindrances in NMEP program management with respect to human resource gaps in key areas including entomology, social and behavior change, and surveillance, monitoring, evaluation, and operations research (SMEO).
- Disruptions due to the COVID-19 pandemic in 2020–2021.

However, in 2022 prospects for effective collaboration in malaria control appear to have improved in the wake of the peaceful, democratic transition of 2021:

- The newly elected administration has started to invest more in health care personnel and essential medicines, and to resolve outstanding debts with medical supply vendors. 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/localization, and improved health care service delivery.
- The 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 consensus between the MOH and its partners around 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 the NMEP capacity at all levels.

3.3. PMI's Approach for Zambia

Zambia is in its fourteenth year as a PMI-focus country and has averaged $30 million per year in PMI support since FY 2017. The proposed FY 2023 PMI budget for Zambia is $28 million; this will bring the total PMI investment to nearly $408 million.

PMI organizes its investments in line with the Zambia national malaria elimination strategy. The previous strategy (2017–2021) is being supplanted by a new five-year strategy (2022–2026) which was launched in August 2022. The new strategy aims to "reduce malaria related morbidity and mortality nationally while pursuing subnational malaria elimination." The new strategy has sub-national goals of 1) in high transmission settings, lowering the burden; 2) in low-transmission settings, increasing the proportion of the population living in malaria-free Health Facility Catchment Areas (HFCAs); and 3) in malaria-free HFCAs, preventing reintroduction. 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 will support a comprehensive package of malaria control interventions, including purchases of commodities and technical assistance (TA) in the key intervention areas outlined in this FY 2023 MOP. Like the previous strategic plan, the new 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 Luapula, Northern, Muchinga, and Eastern provinces, including additional, modest support in case management TA for Central and Copperbelt. This geographic focus is responsive to NMEC partner coordination preferences and aligns with other USAID health programming and government-to-government (G2G) arrangements. Since 2018, PMI

has provided additional, modest support in case management TA for Central and Copperbelt, and since 2019 the PMI-funded IRS program has incorporated support for rural districts of Copperbelt following discussions/agreement with the NMEC.

PMI's investment strategy embraces the national, stratified approach. However, at a more granular level, PMI/Zambia's strategic approach does not align 100 percent with the national strategy. For example, PMI takes a more cautious approach regarding 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 is challenging. However, PMI/Zambia may consider collaboration in a trial of MDA in pre-elimination districts in the future, in the context of operational research (OR). Similarly, PMI historically has not funded larval source management (LSM). However, PMI/Zambia will in calendar year (CY) 2022 conduct an LSM feasibility assessment in selected HFCAs in two pre-elimination districts and, based on assessment findings, may consider modest support for implementation in an elimination setting.

PMI/Zambia's approach reflects all five of PMI's global strategic focus areas, including: 1) supporting the transition away from prioritization of IRS over ITNs to focus on high (>80 percent) national coverage of ITNs with an effective insecticide(s) to ensure reaching the unreached, and scale back IRS to focal areas based on to-be-determined criteria; 2) reaching full integrated community case management (iCCM) saturation of one community health worker (CHW) per 500 population 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 transition iCCM training and outreach training and supportive supervision (OTSS) to G2G, providing support to the End Malaria Council (EMC) in mobilizing domestic resources, and increasing the number of civil society organizations (CSOs) to cover all 47 PMI-supported districts in implementing interpersonal social and behavior change (SBC) activities; and 5) encouraging innovation and exploring new tools such as introduction of the new RTS,S malaria vaccine and scale up of the proactive community case management (CCM) model based on the ProACT study findings.

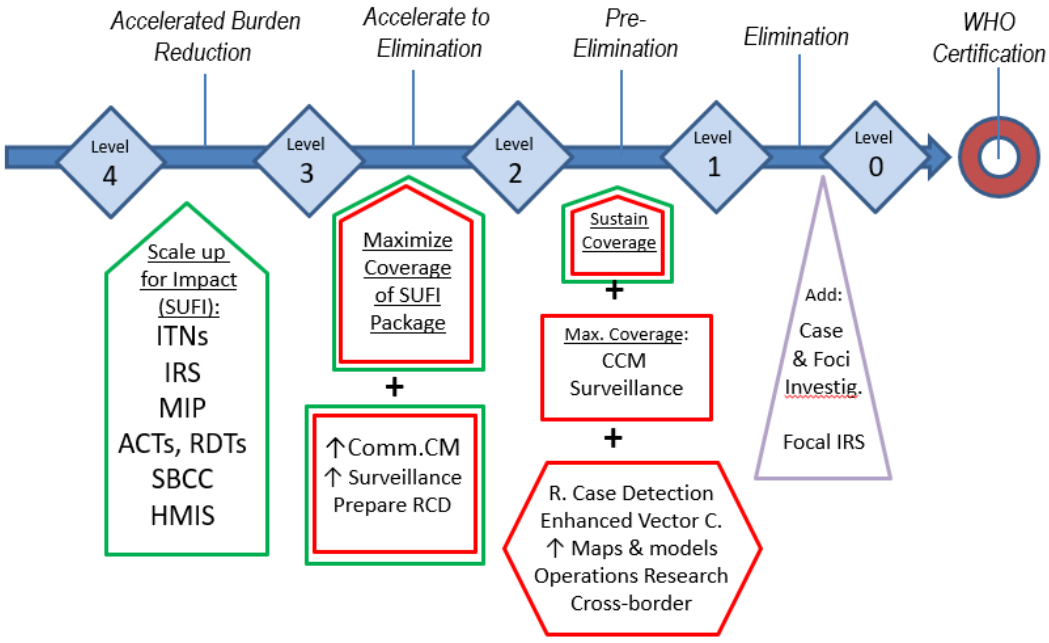
As a major partner of the NMEP, PMI aims to help the country accelerate toward its goal of malaria elimination as aggressively as resources, epidemiologic realities, and local constraints allow. In line with the PMI strategy regarding reaching the unreached, PMI/Zambia prioritizes reducing disease burden in high-burden areas in northern Zambia 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 technical guidance, WHO guidelines, and Zambia's NMESP strategic framework, PMI/Zambia will continue with a phased pre-elimination approach in seven pre-elimination districts in Eastern province (Chadiza, Katete, Sinda, Chipata, Chipangali, Kasenengwa, and Petauke) out of the total 15 districts:

- The initial phase has been 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 CHW-to-population ratio of 1:500), 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. As shown in Figure 2, the PMI pre-elimination districts were provided additional resources to saturate interventions in a staggered approach: the original three from CY 2018, and four new in CY 2019–2020.
- The second phase will include reassessment and introduction of additional or modified approaches as warranted. This will be informed by the 2022 pre-elimination Program Interim Assessment exercise, for example, piloting case-based investigation and response; exploring layering LSM based on the findings from the LSM feasibility assessment; and implementation of proactive CCM if the findings of the ProACT study are validated and adopted.

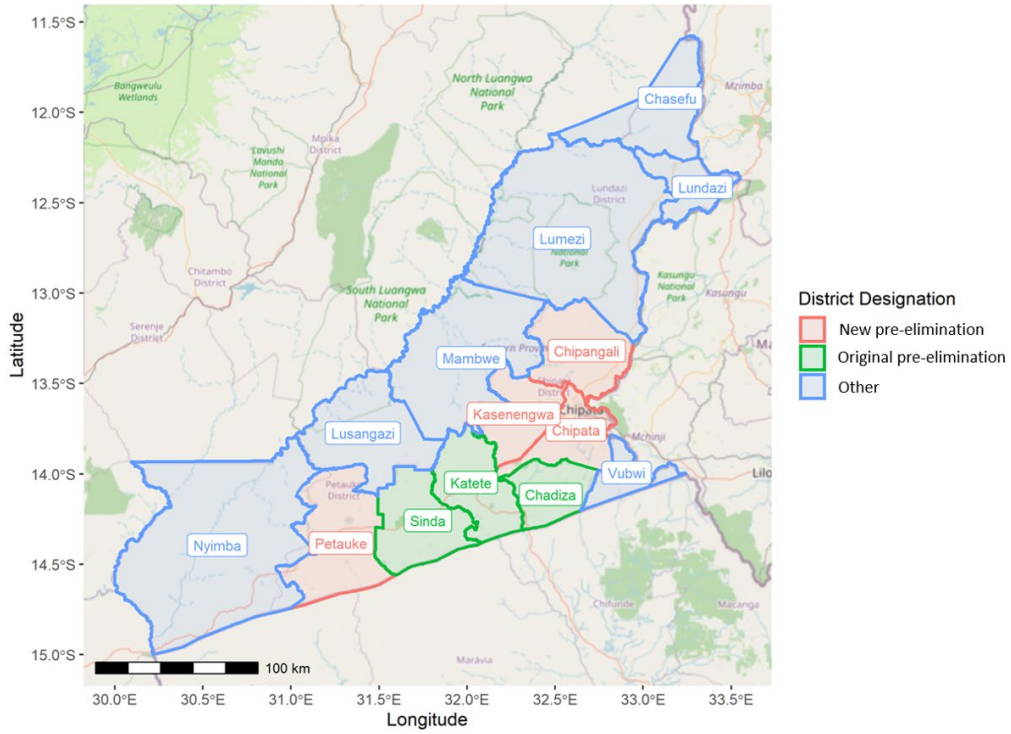
Figure 1. PMI/Zambia's Approach to Supporting the NMESP's Intervention Strategy



Key: · Main MOP investments in Green.
· Additional PMI pre-elimination investments in Red in target districts.
· Potential future investments in Purple as local incidence approaches zero.

Source: PMI/Zambia. Notes: The Zambian NMEP stratifies HFCAs and districts by transmission intensity: High transmission (Level 4, ≥500 cases/1,000 pop/yr); moderate transmission (Level 3, 200-499 cases/1,000 pop/yr); low transmission (Level 2, 50-199 cases/1,000 pop/yr); very low transmission (Level 1, 1-49 cases/1,000 pop/yr); and no malaria (Level 0, 0 cases/1000 pop/yr). Please refer to the Country Malaria Profile for further details on subnational tailoring of intervention by malaria risk strata in Zambia

Figure 2. PMI-supported Districts in Eastern Province, by Programmatic Designation



3.5. Key Changes in this MOP

Key changes in the FY 2023 Zambia MOP as compared to the FY 2022 MOP are highlighted in Table 1, below.

Table 1. Key Changes in this MOP

Challenge/Opportunity	FY 2023 MOP Investment
Stagnation of malaria burden indicators since 2017	Robust support for the new NMESP, which stresses subnational tailoring of interventions by Expanded Program on Immunization (EPI) strata. Align all partners with cost-effective, stratified approach. Explore innovative investments: e.g., targeted LSM, co-funding of blood supply strengthening (pending results of the blood supply assessment and PMI leadership approvals), aid MOH to explore operationalization of RTS,S malaria vaccine.
Commodity security, especially for ACTs	Supply chain strengthening, including greatly heightened focus on commodity security.
Strategic shift from IRS to ITNs	Increased funding for ITN continuous distribution, maintain IRS funding at the reduced level introduced in FY 2022.
iCCM sustainability	Explore introduction of CHW compensation based on feasibility assessment and pilot, increased provision of enablers, further strengthen supply chain.
Increased commitment of GRZ to finance essential medicines	Reduce proportion of medications procured by PMI.
NMEP mandate to “keep the elimination fires burning”	Robust PMI pre-elimination program in Eastern province, as pathfinder. Implement Phase II, with enhanced intervention package and innovation, e.g., pilot 1-3-7 case-based investigation and response, explore layering in LSM.

Challenge/Opportunity	FY 2023 MOP Investment
NMEP program management	Secondment of technical staff at NMEC to fill gaps (entomologist, SBC advisor, database programmer); training; exploring partial refurbishment of NMEC headquarters; targeted aid for vehicle maintenance to fill gaps.
WHO and GAVI approval of RTS,S malaria vaccine in 2021	Assistance to the MOH (NMEC, EPI partners, maternal and child health partners) to explore opportunities to adopt and operationalize the malaria vaccine

II. OPERATIONAL PLAN FOR FY 2023

1. Vector Monitoring and Control

1.1. PMI Goal and Strategic Approach

The primary objective of the NMEP is to provide access to effective high-coverage vector control. The current strategic plan now emphasizes universal coverage (one net per two people) of piperonyl butoxide (PBO) or dual active ingredient ITNs as the primary vector control strategy. This is to be achieved through mass campaigns every three years and continuous distribution channels. IRS will be more judiciously targeted to a select number of districts where impact can be demonstrated. Criteria are being developed for this targeting. The NMEP also promotes entomological monitoring and insecticide resistance surveillance to inform decision-making needs of the NMEP and partners and optimize vector control interventions and insecticide resistance management plans.

A secondary objective of the NMEP is to implement additional interventions such as larviciding, environmental manipulation, baited traps, and other (re)emerging vector control approaches, where specifically appropriate to accelerate malaria transmission reduction and/or fill inherent limitations in primary vector control approaches.

In support of the NMEP, PMI currently supports all the primary objectives in terms of overall oversight, planning, and coordination; TA and commodity support; IRS and ITNs implementation for vector control; and cross-cutting support in program management, SBC, data integration, monitoring, evaluation, and surveillance, and occasionally OR. PMI supports entomological monitoring in 14 sentinel sites in seven districts across four provinces; the Global Fund-supported entomological monitoring activities have consisted mostly of spot checks, but Global Fund funding has historically been under-utilized to support the 23 GRZ sentinel sites. Both PMI and Global Fund support mass ITN campaigns every three years and continuous distribution of ITNs via antenatal care (ANC) and Expanded Program on Immunization (EPI) channels nationwide. PMI implements IRS in 21 district(s) and provides technical assistance to Global Fund-supported IRS.

Figure 3A. Map of Vector Control Activities in Zambia: Entomologic Monitoring Sites in 2021–2022, by District and Funding Partners

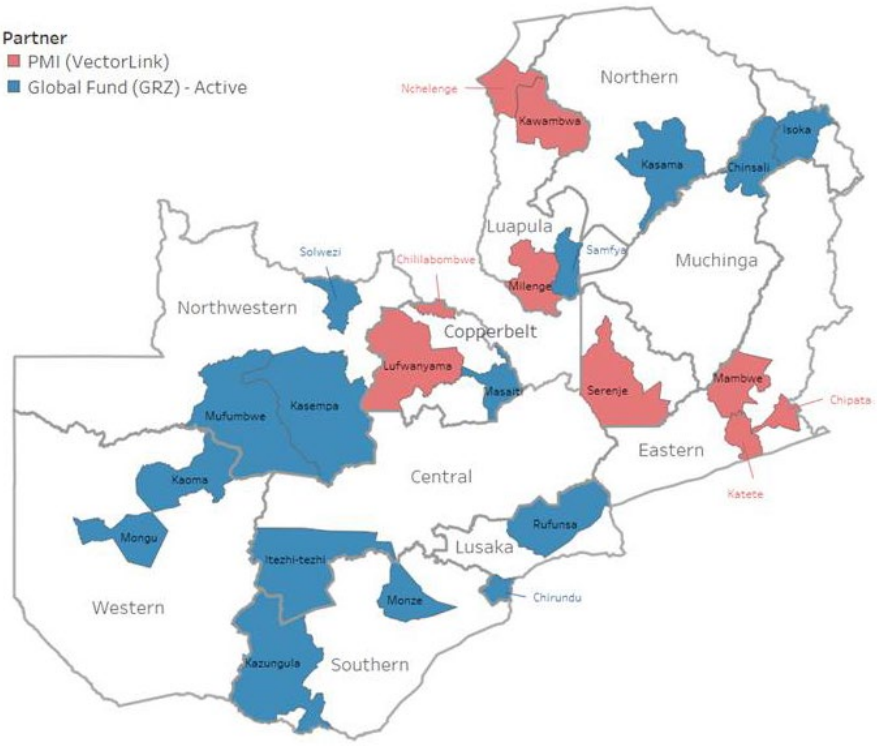
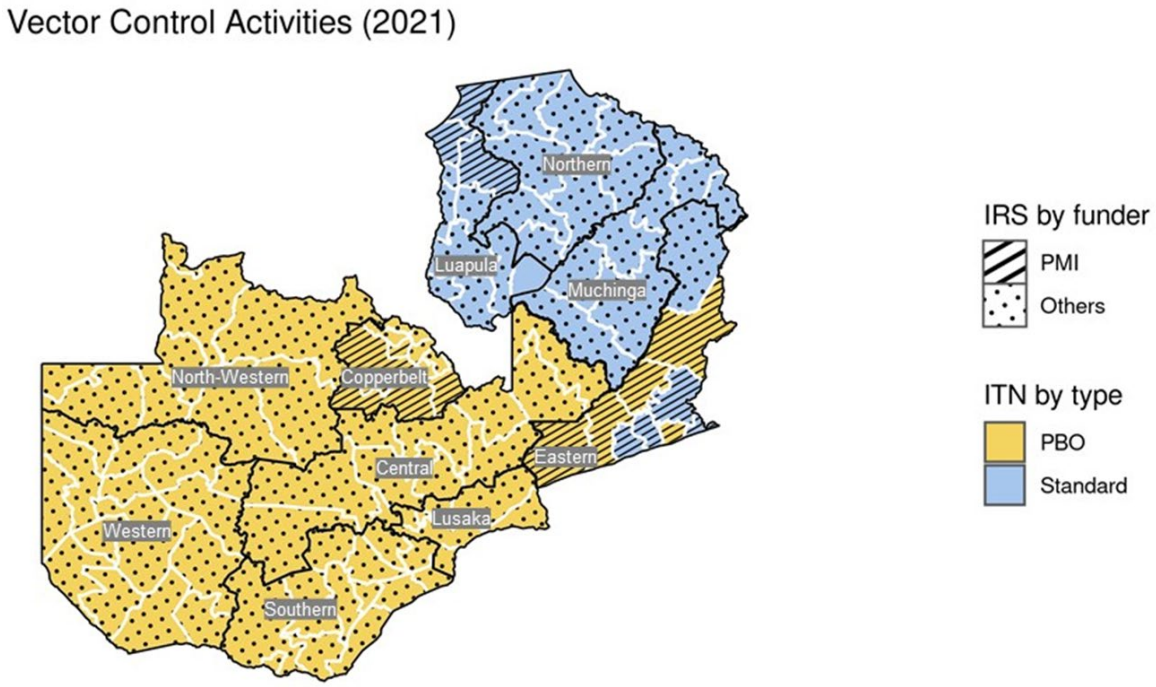


Figure 3B. Map of Vector Control Activities in Zambia. 2021: Showing IRS Operations by District and Funding Partners, and ITNs by Net Type



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 sub-district "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 (between June 2021 and May 2022)

Entomologic Monitoring

- Supported monthly or bimonthly mosquito collections for entomological monitoring in 14 sentinel sites in seven districts across four provinces, in collaboration with the NMEC and PHOs and DHOs (see Figure 3A). This was supplemented by periodic monitoring at additional sites in the same provinces as needed. Monitoring activities included insecticide resistance monitoring, vector bionomics monitoring, and insecticide residual efficacy monitoring. Molecular laboratory and insectary activities were conducted at the PMI-supported lab at the NMEC compound in Lusaka. For more information about entomological monitoring, please refer to the 2021 Entomological Report (https://www.pmi.gov/resources/).
- Provided TA to the Global Fund-supported entomologic monitoring program implemented by the NMEC. The NMEC activities consisted in principle of monitoring at community-based sentinel sites, supplemented by spot checks. However community collections were infrequent, and the overall burn rate of Global Fund allocations was low, due largely to program management challenges. The absence of a qualified entomologist at the NMEC has

undermined program effectiveness. PMI technical assistance to the NMEC included:

1. Procurement of light traps and Prokopac aspirators for the NMEC to use in their sites.
2. Technical support for data integration and visualization to inform decision-making.
3. Participation and facilitation of technical working groups on entomological monitoring and insecticide resistance.
4. Support for participation in regional training.
5. Assistance in IRS quality assurance assays.

Insecticide-treated Mosquito Nets

- Supported the procurement and distribution of standard and PBO ITNs to pregnant women, young children, and school-age children in provinces through continuous distribution channel(s). With PMI support, 600,000 ITNs were procured and 2,498,000 ITNs were distributed during FY 2021, a portion of which were distributed during the 2020–2021 mass campaign.
- Provided technical assistance for initial planning, including resource mobilization, for the 2023 ITN mass distribution campaign, which will distribute PBO ITNs to up to 17 million people nationwide, prioritizing rural and high-burden areas and minimizing co-deployment with IRS operations. PMI is currently in discussions with other partners to coordinate and optimize campaign targeting, consistent with the NMESP. The campaign is expected to entail collaboration with the NMEC, Global Fund, the Against Malaria Foundation, Zambia EMC, and other partners.
- Completed ITN durability monitoring of standard ITNs from the 2017–2018 mass campaign cohort in two districts.
- Supported ITN durability monitoring by implementing baseline and 12-month data collection, monitoring PBO ITNs from the 2020–2021 mass campaign cohort in two districts.
- Conducted a study of ITN misuse and repurposing, with results expected to be disseminated in Q3 2022 to inform SBC and other strategies to mitigate misuse of ITN, especially in fishing.
- Added District Health Information Software 2 (DHIS2) modules to capture ITN school-based distributions, a new feature.
- Supported national and community-level SBC activities to improve demand for ITNs, increase appropriate use, promote care, and mitigate against misuse. For more information, please refer to the Social and Behavior Change section.

Indoor Residual Spraying

- Supported the planning, implementation, and evaluation of the October 2021 IRS campaign in 21 districts, covering 717,351 structures and protecting 3.03 million people. For more information about IRS achievements, please refer to the most recent End of Spray Report. Trained and engaged community members in these 21 districts to support IRS mobilization and spray activities.
- Provided TA to the NMEC/MOH (which is the Global Fund Principal Recipient for IRS) with the planning, training, and environmental compliance of IRS operations in the rest of Zambia (94 districts). Supported the timely implementation of IRS in MOH/Global Fund districts through donation of pumps and personal protective equipment.
- Continued to collaborate with the National Institutes of Health (NIH)-funded, Johns Hopkins-led International Center for Excellence in Malaria Research (ICEMR) research program in Nchelenge district, Luapula, to optimize IRS programming based on research findings. See Operational Research and Program Evaluation section for details.
- Provided support for DHIS2 data entry and use during and after the national IRS campaigns, greatly improving the visibility of IRS performance to managers.

1.3. Plans and Justification for FY 2023 Funding

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

1.3.1. Entomological Monitoring

PMI will continue supporting 14 sentinel sites in districts located in Central, Copperbelt, Eastern, and Luapula provinces (regions) to gather information on insecticide resistance and vector bionomics in the context of new types of ITNs (PBO and dual active ingredient ITNs) as the primary vector control strategy and targeted IRS. Quality of spray and insecticide residual efficacy will also be done in a select number of sites. However, the use the Entomological Surveillance Planning Tool[2] will be used to make entomological monitoring more purposeful by identifying key decisions to be made by the NMEC and tailoring vector monitoring to have data and analyses that inform that decision. Specific questions to be addressed in the upcoming work plan are: 1) How does human behavior impact the effectiveness of ITNs and IRS based on indoor vector exposure, and 2) Do gaps in protection exist due to outdoor human and vector behavior? Tentatively, human behavior data will be collected by observing and

[2] http://shrinkingthemalariamap.org/sites/default/files/tools/espt-eng-feb21-final.pdf

recording the location, activities, and ITN use of household residents. The result of this monitoring will provide insights on gaps in IRS and ITNs effectiveness and will be used to inform appropriate SBC messaging if necessary.

PMI will also support a LSM feasibility assessment in CY 2022 in Eastern province, where there are pre-elimination districts with high coverage of case management (health facilities and community) and vector control (IRS and ITNs) and adequate surveillance, to determine if this approach can accelerate the reduction in malaria transmission in this area; the key questions to be answered are: 1) Can LSM be done, and 2) Should it be done (Phase 1). Larval and adult mosquito surveys, larvicide resistance profile, rainfall data, satellite imagery, operational costs, and other data will be collected, reviewed, and used in mathematical models, if feasible, to develop criteria to assess LSM feasibility. If results are favorable, potential pilot implementation could occur in CY 2023 and beyond (Phase 2).

Given the limitations of the NMEC to consistently conduct entomological monitoring at their Global Fund-supported sites, PMI will make a greater effort to strengthen and support the NMEC's capacity. This will involve supporting secondment of an entomologist to mentor an identified NMEC staff member(s); conducting more training of 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.

Summary of Distribution and Bionomics of Malaria Vectors in Zambia

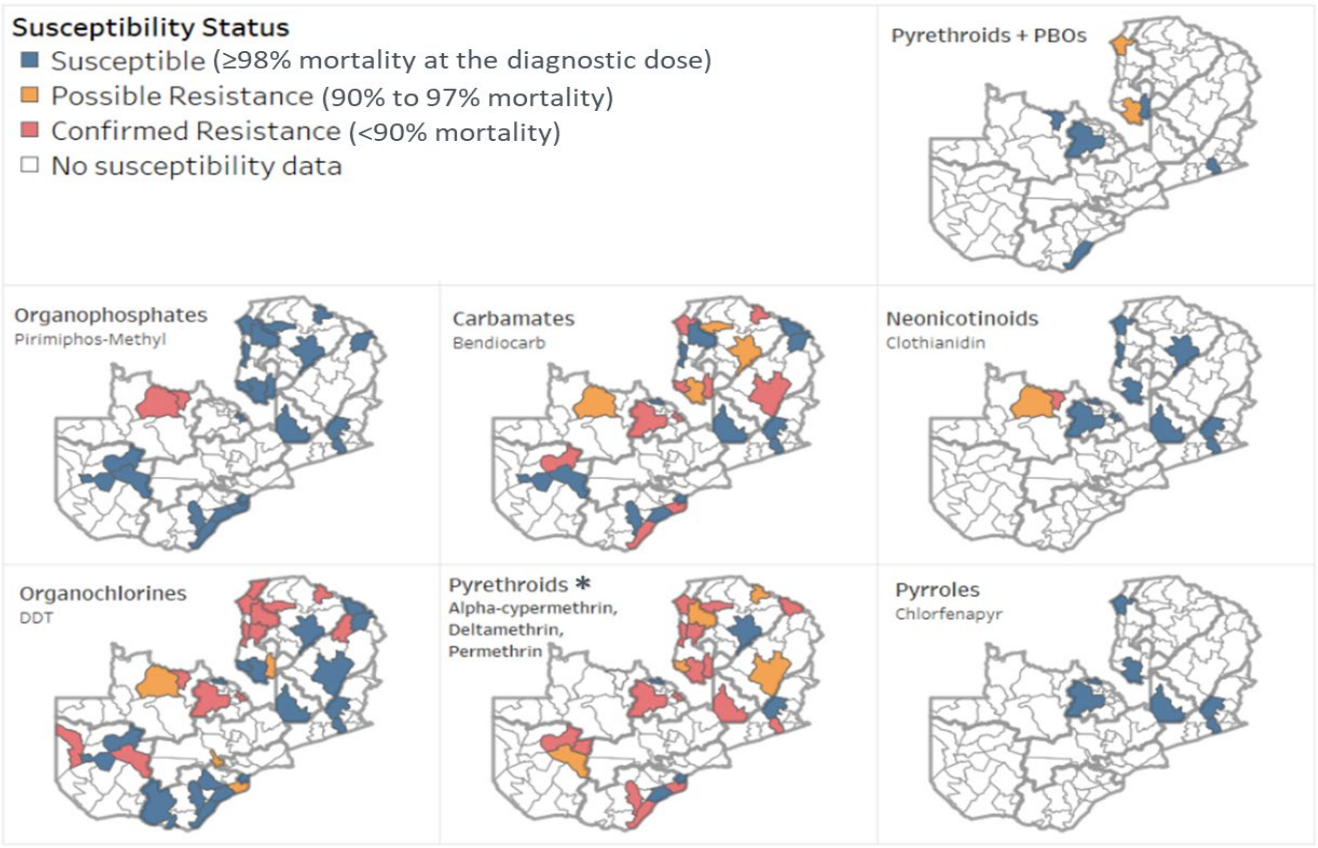
As of 2021, the primary vector is *Anopheles funestus* s.l., and the secondary vector is *An. gambiae* s.l. The majority of the *An. funestus* s.l. vectors collected during the CY 2020–2021 reporting period were *An. funestus* s.s. (99.4 percent), with 0.5 percent *An. vaneedeni* and 0.2 percent *An. parensis*. The majority of *An. gambiae* s.l. were *An. gambiae* s.s. (99.2 percent), with 0.8 percent *An. arabiensis* (see Zambia's 2020–2021 entomological monitoring report; https://www.pmi.gov/resources/). While there is a higher overall abundance of vector *An. funestus* s.l. over *An. gambiae* s.l. in PMI-supported sites, there are a few districts in the 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 to peak rainfall. Overall, across PMI-monitored sites, the trend in the preferred biting location of *An. funestus* s.l. is indoors (23.3 bites per person indoors vs. 14.5 bites per person outdoor), although this result was not statistically significant. There was some district variation in this trend where some sites had significantly higher levels of indoor biting and other sites had high outdoor biting, though not statistically significant. Human behavior has not yet been recorded to calculate a biting behavior index adjusted based on human behavior, but in the subsequent work plan this will be investigated. Currently, only data on indoor resting of

mosquitoes are collected, where overall across PMI-monitored sites, the indoor resting density in sprayed sites was 2.6 mosquitoes per house and 7.5 mosquitoes in unsprayed sites. The preferred host is human for both *An. gambiae* s.l. and *An. Funestus,* with a >90 percent human blood index.

Status of Insecticide Resistance in Zambia

As of CY 2021, there is confirmed resistance to all ITN pyrethroid insecticides (alpha-cypermethrin, deltamethrin, and permethrin) in *An. funestus* s.l. and *An. gambiae* s.l. in PMI sites. However, results from synergist assays showed partial (>10 percent increase in absolute mortality) or full restoration (≥98 percent mortality) of susceptibility to the pyrethroids after PBO pre-exposure. These results suggest that resistance to pyrethroids are oxidase-mediated. There was a mixture of full susceptibility and suspected resistance to dichlorodiphenyltrichloroethane (DDT) in *An. funestus* s.l. vector populations in PMI-supported provinces and full susceptibility in *An. gambiae* s.l. populations 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; however, neonicotinoid resistance has been reported by other partners in North-Western province. Insecticide resistance findings by district and chemical class in 2015–2021 are summarized in Figure 4.

Figure 4. Insecticide Susceptibility, by District and Chemical Class, 2015–2021, Showing Lowest Susceptibility during the Most Recent Sample Year (Source: NMEC/VectorLink.)



Note: In districts where susceptibility is indicated, malaria vectors have been observed to be susceptible to at least one pyrethroid.

1.3.2. Insecticide-treated Mosquito Nets

PMI will continue to support procurement and distribution of ITNs through continuous distribution. ANC and EPI remain the primary channels, but distribution of ITNs through schools will continue to be explored for opportunities for additional expansion. TA will also 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 use and care of ITNs and to mitigate against misuse.

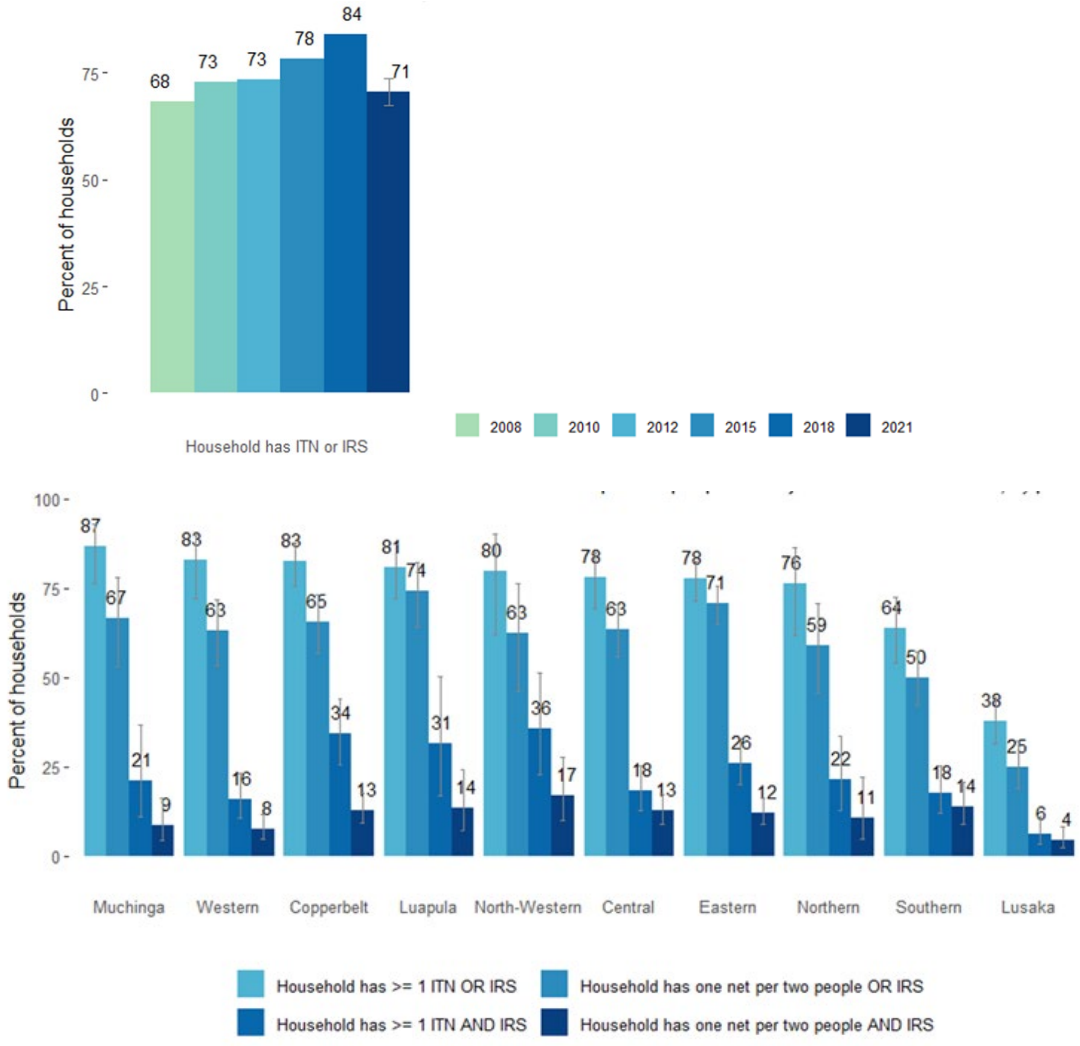
Please see the Social and Behavior Change section for details on challenges and opportunities to improve intervention uptake or maintenance.

ITN Distribution in Zambia

In Zambia, ITNs are distributed via mass campaigns every three years. The most recent campaigns took place in 2017–2018 and in 2020–2021, and the next campaign is planned for 2023. Per NMEC guidance, the 2020–2021 campaign was conducted in a "mosaic approach" at sub-district 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 either vector control method, with allowance for 10 percent co-deployment at household level. Due to 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 if adequate ITN access was defined as owning one net per two persons. National and provincial results are highlighted in Figure 5. ITN use in PMI-supported provinces can be found in the "Key Survey Indicators, 2018–2021, PMI Focus Provinces" table in the Zambia Country Malaria Profile.

Figure 5. Household Access to ITNs and/or IRS, at National Level in 2008–2021 (Upper) and at Provincial Level in 2021 Level (Lower). Source: 2021 MIS



Continuous distribution channels consist largely of distribution to pregnant women at ANC nationwide and to children less than 5 years of age in EPI (well-child) clinics

nationwide. A few mines and plantations distribute nets to their rural workforces. In a limited number of PMI-supported districts, ITNs are provided to grades 1 and 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 CHWs to assist with SBC messaging and limited deployment logistics, as feasible.

The country distributed a mix of standard and PBO nets during its 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 nets in subsequent years. A technical advisory committee which meets annually to review insecticide resistance and other indicators will continue to provide guidance on ITN product type.

In light of the concerning 2021 MIS findings, PMI intends to maintain robust support for ITN distributions. In the FY 2021 and FY 2022 MOPs, comprehensive support was provided in partnership with MOH, Global Fund, Against Malaria Foundation, EMC, and others to ensure the 2023 campaign would achieve universal coverage with PBO ITNs. To maintain this universal coverage, in the FY 2023 MOP, PMI will support the procurement and distribution of 1.2 million PBO ITNs through routine distribution channels, covering most of the needs of the four PMI focus provinces. It is anticipated that the overall ITN gap needs of the country will be filled by Global Fund and MOH contributions.

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

Table 2. 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*
2017/2018	Lundazi	PermaNet 2.0 (standard)	Completed Sep. 2018	Completed July 2019	Completed July 2020	Not done*
2020/2021	Nyimba	Olyset Plus (PBO ITN)	Completed Sep. 2021	Completed Feb 2022	Planned 2023	Planned 2024
2020/2021	Serenje	Veeralin (PBO ITN)	Completed Sep. 2021	Not done**	Planned 2022	Planned 2023

* Because the 36-month data collection point overlapped with the 2020–2021 ITN campaign, no collection was done.
** Given that the time of baseline collection in Serenje occurred nine months after receiving their ITNs in Nov.–Dec. 2020, the 12 month collection will not be done and the next collection will be done at 24 months.

1.3.3. Indoor Residual Spraying (IRS)

In CY 2023, as outlined in the FY 2022 MOP, PMI will shift a portion of its funding from IRS to ITNs, reducing targets for directly supported operations from 590,000 structures to 300,000 structures. This is in line with the country's decision to revert to ITNs as the

primary vector control strategy and allows PMI to maximize its investment in the 2023 ITN campaign. The Global Fund has also reduced its support for IRS in Zambia, with the GRZ stepping up in 2022 to procure pesticides to avoid a precipitous withdrawal of vector control in advance of the 2023 ITN campaign.

By CY 2024, once the CY 2023 ITN campaign has been implemented, the country aims to reduce IRS operations from an average of 2.5 million structures in 115 of 116 districts to a total of 600,000 structures in a smaller number of mainly targeted high-burden districts. PMI may also offer technical assistance to GRZ for responsive IRS in lower burden and urban districts, where surveillance indicates the emergence of hot spots. It will be important for this approach to be deemed technically feasible and beneficial, and for resources are available before support is provided.

In CY 2024, PMI will continue to support this approach of sub-national tailoring of vector control, giving primacy to ITNs. PMI will support the planning, implementation, and evaluation of IRS operations, targeting up to 300,000 structures in a set of districts that will be determined in consultation with the NMEC and in coordination with partners such as mines, plantations, and potentially the Global Fund. The geographic areas are expected to provide continuity from the 2023 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, expiration of the NIH grant in 2024 may limit options.

Table 3. PMI-supported IRS Coverage

Calendar Year	District*	Structures Sprayed (#)	Coverage Rate	Population Protected (#)	Insecticide
2021	Eastern province (14 districts); Copperbelt (4 districts); Luapula (1 study district + 2 adjacent districts)	717,351	97%	3,032,558	Clothianidin only, clothianidin plus deltamethrin
2022	Eastern province (14 districts); Copperbelt (3 districts); Luapula (1 study districts)	590,204 (targeted)	>90% (targeted)	TBD	Clothianidin only, clothianidin plus deltamethrin
2023**	Eastern and other provinces, TBD	300,000	>90% (targeted)	TBD	TBD
2024**	Eastern and other provinces, TBD	300,000	>90% (targeted)	TBD	TBD

* If more than 15 districts, list regions/provinces.
** Planned

IRS Insecticide Residual Efficacy in Zambia

Wall bioassays to assess spray quality after IRS at seven PMI-supported spray sites and three GRZ-supported spray sites, along with monthly assessments of the insecticide decay on walls at five PMI-supported sites, were done on both mud and cement surface types following the 2021 IRS campaign. At PMI sites, 100 percent mortality of *An. gambiae* s.s. Kisumu strain was observed after 48 hours post-exposure in the five districts sprayed with a clothianidin + deltamethrin product. In the two districts sprayed with a clothianidin only product, 100 percent mortality was achieved 120 hours after exposure in most of the houses, while the remaining houses attained at least 96 percent mortality. At GRZ sites, 15 of 18 houses in the three districts achieved 100 percent mortality after 24 hours with DDT, while the remaining houses attained at least 90 percent mortality. The residual efficacy of the clothianidin + deltamethrin product and clothianidin only product deployed in the 2020 IRS campaign at the PMI-supported sites was at least 10 months.

Other Vector Control: Larval Source Management

The PMI-supported entomologic surveillance reports for 2021 and prior years have highlighted the limited impact of PMI-funded IRS campaigns on vector densities and biting rates and have recommended complementary interventions. LSM has a long history in Zambia, supported over the years by mines and plantations. LSM has been featured in national strategic plans over the years, but due to lack of funding, the GRZ has implemented it on a very limited scale—for example, in Lusaka and other urban districts. The NMESP 2022–2026 calls for 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.”

As mentioned above in the entomological monitoring section, in CY 2022, PMI/Zambia plans to conduct a feasibility and potential impact assessment of LSM for the first time within the pre-elimination program areas in Eastern province. At this time, no funding for LSM implementation has been allocated in the FY 2023 MOP (no LSM item in Table 1). 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

Zambia has adopted and implemented IPTp as a key intervention for improved birth outcomes for over 10 years. The goal of PMI is to support the national strategy for malaria in pregnancy (MIP), which includes provision of ITNs at the first ANC visit, a minimum of four doses of IPTp in malaria endemic areas starting at 13 weeks gestational age, and effective case management of malaria per WHO guidelines. In

2016, IPTp guidelines were updated from the initial target of three doses to six doses or until delivery.

National MIP Approach

The new five-year National Malaria Elimination Strategy (NMESP 2022–2026) has adopted MIP—and its objectives outlined in the national malaria policy developed in November 2020—as key interventions for improved birth outcomes:

- All pregnant women shall have access to cost-effective preventive interventions including ITNs and IPTp. IPTp shall consist of administration of antimalarial medicines according to the current guidelines for ANC in Zambia.
- All pregnant women who present with suspected malaria shall receive prompt diagnosis and effective treatment using antimalarial medicines according to the current guidelines for the diagnosis and treatment of malaria in the country.

To improve the uptake of IPTp by eligible pregnant women, the NMESP advises the national program 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.

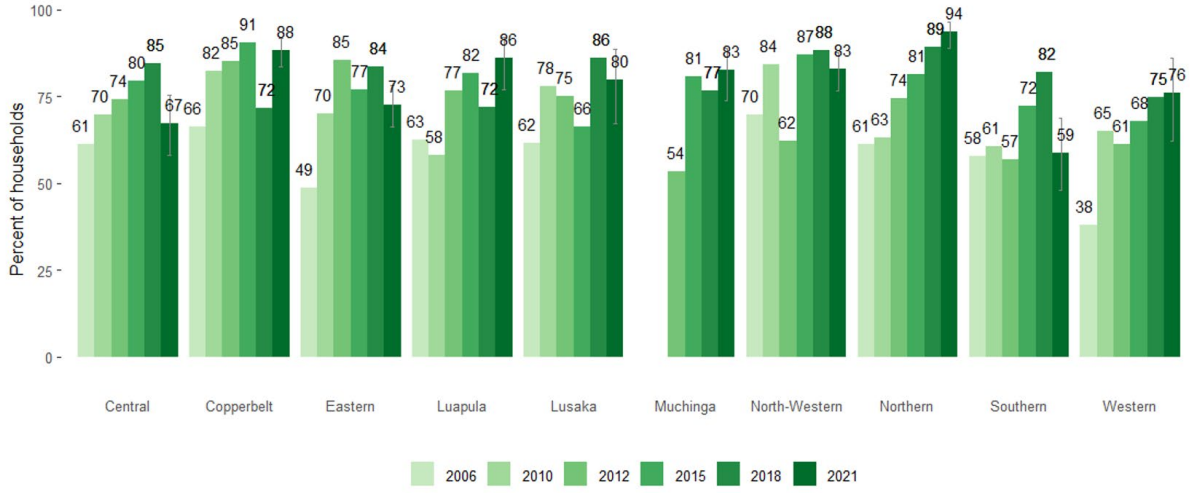
At the national level, the safe motherhood department at MOH deals with all issues related to maternal health including MIP. This is done through the safe motherhood technical working group (TWG). PMI will help to strengthen collaboration on MIP with Medicines Regulatory Harmonization (MRH) and NMEC through the safe motherhood TWG.

PMI's support of MIP aligns with the NMEC's national approach, which includes the provision of free IPTp and one free ITN at ANC visits, as well as prompt diagnosis and treatment. Most of PMI's MIP support takes place in the four high-burden provinces of Luapula, Northern, Muchinga, and Eastern. In Central and Copperbelt, modest support is provided in the form of the MIP module in the OTSS program.

Trends in ANC Coverage

Malaria indicator surveys show steady progress in IPTp coverage. In 2021, 68 percent of pregnant women received medications to prevent malaria, which was stable from 2018 (67 percent) and had increased from 61 percent in 2015. In 2021, IPTp3 coverage in PMI-supported provinces increased from 42 percent (HMIS, 2020) to 58 percent (HMIS, 2021). Figure 6 shows the coverage of at least two doses of IPTp by province.

Figure 6: Percentage of Pregnant Women Who Received at Least Two Doses of IPTp, by Province



Source: Zambia 2021 MIS

Barriers and Missed Opportunities

According to the 2021 MIS, wealth and education levels among pregnant women were determinants in the uptake of full IPTp. Pregnant women with an education level greater than secondary school recorded the highest IPTp uptake for at least two, three and four doses (91 percent, 89 percent and 15 percent, respectively). Pregnant women with no formal school recorded lower IPTp uptake at 66 percent, 58 percent and 11 percent, respectively. With respect to wealth, IPTp uptake of at least two, three and four doses was 83 percent, 74 percent and 21 percent among the most wealthy, as compared to 79 percent, 66 percent and 13 percent, among the least wealthy.

The 2021 MIS reported a 30 percentage point drop in ITN use among pregnant women from 71 percent in 2018 to 41 percent in 2021. To improve on this indicator, in quarter 4 of 2021, PMI supported NMEC to assess ITN continuous distribution through routine ANC/EPI channels in 39 health facilities across 16 districts in five provinces. The assessment found significant supply chain and operational challenges across all districts visited including commodity stockouts and last mile distribution and forecasting and quantification challenges. PMI/Zambia has since shared the assessment findings and recommendations with the NMEC. In addition, PMI facilitated the review of the existing ITN distribution and utilization guidelines in May 2022. Later this year, PMI will support a workshop to disseminate the revised guidelines that address the findings and incorporate the recommendation of the continuous distribution assessment. For details on the proposed activities to strengthen the supply chain, refer to the Health Supply Chain and Pharmaceutical Management section.

Opportunities and Challenges

In recent years, continued erratic supply of sulfadoxine-pyrimethamine (SP) and folic acid affected the implementation of MIP interventions. However, given the New Dawn government's announcement that it will increase expenditure on essential commodities and strengthen supply chain and commodity security, more consistent availability of MIP commodities is expected to support successful implementation of the MIP strategy. In addition, going forward, the new NMESP proposes to ensure availability of adequate supplies of SP and strengthen coordination with other reproductive health stakeholders.

In Zambia, there is a fairly high level of ANC awareness. However, women's malaria awareness has not translated into action in regard to early ANC attendance. Therefore, PMI has enhanced SBC activities to promote early ANC attendance to help ensure full IPTp coverage through an integrated SBC approach with reproductive, maternal, and child health programs given that 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.

2.2. Recent Progress (between January 2021 and December 2021)

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

- Funded procurement of 1,833,333 million doses of SP to fill gaps in GRZ and Global Fund procurements. In addition, PMI continuously monitored stock levels of both SP and ITNs.
- Procured 600,000 ITNs through the continuous distribution channels of ANC and EPI visits.
- Continued to advocate at all levels to improve availability of SP given erratic availability in 2021. There are signs that the new government will increase funding for SP and other essential medicines.
- Trained and supervised health care workers at provincial, district, and health facility levels on the implementation of NMEC IPTp guidelines including training Safe Motherhood Action Groups on the importance of IPTp and early ANC attendance.
- Integrated malaria modules into the Nursing and Midwifery Council of Zambia curriculum for pre-service training.
- Supported OTSS during ANC clinics

2.3. Plans and Justification for FY 2023 Funding

The FY 2023 funding tables contain a full list of malaria in pregnancy activities that PMI proposes to support in Zambia with FY 2023 funding. Please visit

www.pmi.gov/resources/malaria-operational-plans-mops for these FY 2023 funding tables.

PMI/Zambia will continue to support MIP activities as described in the Recent Progress section with the 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 in OTSS in Copperbelt and Central provinces.

- Given continued erratic availability of SP due to GRZ budget constraints, PMI plans to procure a portion of the country's SP needs to complement GRZ and Global Fund contributions. The expectation is that the anticipated gap will be covered by GRZ, as the current Global Fund grant will expire in CY 2023. Please refer to the **SP Gap Analysis Table** in the annex for more detail on planned quantities and distribution channels.
- PMI will continue to provide TA to increase IPTp coverage in Zambia, focusing on supply chain strengthening; training and supervision of provincial, district, and health facility workers on IPTp implementation guidelines; and quality assurance through continued use of an MIP module in OTSS.
- PMI will continue to provide TA and commodities to support and strengthen 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/districts. This will potentially lead to cost-effective monitoring of intervention access and malaria infection rates among pregnant women. Refer to the Operational Research and Program Evaluation section for details.
- To improve demand for prevention and treatment of malaria in pregnancy, PMI will continue to support national and community-level SBC activities. Please see the Social and Behavior Change section for details on challenges and opportunities to improve intervention uptake or maintenance.

3. Drug-based Prevention

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

4. Case Management

4.1. PMI Goal and Strategic Approach

The 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 in reducing morbidity and mortality. Microscopy should be used where there is a well-functioning laboratory with staff well-trained in malaria diagnostics. RDTs are to be used in health facilities lacking microscopy or 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 (CCM in Zambia targets all ages). PMI supports all aspects of this approach through support to national policy and programmatic activities, commodity procurement, and improvement of facility and community-level health worker performance. PMI supports nationwide procurement of malaria RDTs, ACTs, and injectable and rectal artesunate, as well as OTSS activities in six provinces. It should be noted that while CHWs are trained in the diagnosis and treatment of all three diseases under iCCM, the commodities to manage pneumonia and diarrhea are in inconsistent supply.

To continue to make progress in reducing severe and fatal cases of malaria in spite of 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 PMI support in recent years has focused primarily on outpatient care, going forward the inpatient setting will receive increased attention. Given the well-recognized impact of strengthened referral systems on preventing mortality associated with severe malaria, 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. For example, the OTSS program for health facilities will incorporate an inpatient module going forward, the involvement in OTSS by private facilities will be expanded, and the Monitoring, Mentoring, and Motivation program for CHWs will reinforce clinical skills around detection and referral of several cases.

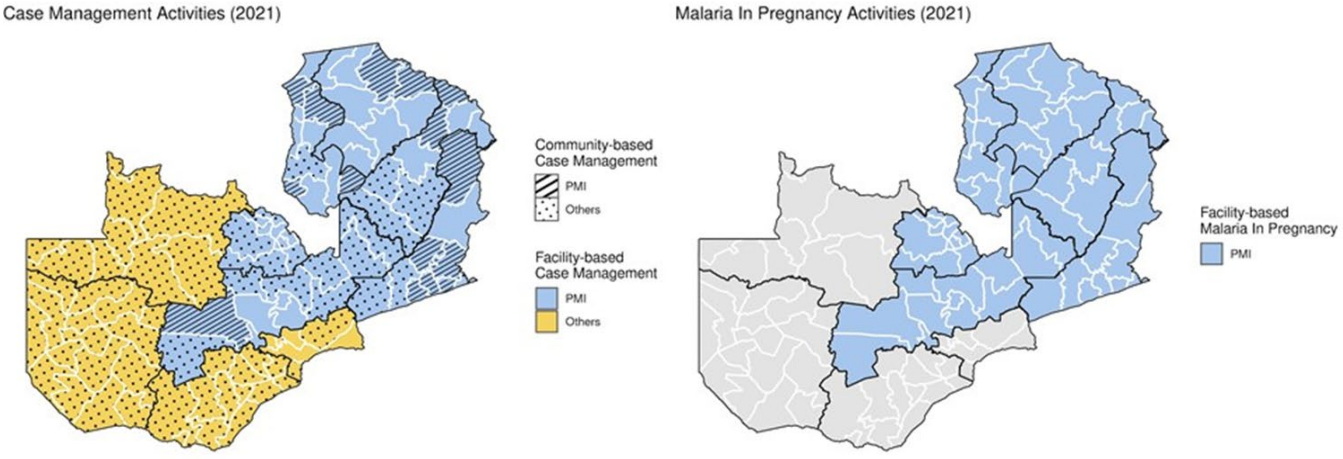
These PMI investments are consistent with the priorities of the new NMESP, which calls for universal access to quality treatment of both uncomplicated and complicated malaria, including ensuring adequate supply and use of recommended, first-line treatments for uncomplicated and complicated malaria in all facilities, in 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 GRZ target is 11,000 new CHWs onboarded nationwide in 2022–2023.)

Community case management of malaria is a national priority.[3] Community case management 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 increase access to malaria diagnosis and treatment, “especially in underserved and hard-to-reach areas.” Its strategic objectives include:

- Training of CHWs to manage malaria cases within their communities according to national guidelines.
- Providing regular supervision and mentoring of CHWs on malaria case management.
- Ensuring provision of malaria commodities to CHWs.

The 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 goal target of 36,000 CHW (ratio of 1:500 population), by 2022 over 16,000 had been trained according to the harmonized national curriculum, deployed, and registered in DHIS2, of which PMI had supported over 28 percent. Per MOH policy and 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. In Levels 1 and 2, the CHWs are encouraged to also conduct active case detection, whereby asymptomatic household members and neighbors of an index case will be tested, and treated if RDT-positive. Both activities target all ages.

Figure 7. Map of Case Management, Community Health and Malaria in Pregnancy Service Delivery Activities in Zambia



[3] In Zambia, iCCM and Reactive Case Detection (RCD) are two distinct sub-activities under what is commonly called Community Case Management of Malaria (CCM).

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

National-Level Case Management Activities

- Updated national case management guidelines in 2022. This includes first-time incorporation into the guidelines of single low-dose primaquine (SLDPQ) for use in elimination districts. The NMEC aims to roll out SLDPQ in rural districts at the pre-elimination stage, expanding from areas of Southern province into PMI-supported pre-elimination districts in Eastern province as soon as feasible.
- Produced and distributed 3,000 job aids to 1,000 health facilities in four provinces.
- Developed national training and supervision capacity. For example, enhanced and maintained the national slide bank and supported External Competency Certification for four laboratory supervisors.
- Supported quarterly National Case Management TWG as well as monthly commodity stakeholders' meetings which focused primarily on malaria medications and RDTs.

Commodities

- Supported the procurement and distribution of 8,043,900 malaria RDTs for nationwide administration, accounting for approximately 22.4 percent of needs.
- Supported the procurement and distribution of 8,803,320 ACTs for nationwide administration, accounting for approximately 65 percent of needs.
- Supported the procurement and distribution of 477,400 vials of parenteral artesunate for nationwide distribution, accounting for approximately 41 percent of needs.
- Supported the procurement and distribution of 30,000 rectal artesunate suppositories (RAS) for nationwide administration, accounting for approximately 18 percent of needs.

Facility Level

- Strengthened malaria diagnosis (with both RDTs and microscopy) and treatment by supporting one or two rounds of OTSS reaching 735 public sector health facilities in six provinces as well as 13 private sector health facilities in Copperbelt Province.
- Key case management indicators during supportive supervision in the 2021 rounds indicated sustained acceptable or desirable performance (>75 percent or >90 percent) in all metrics, including adherence to clinical observation, testing-prior-to-treatment, and adherence to RDT results.
- Built technical and financial management capacity in PHOs and DHOs to transition iCCM training and OTSS to G2G support during CY 2022. For

example, capacity was built in OTSS supervisors to use the advanced Electronic Data System (EDS) monitoring tool and to utilize Tableau for visualizations of DHIS2 data on facility and CHW performance. Supported the development of budgets and roadmaps for implementing the transition of most direct costs and functions to G2G. Best practices and lessons learned from USAID and the President's Emergency Plan for AIDS Relief (PEPFAR) program experience are informing the transition.

Community Level

- Strengthened malaria diagnosis and treatment through the training, deployment, and supervision of over 500 CHWs (also known as community-based volunteers, or CBVs) in four provinces. This included 1,437 CHWs in April 2021–March 2022, and a total of 4,719 CHWs trained since 2018. This represented 28 percent of the national achievement, with the rest supported by BMGF/PATH/ Malaria Control and Elimination Partnership in Africa (MACEPA), Global Fund, Rotary, and the recent and highly promising contribution of the Malaria Partners International in Muchinga and Central (consortium of Rotary/World Vision/BMGF under a $6 million, two year "Programs of Scale" pilot). To date, under NMEC guidance, PMI has adopted the strategy of saturating a target district at the national target level of one CHW per 500 population in rural areas.
- Continued to support CHW deployment in CCM, but with renewed emphasis on helping maintain their activity levels, such as increased supervision, monitoring, and support. In six provinces, supported Zambia's innovative "3-M" program of CHW Monitoring, Mentoring, and Motivation to enhance and sustain the performance of CHWs and their health facility-based supervisors in six provinces.
- Provided bicycles, shirts, aprons, caps, boots, and other perks to enhance CHW performance and motivation. (To date, PMI has not supported CHW compensation, but this is proposed for future investment.)
- As per NMEC policy, continued to support the linkage of Malaria Rapid Reporting (MRR) system for CHW data capture in districts where CCM is scaled up. (See Surveillance, Monitoring and Evaluation section for more detail.)
- In PMI-targeted districts since the beginning of 2021, CHWS identified over 40 percent of malaria cases on a sustained monthly basis. In much of 2020, erratic supplies of ACTs and RCTs in health facilities had rendered health facilities in Luapula, Northern, and Muchinga unwilling or unable to supply CHWs. While the issue lingered in Northern province into 2022, Eastern province has been the most resilient throughout in terms of maintaining high levels of CHW activity. Factors favoring Eastern include the utilization of

CHAZ's supply system for malaria commodities (instead of the Zambia Medicines and Medical Supplies Agency [ZAMMSA]); the institutionalization of CCM in most DHOs, backed by PHO leadership; and the extra resources for CHW support afforded by the PMI pre-elimination program, including a PMI-funded buffer stock for the province.

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

4.3. Plans and Justification for FY 2023 Funding

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

National-Level Case Management Activities

- PMI will continue to develop national training and supervision capacity in case management and support the dissemination of the updated national case management guidelines.
- 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 TWGs and the monthly commodity stakeholders' meetings.

Commodities

PMI will continue to procure a significant portion of the country's annual malaria commodity needs to include ACTs, RDTs, injectable artesunate, and artesunate suppositories. To respond to ongoing concerns around the over-issuance of ACTs in 2020–2021, PMI will decrease ACT procurement and prioritize investing in strengthening malaria commodity security, with the aim to procure three million doses, or just half of the treatments needed, for the more than six million confirmed malaria cases in 2021. This focus includes not only procurement of life-saving commodities, but also a greater focus on making sure they get to the people who need them.

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

Facility Level

PMI plans to target the following in FY 2023:

- *Severe malaria.* PMI will provide technical assistance to improve the definitive management of malaria in inpatient settings to improve facility case fatality rates. The NMEC has become increasingly concerned about persistently high malaria deaths in certain districts and health facilities, including some in PMI focus provinces. This has prompted periodic nationally led site visits and investigations. Areas of concern include erratic supply of injectable medications, especially of blood for transfusion in cases of several malaria anemia, and sub-standard management of severe malaria cases. Approaches may include incorporation of an inpatient module in OTSS and/or establishment of a clinical mentorship program for inpatient care. Pending completion of the blood supply assessment in 2022, investments in this area may be proposed in reprogramming. As mentioned, 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*. Continue decentralized strengthening of diagnostic and clinical capabilities at all levels. This will include funding of OTSS through a combination of G2G mechanisms at the PHO level and traditional TA through an implementing partner. Appropriate modalities of support for district-level staff will be adapted in alignment with the implementation of the health sector devolution plan. By CY 2024, PMI intends to expand G2G support into a fifth province, adding Muchinga to Luapula, Northern, Copperbelt and Central. The use of G2G mechanisms will help achieve the GRZ strategy of decentralizing government function and PMI's strategy of "investing locally." Because no USAID G2G mechanism exists for Eastern province, support for OTSS in the sixth province, Eastern, would flow entirely through a traditional implementing partner.

Community Level

Key partners in iCCM currently and for the foreseeable future include the Global Fund, CHAZ, BMGF/PATH/MACEPA, Malaria Partners International (BMGF/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 numerous districts in other PMI focus provinces have yet to see CCM scale-up, especially in Luapula and Northern provinces, as indicated in Figure 7. Moreover, the need for enablers remains large, and concerns for sustainability of CCM in the absence of regular compensation are frequently expressed. In contrast, CHWs for over a decade have been receiving monthly stipends for services in HIV/AIDS, under PEPFAR. Recent progress in CHW compensation includes the release in May 2022 by the MOH Community Health Unit of a national strategy for CHW incentives.

It is in this context that PMI is planning continued, substantial investments in CCM in FY 2023, coordinating closely with the other partners. The following activities are planned:

- *Continue to scale up CCM in PMI's four focus provinces.* As with OTSS, the use of provincial-level G2G mechanisms to train, deploy, and supervise CHWs will help achieve the GRZ strategy of decentralizing government function, and PMI's strategy of "investing locally." The G2G approach also offers the potential for increased cost-efficiencies in the long term. PMI will continue to pair G2G support with funding through a traditional implementing partner to provide TA, quality assurance, and to facilitate national-level support for the CCM program. The USAID/Zambia provincial offices will continue to assist PHOs with the financial management/ administrative requirements of G2G, applying lessons learned from PEPFAR experience. Because no USAID G2G mechanism exists for Eastern province, support for OTSS in the sixth province, Eastern, would flow entirely through a traditional implementing partner. To move toward saturated coverage of CHWs in all districts, PMI will seek expanded partnership with other funders such as Global Fund/CHAZ in Eastern and BMGF/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 devolution plan.

- Increase investments to assure sustained activity of the CHWs.
    - Continue the previously mentioned activities which sustain the activity of CHWs in malaria diagnosis and treatment in the four focus provinces. These include expanded implementation of the "Monitoring, Mentoring, and Motivation" program for CHWs and provision of enablers (job aids) for CHWs, including bicycles, backpacks, T-shirts, aprons, and caps. They also include the following cross-cutting activities (also described elsewhere in the MOP): 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 in regard to recognition of fever and the dangers of malaria.
    - Mobilize CBVs in targeted geographies to conduct CCM of malaria. Program design and operationalization will be consistent with the emerging MOH policies in provisioning CBV incentive harmonization and with U.S. government policies and best practices, and will be

closely coordinated with other CBV funders, including PEPFAR partners. PEPFAR partners have been compensating thousands of CBVs for community-based services for decades, including through regular stipends, and have utilized an array of implementing mechanisms and operational approaches. While recognizing the inherent differences in community services directed to HIV versus malaria, the PEPFAR/Zambia experience is expected to provide numerous models and lessons learned. Any funding for CBV stipends will be preceded by a feasibility assessment and pilot program prior to implementation of this MOP.

- *RAS implementation for pre-referral treatment of severe malaria.* PMI will continue to invest in measured scale-up of RAS, as requested by the 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.

Monitoring Antimalarial Efficacy

Table 4. Ongoing and Planned Therapeutic Efficacy Studies

Ongoing Therapeutic Efficacy Studies (TES)			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
2021	Serenje, Kaoma, Mpongwe, Mansa, Isoka*	AL, ASAQ, DP	TBD
Planned TES (funded with previous or current MOP)			
Year	**Site name**	**Treatment arm(s)**	**Plan for laboratory testing of samples**
2022	Kasama, Solwezi	TBD	TBD
2024	TBD (3 sites)	TBD	TBD

AL = artemether-lumefantrine; ASAQ = artesunate-amodiaquine; DP = dihydroartemisinin-piperaquine; TBD = to be determined
* Sites are funded by Global Fund

With FY 2023 funds, PMI will resume TES funding in Zambia. Sites and arms will be determined in consultation with the NMEP.

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 new NMESP 2022–2026 and the Case Management Guidelines (revised 2022). Deployment of primaquine is to be in HFCAs with annual incidence of less than 125 per 1,000 population (includes epi

Levels 0, 1, and the “lower half” of 2). The NMEC requests partner support to roll out SLDPQ to eligible HFCAs in Southern province, Eastern province, and elsewhere, with prioritization of rural districts. PMI proposes to pilot SLDPQ in FY 2022 in Sinda district, where HFCAs are nearly all at Level 1. With FY 2023 funds, and informed by the pilot and local epidemiologic status, PMI would support roll-out of SLDPQ in rural HFCAs in selected pre-elimination program districts. PMI investment will include provision of TA 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 as well under the supervision of the health facilities.

Community Level in Pre-Elimination Settings

Provide 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 2023 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 (iCCM) will increasingly be complemented by CHW participation in surveillance and response activities that are appropriate to the local epidemiologic level. These will include expanded engagement in reactive case detection (RCD). As per the national stratified approach, RCD will be limited to HFCAs with case incidence of under 200 cases per 1,000 population per year. Consistent with the NMESP, it will also include introduction of the “1,3,7 approach” to malaria case investigation, limited to selected rural HFCAs with case incidence of under 50 cases/1,000 population/year. The 1,3,7 approach targets reporting of confirmed cases within one day, investigation of specific cases within three days, and targeted control measures to prevent further transmission within seven days. While operationally challenging, the program has a well-established track record in China and Southeast Asia. In Zambia it has been rolled out since 2020 in selected districts of Southern Province (e.g., Mazabuka, Chikankata, Choma) with support from MACEPA and the ICEMR, providing lessons learned and tools to build on during PMI-supported expansion into Eastern province. Moreover, Eastern province would be the preferred setting for potential initial scale-up of the proactive CCM model in CY 2024, based on findings of the ProACT study regarding impact and feasibility, and depending on policy guidance by the NMEP.

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 2017–2021 NMESP: 1) Forecasting and supply planning TA to the MOH, 2) Logistics management information systems capacity-building, 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. Overall, these focus areas align at a high level with the national supply chain strategy functional areas of forecasting, procurement, and rational use; storage and distribution; strategic data; and finance and resources. However, one key area of divergence with GRZ in terms of supply chain can be found within the NMESP 2017–2021. Under the NMESP, the NMEP proposes the use of MDA using DHAPQ (dihydroartemisinin + piperaquine). PMI does not support this initiative and therefore does not procure DHAPQ.

An overview of the health supply chain system can be found in the Zambia Country Profile.

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

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-building, 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 slightly from 34 percent in April 2021 to 35 percent in April of 2022. The primary reasons for this change includes the ongoing challenges related to ACTs and the non-adherence to the standard operating procedures as well as the high issuances of ACTs outside of standard channels. PMI, through both crosscutting USAID supply chain activities and the PMI stockout reduction strategy, is actively working to improve stockout rates in Zambia. This includes day-to-day monitoring of issues and facility consumption data as well as additional support for third party distribution and monitoring. PMI contributions included the following:

Forecasting and Supply Planning TA to the MOH

- Enhanced capacity of MOH core team members—drawn from all levels of supply chain management at the MOH—to promote ownership and coordination of forecasting, quantification, and procurement planning for malaria commodities (with renewed focus on refining standard operating procedures and enhancing active use of standard operating procedures during quantification events).
- Promoted ownership of procurement and supply planning to institutionalize the exchange of procurement and shipping information among stakeholders.
- Held monthly stakeholders meeting to discuss stock status of key antimalaria commodities and review supply plans and any funding gaps.

Logistics Management Information Systems Capacity Building

- Built capacity in logistics system strengthening through training and supervision in the Essential Medicine Logistics Information Program to MOH and CHWs. Provided ongoing training and support to MOH staff in the use of eLMIS to enhance malaria commodity security. Improved upon the stock redistribution system, which is a geographic information system-based tool that uses color coding and other visual cues to inform supply chain decision-making.

Data Visibility for Assessing and Monitoring Stock Status

- Assessed and monitored stock status for antimalarial drugs and mRDTs at the provincial, district, and health center levels using data analytics tools on a monthly basis.
- Improved availability of data for decision-making through End Use Verification surveys at the beginning of FY 2022 and in April 2022.

ZAMMSA Warehousing and Distribution Capabilities

- Provided TA in inventory management procedures, inventory management policies, product security procedures, warehouse management system use, workplace organization processes, and distribution and fleet management. USAID's Global Health Supply Chain Program-Procurement and Supply Management project supported the roll-out of 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.
- 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.
- Provided direct supplemental support to ZAMMSA through PEPFAR, whose funding benefits PMI for distribution, infrastructure improvements, and operational support.

Strengthened Commodity Security and Risk Management

Given growing concerns over ensuring malaria commodities reach the intended destination, USAID/Zambia has developed a Supply Chain Commodity Security and Risk Management Plan which serves as a guide to mitigating 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; anti-corruption solutions; and other key vulnerabilities.

The plan was developed and will be implemented by the Mission technical staff as well as support offices. In particular, the Democracy and Governance Office provided guidance to align the plan with a larger anti-corruption framework to ensure an integrated approach and propose activities which focus on understanding the biggest risks in the commodity supply chain system, including the economic and sociopolitical dynamics that may enable corruption. To better understand issues of possible ACT diversion, PMI, in collaboration with the MOH and the Global Fund, funded an ACT Audit in 2022, with results expected to help strengthen commodity security in the country. PMI has also increased funding for last-mile distribution of malaria commodities to focal provinces and has budgeted for regular spot checks of all malaria commodities and third-party monitoring of last-mile distribution. The USAID Mission will continue to dialogue with PMI HQ regarding possible core support for additional commodity security measures in Zambia.

5.3. Plans and Justification with FY 2023 Funding

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

To respond to concerns of ACT divergence and ensure a stronger supply chain system, PMI will continue to invest increased resources (as compared with the baseline of FY 2021 and prior) to strengthen malaria commodity security. This will be directed to support third-party spot checks, last-mile distribution, and third-party monitoring of the last-mile distribution mechanism. Forecasting and supply planning, Logistics Management Information Systems capacity building, data visibility, and TA for improved warehousing and distribution capabilities at ZAMMSA will continue to be prioritized, and will continue with similar funding levels to those of MOP FY 2022.

6. Social and Behavior Change

6.1. PMI Goal and Strategic Approach

In alignment with the country's national malaria control/elimination communication strategy, PMI utilizes targeted SBC interventions that 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.

The NMEP's objectives for the National Communication Strategy for Malaria Elimination 2017 to 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.

PMI supports data-shaped, coordinated communication and non-communication SBC interventions deployed across PMI geographic focus areas. Through partnerships with community-based organizations and the training of Community Change Agents (CCAs), PMI supports the NMEPs efforts to expand 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 TA, support for capacity strengthening activities including coordination, and has recently seconded an SBC Advisor to the NMEC. PMI is currently supporting efforts to revise the communication strategy to encompass a broader 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, non-governmental 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. This includes implementation of champion communities and engagement with traditional and religious leaders.

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

Development of District-Level SBC Engagement Plans
In 2021, PMI provided TA to 47 districts to develop district malaria engagement plans outlining SBC interventions to be implemented by the MOH and stakeholders in each district.

Contracting with CSOs for SBC Activities
A core PMI strategy to accelerate implementation of SBC interventions at the community level is to work through CSOs, particularly community- and faith-based organizations. To increase the reach of malaria elimination efforts at the community level in PMI-supported provinces, PMI contracted 11 CSOs to work in the four PMI focal provinces. The CSOs implement community-based activities such as CCAs, mobilization and engagement of community leaders, and support for strengthened service communication at the community level. They also benefit from ongoing mentorship and monitoring.

Training and Mentoring of Community Change Agents to Support Community Dialogues

PMI supported community dialogues led by CCAs and health facility staff to influence shifts in normative behavior of individuals and community members. Communities identified key challenges to malaria prevention and treatment and collectively developed strategies to overcome identified barriers, leverage existing motivators, and increase uptake of proven malaria interventions.

Mass Media

In 2021, to reach a large proportion of the Zambian population, PMI supported the development and airing of community radio messages. PMI also developed and aired a six-episode pre-recorded radio discussion program aimed at increasing knowledge, influencing social norms, and building skills through actionable dialogues.

ITN Misuse Study

PMI conducted a study of ITN misuse and repurposing, with results expected to be disseminated in the third quarter of 2022 to inform SBC and other strategies to prevent misuse of ITN, especially in fishing.

Significant Challenges by Technical Area

Insecticide-treated Mosquito Nets

In PMI-supported provinces, ITN ownership reduced from 90 percent (MIS, 2018) to 53 percent (MIS, 2021). This is partly attributed to the “mosaic” distribution described earlier in the Vector Control section. The use of ITNs among those with access also decreased from 52 percent (MIS, 2018) to 28 percent (MIS, 2021). Misconceptions about infertility, suffocation, and lack of malaria-carrying mosquitoes in the “cold season” remain persistent.

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 supernatural 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 just 79 percent of microscopy and 95 percent of non-microscopy 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 SBC approaches used in non pre-elimination districts and provinces. In time, surveillance data will help focus SBC activities to ensure low burden communities maintain high use of malaria prevention interventions.

6.3 Plans and Justification with FY 2023 Funding

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

Develop Community-Level SBC Engagement Plans

Based on the lessons learned in 2021—namely insufficient participation of the wider community in the process of developing and implementing district engagement plans to ensure ownership and use—PMI will support districts and health facilities to facilitate the development of community-level SBC engagement plans at the level of the health facility catchment area. PMI will also provide training to traditional and religious leaders on support for the development of community engagement plans and ensure a whole community approach to malaria reduction.

Engage Civil Society Organizations

To expand reach and promote community engagement in development, ownership, and sustainability of SBC interventions, PMI will increase the number of CSO sub-awards from 11 to 22, covering all 47 districts in all four PMI focal provinces with interpersonal SBC activities. CSO interventions will focus on empowering individuals to address and remove barriers that inhibit the uptake and sustained use of proven malaria interventions. This will be done through the champion community initiative, community dialogues, traditional and religious leaders' involvement, service delivery at the community level, training of Safe Motherhood Action Groups at the community level, and support to radio listening groups.

Train and Mentor CCAs to Conduct Community Dialogues

PMI will continue to support community dialogues led by CCAs and health facility staff to influence shifts in normative behavior of individuals and community members. Communities will identify key barriers and facilitators to malaria prevention and

treatment and together develop strategies to overcome identified barriers and increase uptake of proven malaria interventions.

Air Radio Discussion Programs
In Zambia, community radio has increasingly become popular as a source of information, education, and entertainment. Besides pre-recorded programs and radio spots, PMI will also air interactive radio programs which will allow listeners to call in to engage a panel. DHO staff will be part of each radio program.

The NMEP will conduct a mass ITN distribution campaign in 2023. To support the campaign, PMI will collaborate with the NMEP to craft actionable radio messages in support of the campaign that encourage correct and consistent ITN use and care.

Support the NMEP to Develop and Disseminate the National SBC Strategy
The NMEP is in the process of developing a new national malaria elimination strategy. Once this strategy is completed, PMI will support the development of an accompanying SBC strategy that focuses on targeted, evidence-based approaches that positively influence behavioral outcomes by increasing demand and uptake of malaria interventions.

Priorities
While PMI supports SBC activities that promote the uptake and maintenance of all key malaria interventions, three key behaviors will be prioritized with FY 2023 funds: See Table 5.

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 PMI-focus provinces	• Conduct community and household-level interpersonal communication informed by malaria barrier analysis and malaria behavior survey. • Continue training and mentorship of CCAs. • Introduce and integrate interpersonal communication in on the job training and supportive supervision (OTSS) module at health facilities.
Early ANC attendance and uptake of IPTp3	Women of childbearing age and their partners	All four PMI-focus provinces	• Promote engagement of traditional leaders in malaria in pregnancy activities to enforce early ANC attendance and uptake of IPTp. • Train Safe Motherhood Action Groups in effective interpersonal communication approaches. • Conduct health talks during ANC to encourage consistent uptake of IPTp.

Behavior	Target Population	Geographic Focus	Programming to Address Behavior
Correct and consistent net use and proper net care	General population	All four PMI focus provinces	• 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.

Additional Support Activities

In support of adaptive management, PMI will continue to collect routine SBC data. A malaria barrier analysis, which will investigate social and behavioral motivators and inhibitors to community uptake of proven malaria interventions, is nearing completion, and a malaria behavior survey is planned with FY 2022 MOP funds.

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 Social and Behavior Change Advisor at the 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 through helping to resurrect the SBC coordination mechanism and by supporting the quarterly SBC coordination meetings.
- Continued development of evidence-based SBC materials that address determinants to the adoption of proven malaria interventions. PMI will support the design, development, and production processes for these SBC tools materials.
- Strengthening capacity of key players and stakeholders for effective SBC design, implementation, and evaluation.

7. Surveillance, Monitoring, and Evaluation

7.1. PMI Goal and Strategic Approach

PMI shares SM&E objectives in common with the 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, can be accurately tracked, and the data are used strategically to inform malaria programming at the national, provincial, district, facility, and community levels.
- To assess the impact of the national malaria strategic plans and measure successes in reducing malaria burden.

PMI coordinates and collaborates with the NMEP and several partners, including BMGF/PATH/MACEPA, the Global Fund, WHO, and PEPFAR programs, in providing 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 strengthen routine malaria data collection at the community, health facility, district, provincial, and national levels. 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 program evaluation (PE), most importantly the national MIS. Zambia has implemented the MIS every two to three years since 2006, with data collection consistently timed at the peak malaria season (April–May). The most recent MIS was in 2021.

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

Data for Decision-making (All Levels):

- In collaboration with the End Malaria Council, PMI promoted institutionalization of the African Leaders Malaria Alliance/NMEC malaria scorecard. PMI supported 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 fora such as the NMEP monthly directorate meetings, provincial work planning meetings, TWGs, and the national insecticide resistance technical advisory group.
- At the end of the 2017–2021 NMESP, PMI supported WHO and NMEC to conduct the 2021–2022 national Malaria Program Review, which informed the development of the new NMESP 2022–2026, and the associated national malaria monitoring and evaluation plan
- PMI continued to provide logistical and TA to the SMEO TWG, which meets quarterly to provide national-level coordination and leadership in this area.
- PMI supported training to build SM&E capacity at all levels. For example, 88 MOH staff were trained in data management and mentorship, and 25 MOH staff and NMEP partner staff partners trained in the “R” open-source programming software in collaboration with MACEPA.

Strengthening of Routine Surveillance Systems, Including Data Quality Improvement

- At the national level, PMI provided TA to both the MOH Monitoring and Evaluation (M&E) Unit and the NMEC SMEO unit.
    - PMI continues to work with the MOH M&E Unit and the NMEC to improve the interoperability of the HMIS, MRR, Integrated Disease Surveillance and Response, and eLMIS database systems, including the completeness and consistency of data capture and reporting at both health facility and community levels. PMI supported collaboration between the 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. The activities are informed by the 2020 rapid assessment at all administrative levels, which was followed by a comparative systems analysis that identified inconsistencies in systems data elements and provided recommendations for harmonizing malaria data reporting.
    - A milestone in these database integration efforts will be the planned merging of functionality, such that malaria data that end-users enter into MRR will automatically populate HMIS, improving accuracy and saving labor. With PMI support, the NMEC is piloting this MRR-to-HMIS process in three districts in 2022 (Mumbwa, Lusaka district, and Nchelenge). At the same time, PMI is supporting the NMEC/MOH to expand MRR coverage from the current 85 percent of districts to the targeted 100 percent.
- At the provincial and district levels, PMI continues support for data quality audits (DQAs), data reviews, and clinical meetings as a proven set of tools for improving system performance. PMI provided technical support to harmonize DQA tools. In 2021, PMI supported the MOH to conduct DQAs at 606 health facilities; four provincial and 47 district data review meetings; and 181 facility-level mentoring and technical supportive sessions.
- Data accuracy, in terms of discrepancies observed between the data captured on the source paper records and the final data reported in HMIS, remains a persistent challenge for HMIS and MRR data. Findings from DQAs include, for HMIS: four focus provinces were found to have data accuracy for 2017–2021 in the range of 48-63 percent, against a target of 75 percent, with no sustained improvement during that period. For MRR, no province had better than 60 percent accuracy for health facility data, and only Northern and Muchinga achieved greater than 75 percent accuracy for community data. Identified causes for data inaccuracies include inadequate data validation, prior data submission, use of improvised data, collection, and aggregation

tools, inadequate knowledge in data management especially among newly trained health care workers, data entry errors, and incomplete processing of patient data.

2021 Malaria Indicators Survey

- In CY 2021–2022, PMI supported the implementation, data analysis and report writing of the 2021 Malaria Indicators Survey. PMI, together with the Global Fund and BMGF/PATH/MACEPA, was a major partner in the survey. Data collection took place in May and April 2021 and the report was disseminated in 2022. The MIS findings 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 MIS was disseminated in August 2022.

Digital Community Health Initiative

- PMI, in collaboration with BMGF/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 a Rapid Ecosystem Assessment and stakeholders' working group. 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 and to enhance their integration into the health system. Zambia may be 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 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. This has included capacity building 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-building in HMIS/DHIS2-related issues, including MRR and RCD reporting.
- To improve capacity in malaria elimination, PMI continued to provide technical support for establishing a dedicated server at the NMEC to house and process data for malaria case-based surveillance (i.e., the 1,3,7 approach). For example, PMI supported setting up and managing the server, and configuring tablets for data entry. This was piloted in Southern province, for later adaptation to the pre-elimination program in Eastern province.

- PMI is supporting an ongoing Pre-Elimination Program Interim Assessment which covers the period 2018–2022 to gauge progress to inform the next phase of the program. Key questions include: Can saturating proven malaria interventions serve as a pathway to malaria elimination? Does the intervention package need to be modified and if so, how? Methods include: 1) assessment of progress on key malaria indicators from baseline to date: inputs, outputs, outcomes, impact; 2) triangulation of findings from a wide range of data sources. This involves analysis of epidemiological and entomological secondary data from various sources, including MIS, DHIS2, HMIS, MRR, LMIS, Akros geospatial, ANC surveillance pilot study, ProACT baseline survey in Chadiza, implementor's project data, and others; and 3) statistical modeling to estimate gaps in coverage and address questions about the added impact of optimizing intervention choice and delivery mechanisms.

Field Epidemiology Training Program

- PMI currently supports three Field Epidemiology Training Program residents in collaboration with the Zambian National Public Health Institute and the CDC country office. Two residents are embedded in the SMEO unit of the NMEC in Lusaka, while 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.

7.3. Plans and Justification with FY 2023 Funding

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

PMI/Zambia will continue to support SM&E activities as described in the Recent Progress section, above, with continued focus on the sub-areas 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.

The few notable differences in planned activities in FY 2023 and CY 2024 include the following:

- MIS 2024. There will be a PMI-supported 2024 MIS survey, but funding for the survey has already been allocated in the FY 2022 MOP.

- Mid-term review of the NMESP 2022–2026. PMI will provide technical assistance to the NMEP and partners to conduct the mid-term review in CY 2024, promoting effective data use. PMI's role is expected to be supportive only, with minimal costs, as these review activities historically have been funded by Roll Back Malaria and led by WHO.
- Seconding of a systems administrator to the NMEC SMEO unit to manage and coordinate the development, installation, and review of the malaria program information systems to facilitate efficient and effective accessibility and flow of information in the malaria program. The NMEC has identified this need for partner support, as it is currently managing a complex array of databases without in-house expertise in database programming. These include the NMEC instance of DHIS, the MRR, and EDS. This time-limited secondment is expected to increase NMEC efficiency while also protecting years of PMI investments. The programmer would sit at the NMEC headquarters, providing direct support while also training other staff in data management systems. Given the acute need, the PMI/Zambia team has proposed to commence the secondment using reprogrammed FY 2022 funds.
- 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. These will include expanded engagement in reactive case detection (HFCAs <200 cases/1,000 population/yr) and introduction of 1,3,7 approach (rural HFCAs with <50 cases/population/yr).
- As described in the Operations Research and Program Evaluation section below, PMI would be ready to support roll-out of the ANC-based approach to surveillance in targeted districts, following conclusion of the pilot program in Chadiza and policy review by the MOH.

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, whose focus is 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 the NMEC's nascent program in EPR. Moreover, as Zambia makes progress toward sub-national 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(ii)	X		
Household Surveys	Malaria Indicators Survey		X			X	
Household Surveys	Multiple Indicator Cluster Survey						
Household Surveys	EPI Survey		X (Chadiza)		P (Chadiza)		
Health Facility Surveys	Service Provision Assessment						
Health Facility Surveys	Service Availability Readiness Assessment Survey						
Health Facility Surveys	Other Health Facility Survey						
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies	*		*		X	
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(i)
Malaria Surveillance and Routine System Support	MRR System	X	X	X	P	P	P (i)
Malaria Surveillance and Routine System Support	Support to Integrated Disease Surveillance and Response						
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System	X	X	X	P	P	P
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	P		
Other	Malaria Impact Evaluation						

Source	Data Collection Activity	2020	2021	2022	2023	2024	2025
Other	Entomologic Monitoring	X	X	X	P	P	P

* Non-PMI funded activities
(i) 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.
(ii) PMI does not support the Demographic Health Survey (DHIS). DHIS is typically supported by USAID maternal and child health and family planning activities and multiple cooperating partners.
X denotes completed activities and P denotes planned activities.

8. Operational Research and Program Evaluation

8.1. PMI Goal and Strategic Approach

The Zambian NMESP highlights “harnessing innovation through focused research” as a key aspect of health system strengthening. The NMEP conducts an annual consultative exercise, supported by the Global Fund and with PMI participation, at which research priorities are updated. The NMEP SMEO unit and the SMEO TWG vets research proposals, guides research implementation, and provides for dissemination of findings. PMI coordinates with other major sponsors of malaria research, including BMGF/PATH/MACEPA and NIH, to identify areas that would benefit from PMI support. Recent examples are described in the following section.

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

Pilot of ANC-based Malaria Surveillance in Chadiza

ANC-based surveillance has been piloted with PMI support in Chadiza district, Eastern province, since early 2020, as described in the FY 2022 MOP. The program tracks reported coverage of control interventions as well as RDT positivity rates on a monthly basis in the sentinel population of first-time ANC attendees. As of mid-2022, data collection was on course and scheduled to conclude in July. The platform has incidentally proven useful for COVID-19 surveillance, with Chadiza joining three other sites in a study supported by CDC outside of PMI funding. Validation of findings in comparison to a district household survey was underway. If the ANC-based surveillance method were to be validated, and if feasibility and desirability were to be confirmed on review by the NMEP and stakeholders, the approach could be scaled up to additional districts. Such an approach could provide complementary data for PE in covered geographies.

ProACT Study in Chadiza

The ProACT study in Chadiza district is testing a new way to deploy CHWs in community-level passive case detection and treatment. It was described in the FY 2022 MOP. Briefly, ProACT is designed as a two-arm, cluster-randomized controlled trial to determine whether year-round weekly household visits by CHWs to detect and test people of all ages with fever or history of fever with RDTs (“household sweeps”), and

offer treatment with an ACT for those who test positive, is associated with a greater reduction in confirmed malaria cases and parasite prevalence over a two-year follow-up period than standard CCM by CHWs. (In standard CCM, a patient with symptoms seeks out the CHW for testing.) Randomization is at the level of the CHW catchment areas. The study will also assess feasibility of the household sweeps to inform decisions about potential adoption of this approach if impact is found to be significant

The ProACT study protocol was finalized and approved in 2019, but initiation was delayed by one year due to the COVID-19 pandemic. Baseline survey data was conducted in April–May 2021. That household survey was a modified MIS and had the complementary cost-saving objectives of serving as a baseline for the ProACT study, validating the ANC-based surveillance pilot in Chadiza (described above), and enriching the mapping and modeling activities for the pre-elimination program to better characterize the current and potential future malaria situation. Following community entry and household consenting process, and enjoying excellent support from the local PHO and DHO, the intervention began in the fourth quarter of CY 2021. As of mid-2022, each week CHWs in the intervention arm cluster are meeting the target of visiting approximately 4,000 households, identifying individuals with symptoms of malaria, and testing, treating, or referring as appropriate. In the control arm clusters, CHWs are providing CCM services to populations in their assigned zones in the usual manner.

Ongoing Program Evaluation in Collaboration with ICEMR in Nchelenge
Since 2018, an informal collaboration with the NIH-funded ICEMR station in Nchelenge district, Luapula province, has created ongoing opportunities for PE of a package of malaria interventions in that high-burden setting.

The ICEMR is led by Johns Hopkins University, and the main local collaborator is the Tropical Disease Research Center based in Ndola. The ICEMR collects monthly entomologic and epidemiologic data from a randomized selection of 25 households each month, tracks RDT positivity rates at 11 local health facilities, and conducts special studies on drivers of persistent high transmission, such as mobile populations and unusually challenging local vector dynamics, as well as on case management in the district hospital. To foster the collaboration in PE and leverage the NIH investment, PMI has facilitated data sharing, periodic workshops, joint site visits, and periodic mutual updates, in the spirit of a “learning lab.”

To date, the collaboration has informed PMI and NMEP advocacy to address national challenges around the erratic supplies of blood for transfusion and the erratic supplies of ACTs and RDTs for CCM. The collaboration has already led to course corrections in implementation, especially in IRS. This has included changing from a shorter (pirimiphos-methyl capsule suspension) to longer-lasting clothianidin-only and clothianidin + deltamethrin insecticides (in 2018), and extending IRS coverage to

settlements in the swampy interior of the district and to islands (in 2019 and 2020). However, despite eight years of PMI investment in IRS with various insecticides, there has been minimal impact on parasite prevalence and malaria morbidity and mortality in the district. ICEMR entomologic studies suggested that shifting the timing of IRS from just prior to the rainy season (October/November) to the end of the rainy season (March/April) could better target the prominent, annual local surge in *An. funestus* s.l., and that this could result in a much larger reduction in vector counts and malaria burden. A small study is currently underway to monitor the impact of PMI-supported IRS at the end of the rainy season. The ICEMR researchers are sampling households from these areas for malaria parasitemia, vector density, and other metrics, beginning in March 2022 and continuing through April 2023.

Table 7. PMI-funded Operational Research/Program Evaluation Studies in Zambia

Recently Completed OR/PE Studies	Status of Dissemination	Start date	End date
N/A			
Ongoing or Planned OR/PE Studies	**Status**	**Start date**	**End date**
Zambia antenatal surveillance pilot: assessing coverage and prevalence from routine antenatal care visits in Chadiza district, Eastern province	Ongoing	March 2020	Q4 2022
A cluster randomized controlled trial of proactive community case management for malaria in Chadiza district, Eastern province (also known as the ProACT study)	Ongoing	March 2021	Q4 2023

Table 8. Non-PMI-funded Operational Research/Program Evaluation Studies Planned/Ongoing in Zambia

Source of Funding	Implementing institution	Research Question/Topic	Current status/ timeline
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	Ongoing. Began March 2022, Ends April 2023.
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,

Source of Funding	Implementing institution	Research Question/Topic	Current status/ timeline
			including blood stockouts.
WHO (AFRO II Project)	MOH	Assess feasibility and impact of window screening vs. ITNs alone on malaria prevalence	Ongoing in Nyimba district. Baseline survey done Aug. 2019, implementation began Oct. 2019
BMGF	PATH/MACEPA , MOH	Attractive target sugar baits, entomologic validation, epidemiologic evaluation	Ongoing in Kaoma district

8.3. Plans and Justification with FY 2023 Funding

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

No specific OR/PE activities are proposed with FY 2023 funding. However, PMI implementing partners funded in FY 2023 who are active in Nchelenge district (e.g., IRS, iCCM, supply chain) 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 (recent examples: Nchelenge “learning lab” and the Pre-elimination Program Interim Assessment, as described in previous sections).

9. Capacity Strengthening

9.1. PMI Goal and Strategic Approach

PMI supports 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.

In alignment with NMEP’s 2030 goals, PMI advocates for further saturation of proven interventions and increased focus and funding toward malaria by the GRZ. PMI will complement these efforts by advocating for increased integration of non-governmental cooperating partners.

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

In the past year, PMI provided capacity strengthening support to the NMEC through professional development activities as well as through direct technical assistance to support the 2021–2022 Malaria Program Review and the creation of the new NMESP

(2022–2026). PMI did not provide support to the Peace Corps because the program has been on hold in Zambia due to the COVID-19 pandemic.

PMI has also worked to ensure collaborative integration within the USAID health sector, as well as across MOH offices to ensure maximum program impact. For example, PMI has strengthened collaboration with the USAID Family Health team as well as with the Maternal Reproductive Health Unit at the MOH to increase early ANC attendance and improve IPTp uptake. PMI is also working across sectors with the USAID Democracy and Governance team to develop an integrated anti-corruption and commodity security strategy.

To strengthen local leadership and move toward USAID's sustainability goals, PMI has started to plan for increased G2G funding of select malaria activities to include CHW training as well as OTSS visits in some PMI focal provinces. G2G activity implementation is slated to start in the latter part of 2022. PMI has also engaged with local community- and faith-based organizations to use local capacity to facilitate SBC activities at the community level. PMI is providing mentoring, training, and supervision support to CSOs.

PMI continues to engage with the private sector at multiple levels. For example, PMI leverages the longstanding investments by Zambian mining companies in spraying campaigns for mosquito control by carrying out joint training and planning exercises in Copperbelt province. PMI also commissioned an inventory of private sector contributions in malaria control nationwide, which will help inform future investments by the national EMC as well as USAID activities.

9.3. Plans and Justification with FY 2023 Funding

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

In 2023, PMI will once again support Peace Corps activities in malaria control, including through small project assistance grants. PMI will also support a third-year Peace Corps Volunteer position. PMI will support a malaria orientation for advocacy leaders to ensure they are well versed in malaria activities, successes, and challenges, to better advocate for malaria visibility and funding at the highest levels of government. PMI will continue to provide support to strengthen NMEC staff capacity through development activities such as training workshops and participation in regional/global meetings. PMI may support light refurbishment of the NMEC and vehicle repair as allowable under USAID rules and regulations. Pending completion of the blood supply assessment in 2022, PMI will also

work with maternal and child health colleagues to invest in technical assistance to strengthen health systems for treating severe malaria.

Vaccine Adoption

In light of the 2021 approval of the RTS,S vaccine by WHO for scale up, and by Gavi, the Vaccine Alliance (Gavi) for donor funding, Zambia for the first time sees a path toward adding a vaccine to its package of malaria control interventions. PMI will provide TA to aid the MOH in exploring opportunities to take advantage of innovations in malaria vaccine technology and systems, assisting to fill gaps in expertise and coordination. For example, PMI will assist with coordination between NMEC and EPI and provide TA for development of funding applications, planning for adoption, and operationalization, potentially in an OR context.

The following background and rationale underlie PMI and the MOH's interest:

- In November 2021, the NMEC first met with its EPI counterparts to begin charting a way forward through what was recognized to be a long and laborious process. By March 2022, the NMEP had incorporated malaria vaccine technology into the new 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 NMEC now has a 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 (ZITG), EPI, Gavi, UNICEF."
- In April 2022, the MOH EPI unit made a request for cooperating partners to provide technical assistance in exploring opportunities, including preparation for a Gavi funding application later in the year.
- 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, Kenya) and in high-burden countries. However, they see that Zambia, with its strong track record in malaria surveillance, research, and innovation, its strong record of achievement 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 during the early roll-out.

10. Staffing and Administration

Four health professionals oversee PMI in Zambia. The single interagency team led by the USAID Mission Director or their designee consists of a Resident Advisor

representing USAID, a Resident Advisor representing CDC, and two locally hired experts known as Foreign Service Nationals (FSNs). The PMI interagency team works together to oversee all technical and administrative aspects of PMI, including finalizing details of the project design, implementing malaria prevention and treatment activities, monitoring and evaluation of outcomes and impact, reporting of results, and providing guidance and direction to PMI implementing partners.

ANNEX: GAP ANALYSIS TABLES

Table A-1. ITN Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	24,269,389	24,948,932	25,647,502
Total population at risk for malaria	24,269,389	24,948,932	25,647,502
PMI-targeted at-risk population	24,269,389	24,948,932	25,647,502
Population targeted for ITNs	24,269,389	24,948,932	25,647,502
Continuous Distribution Needs			
Channel 1: ANC	1,310,547	1,347,242	1,384,965
Channel 1: ANC Type of ITN	PBO	PBO	PBO
Channel 2: EPI	1,262,008	1,297,344	1,333,670
Channel 2: EPI Type of ITN	PBO	PBO	PBO
Channel 3: School			
Channel 3: School Type of ITN			
Channel 4: Community			
Channel 4: Community Type of ITN			
Channel 5:			
Channel 5: Type of ITN			
Estimated Total Need for Continuous Channels	2,572,555	2,644,587	2,718,635
Mass Campaign Distribution Needs			
Mass distribution campaigns	0	11,636,635	0
Mass distribution ITN type	PBO	PBO	PBO
Estimated Total Need for Campaigns	0	11,636,635	0
Total ITN Need: Continuous and Campaign	**2,572,555**	**14,281,222**	**2,718,635**
Partner Contributions			
ITNs carried over from previous year	0	0	0
ITNs from Government			
Type of ITNs from Government	PBO	PBO	PBO
ITNs from Global Fund	900,000	2,420,402	
Type of ITNs from Global Fund	PBO	PBO	
Type of ITNs with PMI funding	PBO	PBO	PBO
ITNs planned with PMI funding	600,000	600,000	1,200,000
ITNs planned with PMI funding	0	1,080,000	0
Type of ITNs with PMI funding	PBO	PBO	PBO
Total ITNs Contribution Per Calendar Year	**1,500,000**	**4,100,402**	**1,200,000**
Total ITN Surplus (Gap)	**(1,072,555)**	**(10,180,820)**	**(1,518,635)**

Table A-2. RDT Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	18,926,743	19,456,692	20,001,479
Population at risk for malaria	18,926,743	19,456,692	20,001,479
PMI-targeted at-risk population	18,926,743	19,456,692	20,001,479
RDT Needs			
Estimate OPD attendances	**26,906,421**	**27,833,996**	**28,761,571**
Facility adjustment for reporting (A*2%)	538,128	556,680	575,231
Facility adjustment for data transposing marginal errors (A*5%)	1,345,321	1,391,700	1,438,079
Facility adjustment for data accuracy (A * 15%)	4,035,963	4,175,099	4,314,236
Facility Subtotal - A+B+C+D	**32,825,834**	**33,957,475**	**35,089,117**
Prevalence of fever on OPD cases (E * 50%)	16,412,917	16,978,738	17,544,558
Community fever cases - OPD represents 80% of national cases, with the remainder being community (F/.8)-F	4,103,229	4,244,684	4,386,140
Fever cases in level 0, 1, 2 (G * 32%) *	1,313,033	1,358,299	1,403,565
Positivity rate level 0, 1, 2 (H * 32.9%)	431,988	446,880	461,773
Index follow up in level 0, 1, 2 (20 Individuals per index case tested) (I * 20)	8,639,759	8,937,607	9,235,455
Adjustment for QA/QC - (F+G+J) * 8%	2,332,472	2,412,882	2,493,292
Training CHWs and health workers (5 RDTs per trainee for 3,000 CHWs) (5 * 3,000)	15,000	15,000	15,000
Projected Number of tests to be conducted through a microscope (25 tests (average)*20 days * 12 months * 600 microscopy sites.	3,600,000	3,600,000	3,600,000
Program growth - (F+G+J+K+L-M) * 15%	4,185,507	4,348,337	4,511,167
RDT Needs (tests)	**32,088,885**	**33,337,249**	**34,585,613**
Needs Estimated based on HMIS Data			
Partner Contributions (tests)			
RDTs from Government	0	0	0
RDTs from Global Fund	23,955,800	0	0
RDTs from other donors	0	0	0
RDTs planned with PMI funding	8,025,000	1,512,500	5,150,000
Total RDT Contributions per Calendar Year	**31,980,800**	**1,512,500**	**5,150,000**
Stock Balance (tests)			
Beginning Balance	23,321,775	23,213,690	0
- Product Need	32,088,885	33,337,249	34,585,613
+ Total Contributions (received/expected)	31,980,800	1,512,500	5,150,000
Ending Balance	**23,213,690**	**(8,611,058)**	**(29,435,613)**
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	16,044,442	16,668,624	17,292,806
Total Surplus (Gap)	**7,169,248**	**(25,279,682)**	**(46,728,419)**

Table A-3. ACT Service Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	18,926,743	19,456,692	20,001,479
Population at risk for malaria	18,926,743	19,456,692	20,001,479
PMI-targeted at-risk population	18,926,743	19,456,692	20,001,479
ACT Needs			
Total projected number of malaria cases	7,590,419	7,927,612	8,264,805
Malaria Cases (OPD) - A*90% HMIS contribution	6,831,377	7,134,851	7,438,325
Malaria Cases (Community) - A*10% MRRS contribution	759,042	792,761	826,481
Malaria Cases (OPD) - B*2% (98% HMIS reporting)	136,628	142,697	148,766
Malaria Cases (Community) - C*31% (69% MRRS reporting)	235,303	245,756	256,209
Adjusting for HMIS+MRRS data accuracy - (A+D+E) *15%	1,194,352	1,247,410	1,300,467
Adjusting for HMIS+MRRS data transposing marginal errors - (A+D+E) *5%	398,117	415,803	433,489
Adjusting for uncaptured Malaria cases at Community level - ((C+E)/0.90)-(C+E)	110,483	115,391	120,299
Adjusting for Malaria program growth - (A+D+E+F+G+H) *15%	1,449,795	1,514,200	1,578,605
Total ACTs required in the management of complicated malaria (HMIS)	88,373	83,570	78,767
Total ACT Needs (treatments)	**11,203,471**	**11,692,439**	**12,181,408**
Needs Estimated based on HMIS Data			
Partner Contributions (treatments)			
ACTs from Government			
ACTs from Global Fund	2,491,500	0	0
ACTs from other donors			
ACTs planned with PMI funding	7,478,700	2,699,500	3,066,667
Total ACTs Contributions per Calendar Year	**9,970,200**	**2,699,500**	**3,066,667**
Stock Balance (treatments)			
Beginning Balance	5,027,370	3,794,099	0
- Product Need	11,203,471	11,692,439	12,181,408
+ Total Contributions (received/expected)	9,970,200	2,699,500	3,066,667
Ending Balance	**3,794,099**	**(5,198,840)**	**(9,114,741)**
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	5,601,735	5,846,220	6,090,704
Total Surplus (Gap)	**(1,807,636)**	**(11,045,059)**	**(15,205,445)**

Table A-3. ACT Logistics Gap Analysis Table

Calendar Year	2022	2023	2024
Total country population	18,926,743	19,456,692	20,001,479
Population at risk for malaria	18,926,743	19,456,692	20,001,479
PMI-targeted at-risk population	18,926,743	19,456,692	20,001,479
ACT Needs			
Total projected number of malaria cases based on Logistics data	**14,920,733**	**14,936,288**	**14,951,844**
Total ACT Needs (treatments)	**14,920,733**	**14,936,288**	**14,951,844**
Needs Estimated based on Consumption Data			
Partner Contributions (treatments)			
ACTs from Government	0	0	0
ACTs from Global Fund	2,491,500	0	0
ACTs from other donors	0	0	
ACTs planned with PMI funding	7,478,700	4,425,409	3,066,667
Total ACTs Contributions per Calendar Year	**9,970,200**	**4,425,409**	**3,066,667**
Stock Balance (treatments)			
Beginning Balance	4,501,590	0	0
- Product Need	14,920,733	14,936,288	14,951,844
+ Total Contributions (received/expected)	9,970,200	4,425,409	3,066,667
Ending Balance	**(448,943)**	**(10,510,879)**	**(11,885,177)**
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	7,460,367	7,468,144	7,475,922
Total Surplus (Gap)	**(7,909,310)**	**(17,979,023)**	**(19,361,099)**

Table A-5. Inj. Artesunate Gap Analysis Table

Calendar Year	2022	2023	2024
Injectable Artesunate Needs			
Projected number of severe cases	88,373	83,570	78,767
Servere malaria cases - 2 Months<3 Years	9,456	8,942	8,428
Servere malaria cases - 3 Years < 9 Years	16,393	15,502	14,611
Servere malaria cases - 9 Years < 12 years	9,102	8,608	8,113
Servere malaria cases - > 12 Years	53,421	50,518	47,615
Total Artesunate Inj Vials - 2 Months<3 Years	57,681	54,546	51,411
Total Artesunate Inj Vials - 3 Years < 9 Years	99,998	94,564	89,129
Total Artesunate Inj Vials - 9 Years < 12 years	111,251	105,204	99,158
Total Artesunate Inj Vials - > 12 Years	980,498	927,209	873,919
Total Injectable Artesunate Needs (vials)	**1,249,428**	**1,181,523**	**1,113,617**
Needs Estimated based on HMIS Data			
Partner Contributions (vials)			
Injectable artesunate from Government	0	0	0
Injectable artesunate from Global Fund	0	0	0
Injectable artesunate from other donors	0	0	0
Injectable artesunate planned with PMI funding	1,053,524	1,500,000	358,852
Total Injectable Artesunate Contributions per Calendar Year	**1,053,524**	**1,500,000**	**358,852**
Stock Balance (vials)			
Beginning Balance	403,580	207,676	526,153
- Product Need	1,249,428	1,181,523	1,113,617
+ Total Contributions (received/expected)	1,053,524	1,500,000	358,852
Ending Balance	**207,676**	**526,153**	**(228,612)**
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	624,714	590,761	556,809
Total Surplus (Gap)	**(417,038)**	**(64,608)**	**(785,420)**

Table A-6. RAS Gap Analysis Table

Calendar Year	2022	2023	2024
Artesunate Suppository Needs			
Number of severe cases expected to require pre-referral dose (or expected to require pre-referral dose based on number of providers for the service)	308,279	316,911	325,784
Total Artesunate Suppository Needs (suppositories)	**155,373**	**159,723**	**164,195**
Needs Estimated based on HMIS Data			
Partner Contributions (suppositories)			
Artesunate suppositories from Government	0	0	0
Artesunate suppositories from Global Fund	0	0	0
Artesunate suppositories from other donors	0	0	0
Artesunate suppositories planned with PMI funding	0	0	79,365
Total Artesunate Suppositories Available	**0**	**0**	**79,365**
Stock Balance (suppositories)			
Beginning Balance	167,076	11,703	0
- Product Need	155,373	159,723	164,195
+ Total Contributions (received/expected)	0	0	79,365
Ending Balance	**11,703**	**(148,020)**	**(84,830)**
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	77,687	79,862	82,098
Total Surplus (Gap)	**(65,984)**	**(227,882)**	**(166,928)**

Table A-7. SP Gap Analysis Table

Calendar Year	2022	2023	2024
Total Country Population	18,926,743	19,456,692	20,001,479
Total Population at Risk for Malaria	18,926,743	19,456,692	20,001,479
PMI Targeted at Risk Population	18,926,743	19,456,692	20,001,479
SP Needs			
Estimated ANC Visit	2,919,526	3,362,922	3,806,318
Facility adjustment for reporting (A*2%)	58,391	67,258	76,126
Facility vs HMIS data transposing - marginal error (A*5%)	145,976	168,146	190,316
Facility adjustment for data accuracy (A * 15%)	437,929	504,438	570,948
Adjusting for HIV Pregnant women expected to be on cotrimoxazole prophylaxis (Average 80,000 annually) - (A+B+C+D) - 80,000	3,481,822	4,022,765	4,563,708
Program growth (E* 15%)	522,273	603,415	684,556
Total ANC Visits (SP Treatments)	**4,004,095**	**4,626,180**	**5,248,264**
Total SP Needs (Tablets)	**12,012,285**	**13,878,539**	**15,744,792**
Needs Estimated based on HMIS Data			
Partner Contributions (doses)			
SP from Government	0	0	0
SP from Global Fund	2,086,333	0	0
SP from other donors	0	0	0
SP planned with PMI funding	1,543,333	500,000	1,774,193
Total SP Contributions per Calendar Year	**3,629,667**	**500,000**	**1,774,193**
Stock Balance (doses)			
Beginning balance	594,667	220,238	0
- Product Need	4,004,095	4,626,180	5,248,264
+ Total Contributions (Received/expected)	3,629,667	500,000	1,774,193
Ending Balance	**220,238**	**(3,905,941)**	**(3,474,071)**
Desired End of Year Stock (months of stock)	6	6	6
Desired End of Year Stock (quantities)	2,002,047	2,313,090	2,624,132
Total Surplus (Gap)	**(1,781,809)**	**(6,219,031)**	**(6,098,203)**