

This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The final funding available to support the plan outlined here is pending final FY 2017 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.



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PRESIDENT'S MALARIA INITIATIVE

MALAWI

Malaria Operational Plan FY 2017

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ABBREVIATIONS and ACRONYMS

ACT	Artemisinin-based combination therapy
AL	Artemether-lumefantrine
ANC	Antenatal care
AS/AQ	Artesunate-amodiaquine
CDC	Centers for Disease Control and Prevention
CMED	Central Monitoring and Evaluation Department
CMST	Central Medical Stores Trust
DHS	Demographic and Health Survey
DP	Dihydroartemisinin-piperaquine
DQA	Data quality assessment
EHP	Essential health package
FANC	Focused antenatal care
FY	Fiscal year
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GoM	Government of Malawi
HSA	Health surveillance assistants
HSSP	Health Sector Strategic Plan
HTSS	Health Technical Support Services
iCCM	Integrated community case management
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
IVM	Integrated vector management
LMIS	Logistics management information system
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MoH	Ministry of Health
MOP	Malaria Operational Plan
NFM	New Funding Model
NMCP	National Malaria Control Program
OTSS	Outreach training and supportive supervision
PMI	President's Malaria Initiative
RDT	Rapid diagnostic test
SBCC	Social and behavior change communication
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
SPA	Service provision assessment
SWAp	Sector-wide approach
TES	Therapeutic efficacy study
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USG	United States Government
VHC	Village health clinics
WHO	World Health Organization

I. EXECUTIVE SUMMARY

When it was launched in 2005, the goal of the President's Malaria Initiative (PMI) was to reduce malaria-related mortality by 50% across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective 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); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

In 2015, PMI launched the next six-year strategy, setting forth a bold and ambitious goal and objectives. The PMI Strategy for 2015-2020 takes into account the progress over the past decade and the new challenges that have arisen. Malaria prevention and control remains a major U.S. foreign assistance objective and PMI's Strategy fully aligns with the U.S. Government's vision of ending preventable child and maternal deaths and ending extreme poverty. It is also in line with the goals articulated in the RBM Partnership's second generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and WHO's updated *Global Technical Strategy: 2016-2030*. Under the PMI Strategy 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination.

Malawi was selected as a PMI focus country in FY 2006.

This FY 2017 Malaria Operational Plan presents a detailed implementation plan for Malawi, based on the strategies of PMI and the National Malaria Control Program (NMCP). It was developed in consultation with the NMCP and with the participation of national and international partners involved in malaria prevention and control in the country. The activities that PMI is proposing to support fit in well with the National Malaria Control strategy and plan and build on investments made by PMI and other partners to improve and expand malaria-related services, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants. This document briefly reviews the current status of malaria control policies and interventions in Malawi, describes progress to date, identifies challenges and unmet needs to achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2017 funding.

The proposed FY 2017 PMI budget for Malawi is \$22 million. PMI will support the following intervention areas with these funds:

Entomologic monitoring and insecticide resistance management: The Malawi Vector Control Strategy 2015-2019 promotes integrated resistance monitoring and implementation of a resistance management plan, collection of entomological data to monitor impact and capacity building for implementation. Over the past five years, PMI-supported entomological monitoring has documented increasing vector insecticide resistance, including the rise and spread of pyrethroid and carbamate resistance in *An. funestus*, which is the primary malaria vector across most of the country. As of 2015, all *An. funestus* populations tested against the organophosphates malathion and pirimiphos-methyl have been fully susceptible. These data indicate organophosphates are the only technically sound options for IRS in Malawi. PMI supports entomological surveillance in seven districts, including measurements of mosquito density and insecticide resistance. Additionally, the team conducted a comparison of the effectiveness of pyrethrum spray catches vs. CDC light traps, and measured sporozoite rates in routine collections for the first time in several years.

With FY 2017 funding, PMI will continue to support entomological monitoring in targeted districts. In past years, the entomology team has had difficulty collecting enough *An. funestus* to carry out resistance assays in all districts. Because the GoM has no firm plans to conduct IRS in the previously sampled districts, PMI plans to reduce the number of districts from seven to five, while intensifying collections in these districts to ensure adequate mosquito sample sizes are collected for all resistance assays. PMI will continue to support insecticide resistance monitoring, including measurement of resistance intensity and synergist assays, measurement of species distribution and abundance, and mosquito behavior. PMI will also continue to provide technical assistance to the NMCP for its entomological monitoring program, which aims to map insecticide resistance in all districts on a rotating annual basis, and which will cover any potential IRS districts.

Insecticide-treated nets (ITNs): The NMCP developed the Malawi Vector Control Strategy 2015-2019 and implementation plan, in which the distribution and promotion of ITN use are the primary malaria prevention interventions in the country. PMI has consistently supported NMCP efforts through the procurement and distribution of ITNs for continuous distribution to pregnant women and children under the age of one year at antenatal care clinics and delivery or expanded program on immunization visits. Over the past six years, an estimated 7 million ITNs have been distributed countrywide in Malawi through routine channels. In addition, PMI has supported Malawi with technical support for planning and management of routine and mass distribution mechanisms, as well as support for social and behavior change communication and community mobilization efforts to improve the uptake and utilization of ITNs.

With FY 2017 funding, PMI will continue to support the NMCP's efforts to ensure high coverage of pregnant women and children through the procurement and distribution of ITNs through routine channels (1.2 million ITNs), and support management, oversight, and distribution of PMI-procured nets to health facilities for routine distribution. FY 2017 activities will also include technical assistance to the NMCP for ITN quantification and distribution planning, and supportive supervision of ANC staff. PMI will continue support for Year 2 of ITN

durability monitoring. Based on lessons learned, PMI will provide technical assistance to facilitate planning and preparation for the mass distribution campaign expected in 2018 – 2019.

Indoor residual spraying (IRS): The 2011-2016 Malawi Malaria Strategic Plan incorporates IRS as part of an integrated vector management strategy. Depending on available resources, the plan proposes resuming IRS with long-acting organophosphates in three high-burden districts in 2016, with the goal of expanding to eight high transmission districts.

In 2007, PMI piloted IRS with a pyrethroid insecticide in part of one high transmission district in Malawi, eventually scaling up to cover two districts. In 2010, the Government of Malawi (GoM) began supporting IRS in an additional five districts in 2010. However, high levels of pyrethroid and carbamate resistance in *An. funestus* necessitated a shift to organophosphate insecticides. Given the high cost and short duration of residual efficacy of short-acting organophosphate, the only alternative available at the time, PMI suspended direct support for IRS in Malawi after the 2011 spray season.

Although the future of the IRS program is uncertain due to resource challenges, the NMCP has expressed their intent to pursue GoM funding for IRS with organophosphates in 2017 in up to three high-risk districts. The NMCP has requested technical assistance from PMI to ensure that the campaign is implemented in a timely and effective manner and in compliance with accepted environmental and worker safety standards. Therefore, with FY 2017 funding, PMI plans to fund activities to catalyze the IRS campaign, including support for microplanning, geocoding, training, environmental compliance, worker safety, and other logistical activities.

Malaria in pregnancy (MIP): Through focused antenatal care (FANC), PMI supports all aspects of the Ministry of Health’s three-pronged approach to reducing the burden of malaria in pregnancy: use of intermittent preventive treatment in pregnant women (IPTp) during antenatal care (ANC), distribution of ITNs to pregnant women, and effective case management of malarial illness and anemia. PMI, in conjunction with the NMCP and Reproductive Health Directorate, has worked to increase uptake of IPTp through training and supervision of providers and assistance with directly observed treatment. With support from PMI, the Ministry of Health (MoH) updated the national policy on IPTp to reflect the new World Health Organization (WHO) guidelines, and trained nearly all health workers in these new guidelines in 2014-15. The revised policy removes previous barriers to IPTp uptake, under which women were only to receive IPTp at specific intervals during pregnancy. Nevertheless, despite two decades of IPTp policy in Malawi, coverage goals have yet to be met. There are still systemic barriers to seeking ANC in the first trimester and increasing sulfadoxine-pyrimethamine (SP) resistance represents another significant threat to IPTp in Malawi.

With FY 2017 funding, PMI will continue integrated and malaria-specific social and behavior change communication activities in support of IPTp, case management, and ITN use at national and community levels; provide free ITNs for routine distribution at ANC visits and at labor and delivery for newborns; procure sulfadoxine-pyrimethamine (2.4 million treatments) and supplies to ensure directly observed therapy and IPTp uptake at ANC; support supervision activities for malaria in pregnancy interventions as part of the focused antenatal care package; and help improve the collection of data on IPTp through support to strengthen the Health Management Information System (HMIS) system.

Case management: Increasing capacity to ensure prompt and effective case management and reduce the presumptive use of antimalarial medications was a key priority in Malawi's Malaria Strategic Plan. PMI has supported the Government of Malawi through procurement of malaria commodities including rapid diagnostic tests (RDTs), artemisinin-based combination therapy (ACT) treatments, injectable artesunate, and artesunate suppositories; training of health facility workers; outreach training and supportive supervision (OTSS) to laboratory and clinical supervisors; and support to village health clinics.

Supply chain issues are a key concern in Malawi. Due to issues of leakage and general mismanagement, a parallel supply chain was created in 2010 to distribute donor-procured malaria commodities. In 2012, representatives from the GoM, Central Medical Stores Trust (CMST), and partners, including World Health Organization, the Global Fund, DFID, and PMI, conducted a review of the supply chain management system and developed a *Joint Strategy for Supply Chain Integration in Malawi*. In addition to support for Central Medical Store (CMS) reform, the USG has supported efforts to improve the overall supply chain through continued support to the MoH to strengthen commodity management and planning at all levels of the system. At the zonal, district, facility, and community levels, PMI will continue to focus on improving provider behavior, accountability for medicines, and improved data management. PMI and other USAID health elements plan to support a supply chain technical advisory group within the newly formed Drug Theft Investigation Unit (DTIU).

ACT consumption has continued to outpace reported malaria cases, with approximately 10 million ACTs consumed compared to approximately 6 million malaria cases (per HMIS data) in 2015. Investigations have identified the facility level—as opposed to central or district levels—as the most problematic. The consensus is that the problem is multifactorial, with continued presumptive treatment, poor record-keeping, and theft as the likely main contributors. Other contributing factors include stock mismanagement, inadequate facilities for commodity storage, and patients often receiving a diagnosis and treatment at different locations within the facility, which leads to additional record-keeping challenges. An action plan has been created with input from the NMCP, HTSS, and other stakeholders to improve commodity oversight and management – including improved supervision at the district, facility, and community levels, better use of data for decision-making, and audits of facilities with discrepancies between consumption and reported cases. Additionally, the recent training of health workers in malaria case management included an emphasis on compliance with RDTs and appropriate use of ACTs, which, when coupled with appropriate follow-up and supervision, should improve provider behavior.

With FY 2017 funding, PMI will focus on improving community and facility-based case management services in ten priority districts, those with the highest malaria burden in the country. Case management commodities, specifically RDTs and ACTs, will still be supplied nationwide and supply chain technical assistance will be provided to all districts through zonal supply chain staff. Parenteral and rectal artesunate for severe malaria treatment will not be procured with PMI funds because other donors provide support for these commodities. PMI will continue to provide diagnostic technical assistance in ten focus districts, concentrating on quality improvement/quality control for diagnostics in facility and community settings. Support will also

include improving RDT use and adherence to results, appropriate severe malaria case management and referral from community and lower health facility levels, and supervision and mentorship in facility and community settings. Based on support from other donors, PMI will not support biannual therapeutic efficacy monitoring with FY 2017 funding.

Health systems strengthening and capacity building: PMI supports targeted health system strengthening activities which cut across intervention areas, such as training of health workers, supply chain management and health information systems strengthening, drug quality monitoring, and NMCP capacity building. Through its implementing partners, PMI provides technical support to the MoH to help improve policies, management and leadership, and fiscal responsibility. PMI promotes evidence-based policies, strengthens the management and technical capacity of the NMCP and other MoH divisions, supports development and strengthening of electronic data systems, strengthens the zonal supervision structures, bolsters decentralized management of health services at the district level, and strengthens the government's capacity for financial planning and management and budget execution.

With FY 2017 funding, PMI Malawi plans to focus and concentrate its service delivery strengthening efforts in ten high malaria burden districts, building government capacity for facility-based case management, FANC and delivery of IPTp, community mobilization and integrated community case management (iCCM), and surveillance monitoring and evaluation at the district level. These capacity building efforts will include training and expanded supportive supervision and mentoring to relevant cadres (e.g., district and zonal health officers, facility and community health care workers, etc.). PMI plans to continue to provide pre-service training to pharmacy assistants so that this cadre will enter the workforce with the stock management skills necessary to help ensure commodity security at the facility level. Simultaneously, at the central level, PMI will provide technical and operational support to the NMCP and other key parts of the MoH (such as the Central Monitoring and Evaluation Department (CMED) and the Integrated Management of Childhood Illness Unit), support policy development and dissemination, strengthen pharmaceutical supply chain management, and reinforce the HMIS and monitoring and evaluation.

Social and behavior change communication (SBCC): The NMCP put in place a Malaria Communication Strategy (2015-2020), whose goal is to improve behavioral change interventions through advocacy and social mobilization, and has established a technical committee to support and guide the implementation of this strategy. PMI Malawi's SBCC efforts are in line with this national strategy and support an integrated approach focused on ITNs, MIP, and case management. SBCC activities have included national campaigns and door-to-door visits to promote year-round ITN use; large-scale campaigns to emphasize ANC attendance to improve IPTp uptake; and community-based campaigns that emphasize ITN utilization, as well as improved case management through the promotion of early care-seeking behavior. SBCC strategies have been employed from the national to the community level to target policy makers, health care providers, and community members. In promoting malaria interventions, PMI has utilized a variety of SBCC approaches, including educational meetings, mass media, print media, community drama, and interpersonal communication activities.

With FY 2017 funding, PMI plans to support an integrated SBCC approach at the national level and at the community level in ten focus districts with ITN, IPTp, and case management messaging. National level efforts will focus on advocacy, mass media communication, and materials development, while community level efforts will focus on interpersonal and small group interventions and strategies to engage traditional authorities to support and promote the importance of malaria prevention activities.

Surveillance, monitoring, and evaluation (SM&E): The NMCP's 2011-2016 Malaria Strategic Plan calls for strengthening of surveillance, monitoring, and evaluation systems through routine health management information systems, malaria-specific surveillance and special surveys to gather entomologic, epidemiologic, and coverage indicator data. PMI has supported numerous monitoring and evaluation activities in Malawi, including household surveys (Demographic Health Survey [DHS], Malaria Indicator Survey [MIS]), health facility surveys (service provision assessment, end-use verification survey), malaria surveillance and routine system support (sentinel surveillance, HMIS), and an impact evaluation.

With FY 2017 funding, PMI plans to continue to support strengthening of routine health management information systems and malaria-specific surveillance, as well as assessing the availability of commodities at health facilities. For district-level activities in the ten PMI focus districts, PMI will work closely with the central level and other malaria partners to ensure activities are in-line with the priorities of the GoM, support national level initiatives and ensure coordination of activities with other partners working in the non-focus districts. PMI will support an impact evaluation of the integrated district-level service delivery and systems strengthening activities to provide evidence of impact of the project on the availability and quality of health services and health system performance in the ten PMI focus districts.

Operational research (OR): The NMCP's 2011-2015 Malaria Strategic Plan calls for strengthening OR through the support of local capacity building and the creation of stronger coordination between the NMCP and researchers to harmonize and prioritize operational research efforts. PMI-funded OR has provided important data for decision-making, including studies measuring the durability of long-lasting ITNs, the impact of IRS, the effectiveness of the IPTp strategy, the quality of health facility case management practices for uncomplicated and severe malaria, the ability of patients to complete recommended first-line treatment for malaria, the distribution of potentially drug-resistant parasites and mosquitoes and the effectiveness of ITNs in an area with significant pyrethroid resistance.

In early 2015, a PMI-funded evaluation of mobile-telephone text messaging to improve health worker performance was initiated. End-line surveys were conducted in November 2015 and May 2016 to assess the impact of the intervention. Analysis of these end-line data revealed no significant improvement in health care worker performance in the intervention group (based on these results, the May 2016 end-line survey was not conducted). In 2015, PMI supported a repeat evaluation of the effectiveness of IPTp focusing on the effect of the sextuple (dhps581) mutation, which is associated with extremely high levels of resistance. Preliminary data suggest that SP remains effective in preventing patent, but not subpatent parasitemia, and was associated with increased birthweight in women who received at least three doses compared to women who received fewer than three doses. PMI has been supporting the NMCP to develop a research

agenda and data dissemination platform to better coordinate and share research among partners in Malawi.

Funding from previous years continues to support two studies. The first assesses the efficacy of IPTp with dihydroartemisinin-piperaquine compared to SP to help determine whether this might be an alternative to IPTp-SP. The second is a pilot assessment of the effect of community delivery of IPTp-SP on IPTp uptake and ANC attendance. There are no OR studies planned with FY 2017 funds.

II. STRATEGY

1. Introduction

When it was launched in 2005, the goal of PMI was to reduce malaria-related mortality by 50% across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective 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); and intermittent preventive treatment of pregnant women (IPTp). With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014. This strategy included a long-term vision for malaria control in which sustained high coverage with malaria prevention and treatment interventions would progressively lead to malaria-free zones in Africa, with the ultimate goal of worldwide malaria eradication by 2040-2050. Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011. The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

In 2015, PMI launched the next six-year strategy, setting forth a bold and ambitious goal and objectives. The PMI Strategy for 2015-2020 takes into account the progress over the past decade and the new challenges that have arisen. Malaria prevention and control remains a major U.S. foreign assistance objective and PMI's Strategy fully aligns with the U.S. Government's vision of ending preventable child and maternal deaths and ending extreme poverty. It is also in line with the goals articulated in the RBM Partnership's second generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and WHO's updated *Global Technical Strategy: 2016-2030*. Under the PMI Strategy 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination.

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achieving the targets of the NMCP and PMI, and provides a description of activities that are planned with FY 2017 funding.

2. Malaria situation in Malawi

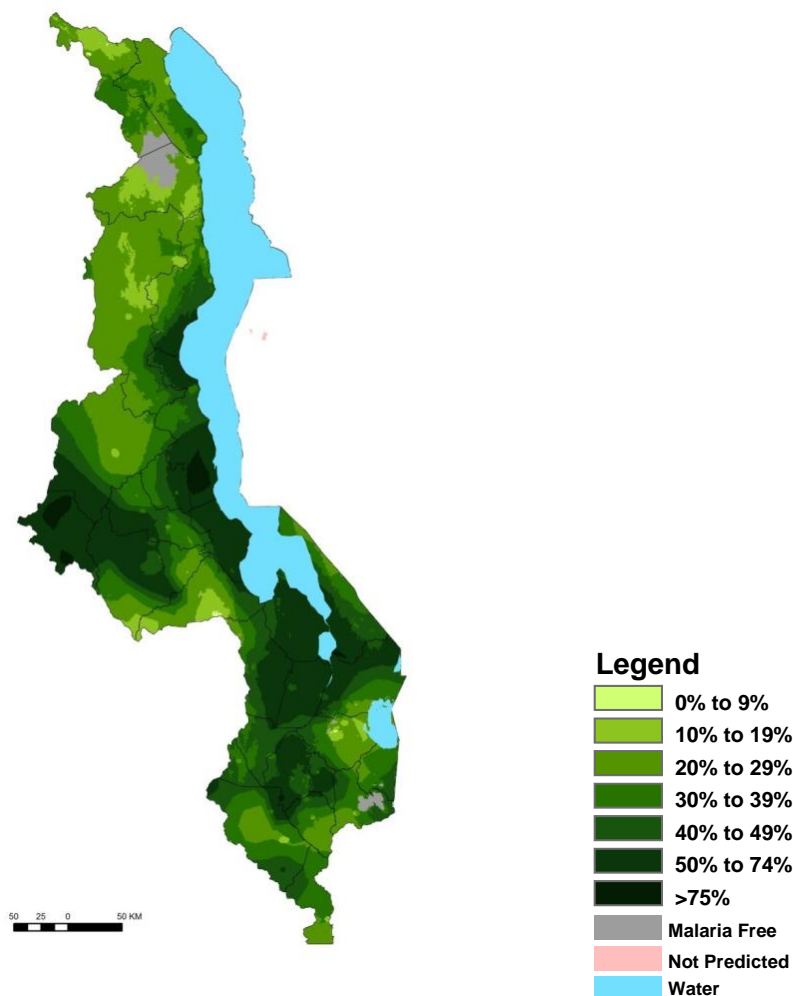
Malawi is a landlocked country bordered by Tanzania to the north, Zambia to the west, and Mozambique to the east and south. The population in 2017 is projected to be 17.3 million, comprised of approximately 51% women and approximately 20% children under five years of age (National Statistical Office of Malawi). Rapid population growth continues to be a challenge, with an average of five children per woman (2014 Multiple Indicator Cluster Survey [MICS]) and an annual population growth rate of 2.9%, thus the proportion of children less than five years old continues to grow.

Malaria is endemic in more than 95% of the country (Figure 1). Transmission is perennial in most parts of the country and peaks after the start of the annual rains that typically begin in November and last through April. The highest transmission areas are found along the hotter, wetter, and more humid low-lying areas (lakeshore, Shire River Valley, and central plain), while the lowest risk areas fall along the highlands of Rumphu, Mzimba, Chitipa, and Kirk Range.¹ *Anopheles funestus* is considered to be the primary vector species; *An. gambiae* s.s. and *An. arabiensis* also are present and may predominate in some areas at certain times of the year. *Plasmodium falciparum* is the most common species of malaria, accounting for 98% of the infections and all severe disease and deaths.

Over the past six years, PMI-supported entomological monitoring has documented increasing vector insecticide resistance, including the rise and spread of pyrethroid and carbamate resistance in *An. funestus*. Pyrethroid resistance in *An. funestus* was first identified in 2010-2011 and recent data from 2015 demonstrated low mortality in all sites (0 to 41% for deltamethrin, 0 to 44% for permethrin). Pyrethroid and piperonyl butoxide (PBO) synergist bioassays conducted in Nkhotakota and Chikwawa districts showed a significant increase in mortality, indicating that pyrethroid resistance is partially mediated by mixed-function oxidases. Resistance to carbamate insecticides was first documented in 2011, and data from 2014-15 showed mortality rates of 5 to 19% in the three districts sampled. All *An. funestus* populations tested against the organophosphates malathion and pirimiphos-methyl have been fully susceptible, while susceptibility to DDT has varied by site and over time, from 65 to 100% mortality.

¹ Kazembe LN1, Kleinschmidt I, Holtz TH, Sharp BL. 2006. *Spatial analysis and mapping of malaria risk in Malawi using point-referenced prevalence of infection data*. Int J Health Geogr. 2006 Sep 20;5:41.

Figure 1: Predicted population-weighted *Plasmodium falciparum* parasite prevalence in children two to ten years of age, Malawi 2010-2012^{2,3}



Malaria continues to be a major public health problem and is responsible for approximately 6.1⁴ million presumed and confirmed cases reported annually from health facilities and by the community case management program, and 29% of all outpatient visits across all ages (2015 Health Management Information System [HMIS] data, unpublished). Among children under five years, malaria parasite prevalence by microscopy was 33% nationally (2014 MIS).

² Okiro EA, Noor AM, Malinga J, Mitto B, Mundia CW, Mathanga D, Mzilahowa T, Snow RW (2014). *An epidemiological profile of malaria and its control in Malawi*. A report prepared for the Ministry of Health, the Roll Back Malaria Partnership and the Department for International Development, UK. March, 2014.

³ Electronic and manual searches for published and unpublished reports were used to identify available malaria prevalence surveys (including the 2010 and 2012 Malawi Malaria Indicator Surveys). Age-corrected survey data (sample size and numbers positive) at known locations (longitude and latitude) and times (year) with a minimal set of conservative, long-term climate and human settlement covariates were used. Covariates statistically significant to the age-corrected infection prevalence were identified (in this case urbanization). Empirical data and spatially matched covariates were used within a Bayesian hierarchical space–time model to produce continuous maps of $PfPR_{2-10}$ for 2010-2012.

⁴ According to HMIS, there were 4.9 million cases reported from facilities (a combination of parasitologically confirmed and presumed) and 1.2 million cases reported from iCCM (nearly all presumed).

Pregnant women and their fetuses are at high risk of the negative consequences of malaria. From 1996-2007, the incidence of placental malaria fell from 25% to 7% at the main referral hospital in Blantyre.⁵ Although this is a selected population with unusually easy access to the best medical services available in the public sector in Malawi, a similar low level of acute placental malaria (5%) was measured in a rural area in Machinga District that was evaluated as part of a study monitoring the continued effectiveness of sulfadoxine-pyrimethamine (SP).⁶

3. Country health system delivery structure and Ministry of Health (MoH) organization

The Malawi health service delivery system is pyramidal, consisting of tertiary, secondary, primary, and community care levels. There are approximately 679 public sector health facilities, 509 of which are administered by the GoM. District and central hospitals provide secondary and tertiary care services, respectively, but also provide primary care to individuals within their catchment area. Primary care is delivered through clinics and health centers where curative, maternity, and preventive services are offered. Access to health facilities is limited: approximately half of Malawians live within a five-kilometer radius of a health facility. In response, Malawi has more than 3,500 health surveillance assistants (HSAs) in hard-to-reach areas who provide integrated community case management (iCCM), in addition to other services, through village health clinics (VHCs). HSAs are trained to assess, classify, and provide first-line treatment for selected childhood illnesses, including malaria, in addition to referral to the next level of care. Local community-based organizations also provide non-clinical malaria services such as social and behavior change communication (SBCC) on key malaria messages, counseling, and net distribution. The Malawi health system is highly decentralized with many programming decisions made at the district level and coordination and supervision done by the zonal level (there are five zones). The Christian Health Association of Malawi operates 170 health facilities mainly in rural areas nationwide and provides approximately one-third of health services, including free provision of Essential Health Package (EHP) services in many places. The EHP covers conditions affecting the majority of the population of Malawi, especially the poor, including: vaccine preventable diseases, acute respiratory infections, malaria, tuberculosis, diarrhea, sexually transmitted infections, perinatal conditions, and HIV/AIDS. Fees are charged where service level agreements with the government have not been established.

The NMCP is located under the Ministry of Health's (MoH) Directorate of Preventive Health Services. The NMCP Program Manager is thus a Deputy Director of Preventive Health Services. The program is staffed by a core group of 10 technical officers. The NMCP sets policies, establishes strategies, coordinates activities, and provides technical guidance for the MoH with respect to malaria prevention and control interventions. The management structure is comprised of 29 District Malaria Coordinators to direct activities in each district, as well as 29 District ITN

⁵ Feng G, Simpson JA, Chaluluka E, Molyneux ME, Rogerson SJ. 2010. *Decreasing burden of malaria in pregnancy in Malawian women and its relationship to use of intermittent preventive therapy or bed nets*. PLoS One. 2010 Aug 6;5(8):e12012.

⁶ Gutman J, Mwandama D, Wiegand RE, Ali D, Mathanga DP, Skarbinski J. 2013. *Effectiveness of intermittent preventive treatment with sulfadoxine-pyrimethamine during pregnancy on maternal and birth outcomes in Machinga district, Malawi*. J Infect Dis. 2013 Sep;208(6):907-16.

Coordinators. The District Malaria Coordinator positions were officially converted to full-time in 2015. However, the transition is not complete and many of the Malaria Coordinators are still unofficially required to perform clinical or other, non-malaria duties. The ITN Coordinator positions are still filled by staff members with other primary designations. Other staff at the district level, including the District Health Officer, District Medical Officer, District Pharmacist, and District HMIS Officer, are critical to the malaria program.

4. National malaria control strategy

The 2011-2016 National Malaria Strategic Plan, entitled “Towards Universal Coverage,” built on the successes achieved and lessons learned during implementation of the previous two strategic plans. The Malaria Strategic Plan was developed and approved by the MoH in early 2011 and originally covered the period 2011-2015. The NMCP conducted a mid-term review in 2014 and extended the plan through 2016, in line with the Malawi Health Sector Strategic Plan (HSSP). The MoH intends to review and revise the Malaria Strategic Plan by October of 2016 to cover the next five-year period. Within the 2011-2016 plan, Malawi aimed to move from targeted malaria control interventions to provision of universal access to proven interventions so that all Malawians at risk of malaria have equitable access to malaria prevention, care, and treatment. The NMCP activities were designed to be implemented within the Health Sector Strategic Plan (HSSP), including the provision of the essential health package. Specifically, the Malaria Strategic Plan objectives were to ensure that by 2016, the MoH would be in a position to:

- Achieve universal coverage of all interventions with an 80% or higher utilization rate of proven malaria interventions;
- Strengthen the systems for surveillance, M&E, and operational research to better track implementation of malaria control activities and provide the information necessary for effective programmatic decision-making; and
- Strengthen capacity in program management to achieve malaria program objectives at all levels of health service delivery.

Within the Malaria Strategic Plan, six primary intervention areas were targeted: 1) integrated vector management (IVM); 2) case management; 3) malaria in pregnancy; 4) social mobilization and advocacy; 5) surveillance, monitoring, evaluation, and operations research; and 6) program management.

IVM: The NMCP ITN policy promotes free distribution of ITNs for children born in health facilities, children attending their first visit under the Expanded Program on Immunization (EPI) (if an ITN was not received at birth), and to pregnant women at their first visit to an antenatal care (ANC) clinic. [Note: In practice, ITNs are distributed for newborns following delivery at a health facility and at ANC, but not through EPI visits.] The policy also supports time-limited, national, free distribution campaigns that are conducted every two to three years. Malawi aims to achieve universal coverage with ITNs, defined as one net for every two people, with the objective of increasing net ownership and net usage among pregnant women and children under five years of age to at least 90%.

Within the Malaria Strategic Plan, Malawi intended to expand IRS to up to eight highly endemic districts by 2016, which has not occurred. Since the mid-term review in 2014, the NMCP has developed and adopted an evidence-based IVM strategy to guide future vector control activities and entomologic monitoring. An implementation plan for this strategy has also been drafted but endorsement by the MoH is still pending. Given the emergence and expansion of pyrethroid and carbamate resistance, the high cost of alternative insecticides, and the limited funding from the Government of Malawi (GoM), the drafted IVM implementation plan calls for a more limited and targeted expansion of IRS.

Although ITN distribution and IRS remain the main malaria vector control interventions in Malawi, larval source management will be used as a complementary strategy, as resources from GoM and other donors allow.

Case management: The primary focus of the Malaria Strategic Plan included improvement of parasitological confirmation of malaria through the use of microscopy in central and district hospitals, as well as in facilities with high patient loads, and the use of rapid diagnostic tests (RDTs) at all levels of the health system. The phased roll-out of RDTs to health facilities has been completed. The roll-out to the community level has met with considerable delays but is underway and expected to be completed by the end of calendar year 2016.

The Malaria Strategic Plan also called for strengthening of the systems for quality assurance for both diagnosis and treatment. In addition, health worker capacity for patient care as well as post-marketing surveillance and pharmacovigilance were strengthened.

In 2006, the MoH selected artemether-lumefantrine (AL) as the first-line and artesunate-amodiaquine (ASAQ) as the second-line treatment for uncomplicated malaria, reserving parenteral quinine for the treatment of severe malaria and oral quinine for the management of malaria in the first trimester of pregnancy. In 2013, the MoH revised the guidelines for the management of severe malaria to recommend treatment with parenteral artesunate at health facility and hospital levels and rectal artesunate as pre-referral treatment at community level. The MoH has completed training for health workers in the use of parenteral artesunate and the roll-out of this medication is underway. The NMCP is currently rolling out the use of rectal artesunate for pre-referral treatment as part of the roll-out of RDTs to the community level.

Malaria in pregnancy: As part of a comprehensive focused ANC (FANC) package, Malawi is committed to increasing the provision of SP in all health facilities. The national policy on IPTp has been revised to be in line with WHO guidance. Malawi has finalized guidelines and training manuals for policy implementation and nearly all health workers were trained in these new guidelines during the case management trainings conducted in 2014-15.

Social mobilization and advocacy: The Malaria Strategic Plan and the recently completed 2015-2020 Malaria Health Communication Strategy recommend social mobilization and advocacy strategies to increase the use of all malaria interventions through increased efforts aimed at qualitative and quantitative research, prioritization for promotion of targeted positive behaviors, and capacity building.

Surveillance, monitoring and evaluation, and operations research: The Malaria Strategic Plan aimed to strengthen routine data systems, surveillance, and operations research, promoting use of

information while strengthening capacities for data use at all levels. The NMCP will continue to work closely with the Central Monitoring and Evaluation Department (CMED) and other partners to incorporate appropriate malaria indicators into the district health information system (DHIS 2) and strengthen the overall HMIS. The 2011-2015 Monitoring and Evaluation Plan outlined the key strategic areas and focuses on tracking progress and measuring results of the various malaria prevention and control interventions to better inform policy, planning, and decision-making. A revision of the Monitoring and Evaluation Plan was scheduled for calendar year 2015 but is still pending.

Program management: The Malaria Strategic Plan also emphasized capacity strengthening in program management at all levels of health service delivery. This required resource mobilization and strengthened coordination across partners. The NMCP has linked its management objectives to existing national and international development strategies to enhance its policy direction. The procurement and supply chain management system was highlighted as an area requiring significant strengthening.

5. Updates in the strategy section

There have been four developments in the past 12 months that should be noted:

- With technical support from PMI and other malaria and iCCM stakeholders, Malawi submitted a combined malaria and iCCM concept note for the Global Fund New Funding Model (NFM) in January 2015. The concept note has since been reviewed and endorsed by the Global Fund and, although delayed by several months, implementation is now underway. The grant is valued at approximately \$34 million, primarily allocated for procurement of ACTs, RDTs, and parenteral artesunate, as well as iCCM, SBCC, and SM&E strengthening. As part of the NFM agreement, the GoM committed to provide \$30 million in willingness-to-pay funding, including over \$7 million for malaria commodities. This funding is critical to the successful implementation of malaria prevention and control activities in Malawi, and PMI continues to support the GoM to help ensure timely and effective grant implementation.
- With extensive technical support from PMI, the NMCP completed an ITN mass distribution campaign in 19 of Malawi's 29 districts in May 2016. This campaign was implemented using procurement and operational support from the Global Fund Round 9 Phase 2 grant. The original intention was to complete the campaign by October 2015, prior to the start of the annual rains and peak malaria transmission. However, disbursement of Global Fund operational funds was repeatedly delayed due to financial management and accountability issues within the MoH Department of Finance. These delays resulted in significant and avoidable morbidity and mortality. (Of note: mass distribution campaigns were completed in six additional districts by the NMCP in December 2014 and in the remaining four districts between 2014 and 2016, with support from the Against Malaria Foundation.)
- Issues of theft and accountability for health commodities, including malaria commodities, continue to plague the malaria program. A Commodity Security Action Plan was developed to improve accountability for medicines and other health commodities; with support from PMI, implementation of malaria-specific activities began in December 2015. Media attention around commodity theft has been highly supportive: following a press conference in October 2015 with the US Ambassador to Malawi and the US Global

Malaria Coordinator, several media outlets have consistently reported on theft from health facilities. Additionally, the USAID Office of Inspector General “Make a Difference” campaign and hotline, launched in April 2016, provides rewards for credible information on malaria drug theft. This has helped to improve public awareness of the issue. Finally, due in part to high level support and action from the President and the Minister of Health, there has been an uptick in arrests and prosecutions of health facility staff who have been found to be stealing medications. Specifically, the Minister of Health has supported the creation of a Drug Theft Investigation Unit (DTIU), which has been auditing facilities and pursuing criminal and administrative action against individuals found to be stealing.

- PMI’s primary service delivery, systems strengthening, and communications implementing partners will close project activities in the start of FY 2016. The PMI team has worked with USAID Mission staff to design the subsequent project for these critical programmatic areas. As part of the new design, PMI reduced the number of targeted districts from the current 15 districts (not selected based on malaria-specific criteria) to 10 of the highest burden malaria districts. These districts were chosen primarily based on the available epidemiologic data from the HMIS and models of district level prevalence from anemia and parasitemia studies. The PMI team anticipates that this more epidemiologically-driven and focused approach will increase the impact of the limited PMI funding on overall malaria transmission.

6. Integration, collaboration, and coordination

In Malawi, the MOH and donors developed the health sector-wide approach (SWAp) under the HSSP to coordinate donor and GoM activities. Under the SWAp, resources are given either to a common pool or to projects aligned with GoM strategies and plans. The SWAp is governed by a secretariat supported by technical working groups that provide technical guidance and decision-making on key technical issues. Development partners also participate in the SWAp governance structures through the Health Donor Group; PMI is represented in this group by the Director of USAID’s Office of Health, Population, and Nutrition (HPN).

Malaria-specific partners

PMI actively coordinates with development partners in Malawi on malaria and cross-cutting health issues. For malaria-specific activities, the Global Fund is the other key development partner. To date, the Global Fund has approved a total of approximately \$177 million for malaria activities in Malawi, including approximately \$34 million under the NFM. Approximately \$139 million of the total approved funding has been disbursed. The majority of resources (over \$21 million) under the NFM grant will be used for malaria commodities and distribution, with additional resources available for iCCM, SBCC, and SM&E strengthening, as well as program management activities. Under the NFM, Malawi has two principal recipients: the MoH for commodities and management support, and World Vision for programmatic activities.

The NMCP receives additional technical assistance from a number of partners:

- The United Nations Children’s Fund (UNICEF) supports resource and programmatic management within the MoH, as well as malaria prevention and control efforts at the district level, including the procurement of emergency ACTs for community case management (CCM) and development of SBCC materials.
- The World Health Organization (WHO) provides assistance on a variety of technical issues.
- The Clinton Health Access Initiative (CHAI) promotes the use of injectable artesunate as the first-line treatment for severe malaria and, until its recent conclusion, served as the in-country implementer of the UNITAID grant to Medicines for Malaria Venture to purchase injectable artesunate. CHAI also provides technical support to the NMCP on commodity quantification and Global Fund issues.
- Save the Children, with support from the WHO Global Malaria Programme and the Government of Canada, implements the Rapid Access Expansion (RAcE) program to support the scale-up of integrated community case management (iCCM) in eight districts. With internal funds, Save the Children also supports the scale-up of iCCM and community health activities in four additional districts, as well as the piloting and implementation of school-based malaria control in one district with additional funding from the Berglund Family Foundation.
- Concern Universal, with support from the Against Malaria Foundation, implements rolling mass ITN distributions in four districts and provides technical assistance to the NMCP, primarily around ITN distribution.

Other relevant health partners

In addition to malaria, the United States Government (USG) in Malawi supports a robust health program with emphasis on HIV/AIDS; maternal, newborn, and child health; family planning; nutrition; water, sanitation, and hygiene; and health systems strengthening. Malawi is a President’s Emergency Plan for AIDS Relief (PEPFAR) long-term strategy country, receiving over \$130 million in FY 2016 for care and treatment of HIV, key population prevention, community-based care and support and health systems strengthening. USAID HPN received approximately \$40 million in FY 2016 funds for other health sectors and supports service delivery improvements, community mobilization, and systems strengthening in focus districts, in addition to significant central level support. PEPFAR, USAID HPN, and PMI share several implementing partners working on integrated or common platforms to support improved health outcomes in Malawi. The PMI team works closely with PEPFAR and the USAID health teams to coordinate activities.

The United Kingdom Department for International Development (DFID) is a key partner in the broader health sector, with extensive focus on improving the health supply chain. In addition to procurement and distribution of essential medicines, DFID provides substantial technical assistance to the Central Medical Stores Trust (CMST) and, with funding through USAID, supported installation of 115 prefabricated pharmacy storage units in health facilities across Malawi to improve quality and security of commodity storage. As part of efforts to ensure commodity security and accountability of medicines in the public sectors, DFID intends to

provide technical assistance to the MoH's DTIU and is exploring ways to support district level governance and accountability structures.

7. PMI goal, objectives, strategic areas, and key indicators

Under the PMI Strategy for 2015-2020, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination. Building upon the progress to date in PMI-supported countries, PMI will work with NMCPs and partners to accomplish the following objectives by 2020:

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80% reduction from PMI's original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40% from 2015 levels.
3. Assist at least five PMI-supported countries to meet the World Health Organization's (WHO) criteria for national or sub-national pre-elimination.⁷

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

1. Achieving and sustaining scale of proven interventions
2. Adapting to changing epidemiology and incorporating new tools
3. Improving countries' capacity to collect and use information
4. Mitigating risk against the current malaria control gains
5. Building capacity and health systems towards full country ownership

To track progress toward achieving and sustaining scale of proven interventions (area of strategic focus #1), PMI will continue to track the key indicators recommended by the Roll Back Malaria Monitoring and Evaluation Reference Group (RBM MERG) as listed below:

- Proportion of households with at least one ITN
- Proportion of households with at least one ITN for every two people
- Proportion of children under five years old who slept under an ITN the previous night
- Proportion of pregnant women who slept under an ITN the previous night
- Proportion of households in targeted districts protected by IRS
- Proportion of children under five years old with fever in the last two weeks for whom advice or treatment was sought
- Proportion of children under five with fever in the last two weeks who had a finger or heel stick
- Proportion receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs
- Proportion of women who received two or more doses of IPTp for malaria during ANC visits during their last pregnancy

⁷ http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

8. Progress on coverage/impact indicators to date

Table 1: Evolution of Key Malaria Indicators in Malawi from 2006 to 2014

Indicator	2006 MICS	2010 MIS	2010 DHS	2012 MIS	2014 MICS	2014 MIS	2015 DHS**
% Households with at least one ITN	38	58	57	55	78	70	59
% Households with at least one ITN for every two people	N/A	N/A	N/A	19	34	30	25
% Children under five who slept under an ITN the previous night	25	55	38	56	66	67	45
% Pregnant women who slept under an ITN the previous night	8	49	35	51	61	62	49
% Children under five years old with fever in the last two weeks for whom advice or treatment was sought	N/A	26*	65	50	75	59	67
% Children under five with fever in the last two weeks who had a finger or heel stick	N/A	7	17	21	42	33	52
% Children receiving an ACT among children under five years old with fever in the last two weeks who received any antimalarial drugs	N/A	N/A	N/A	91	88	92	92
% Women who received two or more doses of IPTp during their last pregnancy in the last two years	48	60	55	54	59	63	63

*The 2010 MIS collected data on care-seeking within 24 hours of fever onset. The subsequent surveys, including the 2010 Demographic and Health Survey (DHS), did not specify a time frame.

** For ITN indicators, it should be noted that data collection for the 2015 DHS was conducted from October 2015 – January 2016, several months prior to a mass ITN distribution campaign conducted from March 2016 to May 2016 in 19 of Malawi's 29 districts.

9. Other relevant evidence on progress

PMI Malawi has supported two national health facility surveys to assess the status of case management of malaria in public health facilities. The first was conducted in 2011 (prior to the national roll-out of RDTs to health facilities) and focused on the management of uncomplicated malaria. In total, 107 health facilities, 2,019 outpatients, and 135 health workers were surveyed. Key findings include:

- Only 42% of patients attended facilities with functional microscopy. The quality of facility microscopy was poor compared to expert microscopists (sensitivity = 47% and specificity = 84%).
- Thirty-four percent of all patients seeking curative care at outpatient departments during the high transmission season had parasitologically-confirmed, uncomplicated malaria.
- Sixty-seven percent of patients with malaria confirmed by microscopy were correctly treated with an ACT; 95% were correctly dosed. The main cause of incorrect treatment was malaria cases missed by clinicians.
- Thirty-one percent of patients without malaria received an ACT.
- Most patients were seen by health workers (69%) explicitly trained on the malaria treatment guidelines.

The second national health facility survey was conducted in 2012 and focused on the management of severe malaria. In total, 200 health workers were surveyed at 36 hospitals that admit patients with severe malaria and 1,252 inpatient records were reviewed. Key findings include:

- Forty-two percent of all patients were given an admission diagnosis of malaria.
- RDTs were available in 97% of the facilities, but were out of stock at least once in the prior three months in 44% of facilities. Microscopy supplies were available in 89% of the facilities, but were out of stock in 22% of facilities in the prior three months.
- Sixty-five percent of patients had parasitological confirmation of their diagnosis on admission.
- Quinine was available in 92% of the hospitals on the day of the survey, but 26% of facilities reported at least one stockout of all severe malaria treatments within the prior three months. Seventy-six percent of all severe malaria patients received intravenous quinine, the first-line medication (during the time of the survey) for the treatment of severe malaria.
- On-the-job malaria training was reported by 57% of health workers, primarily on the use of RDTs. Only 5% reported malaria supervision in the prior six months.
- Health workers cited availability of treatment (58%), availability of diagnostic supplies (32%), and knowledge gaps (30%) as the main obstacles to malaria care.

With funding and support from PMI, Malawi and the Roll Back Malaria (RBM) partnership completed an impact evaluation of malaria control efforts between 2000 and 2010. The *Progress and Impact Series* report was launched in April 2013. Key findings included a 41% reduction in under-five mortality from 188 to 112 deaths per 1,000 live births over the period 1996-2000 and 2006-2010, and modeling, which estimated that approximately 21,600 deaths among children under five years of age were prevented by malaria control interventions.

The 2013-14 service provision assessment (SPA) was designed to be a census of all formal sector health facilities in Malawi. The assessment used health facility inventory, health provider and client exit interview questionnaires, and observations protocols. Key findings include:

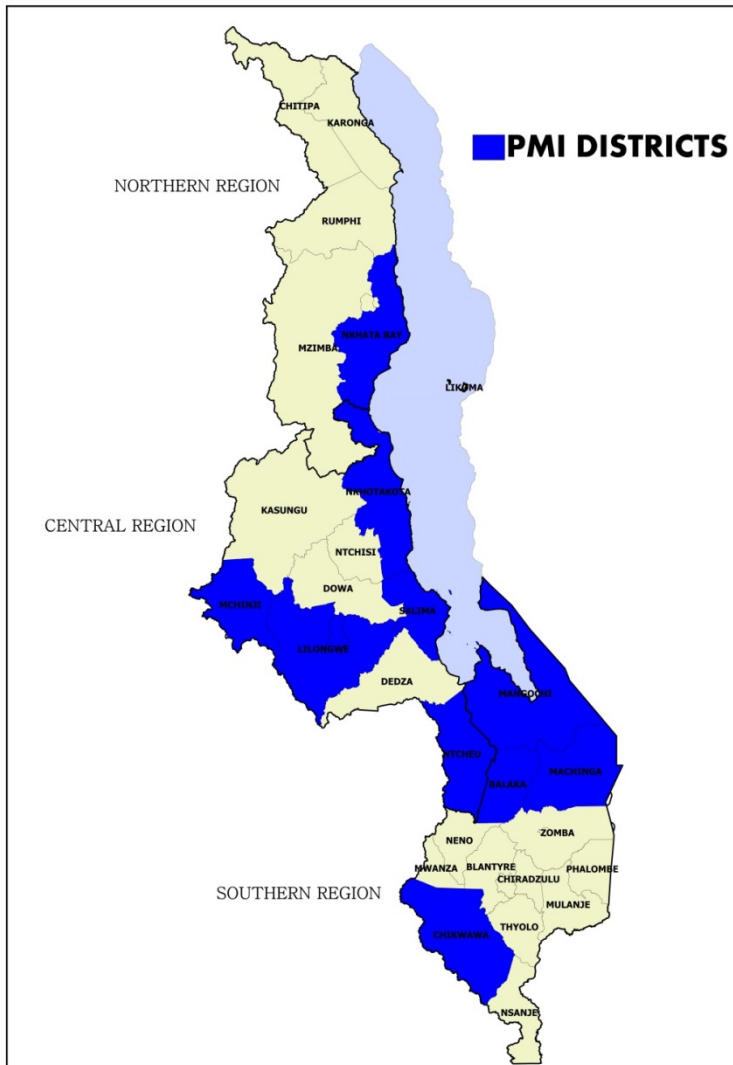
- Of all facilities, 96% offer malaria diagnosis and/or treatment services. Only 65% of facilities offer ANC services.
- Among all facilities offering malaria diagnosis and/or treatment, 61% had staff trained on malaria case management. First-line ACTs and RDTs were available in 92% and 88% of these facilities, respectively. Parenteral quinine for the treatment of severe malaria was available in 90% of facilities. Parenteral artesunate, which is being rolled out as the new first-line agent for severe malaria, was available in only 10% of facilities.
- Among facilities offering ANC services, 75 and 84% of hospitals and health centers, respectively, had ITNs available. SP for IPTp was available in 99% of these facilities.

III. OPERATIONAL PLAN

PMI Support Strategy

PMI’s strategy is to support the MoH and the NMCP to implement the Malaria Strategic Plan. While maintaining nationwide support for certain interventions (e.g., commodity procurement and distribution), PMI has adapted its strategy to focus key interventions in ten of the districts with the highest malaria burden. Service delivery support, community mobilization, and district-level health systems strengthening activities are being prioritized in these focus districts. The PMI team anticipates that this more epidemiologically-driven and focused approach will increase the impact of the limited PMI funding on overall malaria transmission. PMI will work closely with the MoH and other malaria partners to ensure PMI-funded activities in the focus districts are in line with the priorities of the GoM, support national level initiatives, and are coordinated with the activities of other partners working in the non-focus districts.

Figure 2: PMI focus districts under current service delivery, systems strengthening, and communications implementing partners.



1. Vector monitoring and control

NMCP/PMI objectives

The 2011-2016 Malawi Malaria Strategic Plan promoted an integrated vector management strategy, including vector surveillance, insecticide resistance management, routine and mass distribution of ITNs, geographically targeted IRS, and larval source management. PMI supports the use of all of these interventions, with the exception of larval source management. In 2014, the NMCP, with technical and financial support from PMI, developed the Malawi Vector Control Strategy 2015-2019. The Strategy outlines nine major actions for vector control: advocacy for funding; attainment of universal coverage of ITNs across the country; scale-up of IRS to all target districts; implementation of larval source and environmental management; establishment of broad stakeholder engagement; enhanced community engagement; increased resistance monitoring and implementation of a resistance management plan; collection of entomological data to monitor impact; and capacity building for implementation. PMI also supported the drafting of an implementation plan for this strategy in May 2015. At the time of writing, this implementation plan had not been officially adopted by the MoH.

The primary malaria prevention intervention in Malawi is distribution of ITNs and promotion of ITN use. The Malaria Strategic Plan called for universal coverage with ITNs (defined as one net for every two individuals), and outlined specific targets to be reached by 2016, including 90% household ownership of at least one ITN, and 90% ITN use among pregnant women and children less than five years of age. The country has a two-pronged strategy for ITN distribution: (1) free routine distribution to pregnant women through ANC, and to newborns in Labor and Delivery; and (2) time-limited, intermittent mass campaigns targeting universal coverage every three years. Though not a formal distribution channel, the NMCP also distributes ITNs to affected populations during disasters, most notably during floods that have occurred in multiple recent years.

Depending on availability of resources, the Malaria Strategic Plan also called for the implementation of IRS in at least three high-transmission districts, with the goal of expanding to eight districts. Activities in the strategy include: 1) strengthening policy and planning for IRS through needs assessments, timely forecasting, selection, and procurement of IRS commodities; 2) building capacity at national and district levels to implement IRS through improved training and supervision; 3) implementing SBCC to increase household acceptance of IRS; 4) ensuring environmental safeguards and personnel health and safety compliance; 5) monitoring and evaluating IRS implementation; and 6) regular entomological monitoring and insecticide resistance surveillance to guide insecticide selection and to target spray areas.

a. Entomologic monitoring and insecticide resistance management

Progress since PMI was launched

Over the past five years, PMI-supported entomological monitoring has documented increasing vector insecticide resistance, including the rise and spread of pyrethroid and carbamate resistance in *An. funestus*, which is the primary malaria vector across most of the country. Pyrethroid

resistance in *An. funestus* was first identified in 2010-2011, with permethrin mortality rates of 40-92%, deltamethrin mortality rates of 41-80%, and lambda-cyhalothrin mortality rates of 32-70%. According to WHO guidelines, all tested populations of *An. funestus* were classified as resistant to pyrethroids. More recent data from 2015 has shown even higher resistance rates (0-41% mortality for deltamethrin, 0-44% for permethrin). Piperonyl butoxide (PBO) synergist bioassays conducted in Nkhotakota and Chikwawa districts showed a significant increase in mortality over pyrethroid-only bioassays, indicating that pyrethroid resistance is partially mediated by mixed-function oxidases (Chikwawa: 14-18% with pyrethroid alone vs. 80-84% with PBO; Nkhotakota: 2-3% with pyrethroid alone vs. 63% with PBO).

An. funestus is also resistant to carbamate insecticides. Entomological monitoring data from seven districts collected in 2011 showed that only the population in Mangochi District was fully susceptible to bendiocarb (100% mortality). The mortality rate for the Salima population was 96%, indicating the possible emergence of resistance, and populations from the remaining five districts were resistant according to the WHO guidelines, with less than 90% mortality. In 2012, monitoring in seven districts identified resistance to bendiocarb in all sites. More recently, data on carbamate resistance has been limited due to low mosquito numbers and prioritizing samples for pyrethroid resistance testing, but data from 2014-15 showed mortality rates of 5 to 19% in the 3 districts sampled.

An. arabiensis is the main vector in Karonga District (northern Malawi) and a minor vector in the rest of the country. In 2011, *An. arabiensis* in Karonga were 98-100% susceptible to pyrethroids. In 2015, *An. gambiae* s.l. (presumed to be mainly *An. arabiensis*) in Karonga were still classified as suspected resistant to deltamethrin (95-97% mortality). However, data from other areas of the country show emerging resistance, with 57-100% mortality to deltamethrin and 44-100% mortality to permethrin. Data on *An. arabiensis* susceptibility to bendiocarb are limited, with a single report of resistance in 2014.

Data on DDT resistance from 2012 showed widespread susceptibility, however, data from 2013-15 suggest emerging resistance (75-81% mortality, in three districts). Regardless, DDT cannot be used for malaria control, as it is currently not registered in Malawi due to environmental concerns and strong opposition from the agricultural sector, which fears that contamination of crops may result in the loss of export markets.

As of 2015, all *An. funestus* populations tested against the organophosphates malathion and pirimiphos-methyl have been fully susceptible. These data indicate organophosphates are the only technically sound options for IRS in Malawi.

In 2013-2014, CDC funded an entomological study evaluating PBO synergist nets vs. pyrethroid-only nets in Balaka and Machinga districts. In contrast to results from PBO synergist assays conducted in the routine monitoring districts, in the Balaka study site, PBO restored *An. funestus* pyrethroid mortality to 94-99%. In laboratory tests, PBO-treated ITNs restored full susceptibility in wild *An. funestus*. However, in community trials, mosquito density was low and data were inconclusive; parity data showed that there may be a benefit of PBO nets, but the trend was not statistically significant. The inconclusive results may have been due to high heterogeneity between villages, or continued efficacy of pyrethroid-only ITNs.

Progress during the last 12-18 months

In 2015, PMI supported entomological surveillance in seven districts, including measurements of mosquito density and insecticide resistance. Additionally, the team conducted a comparison of the effectiveness of pyrethrum spray catches vs. CDC light traps, and measured sporozoite rates in routine collections for the first time in several years. The final report for these activities is pending the results of CSP ELISAs and is expected to be completed late in 2016. Due to delayed disbursement of funding to PMI's entomological monitoring partner, no surveillance activities were conducted for the period of October 2015 through June 2016.

The NMCP feels the need to ascertain more detailed information on insecticide resistance throughout Malawi, and has initiated mapping of insecticide resistance with funding from the Global Fund Round 9/Phase 2 and New Funding Model grants. The NMCP plans to conduct this surveillance annually in several districts, rotating the districts sampled from year to year. The first surveillance round was conducted in May 2015 in eight districts not already sampled under the PMI-funded activities, and included only phenotypic susceptibility testing for pyrethroids among *An. arabiensis* populations. Resistance was documented for all 42 populations tested across the eight districts. The PMI team continues to work closely with the NMCP and PMI's entomological surveillance implementing partner to ensure that all monitoring efforts in Malawi are complementary, well-coordinated, and provide the evidence needed for effective programmatic decision-making.

Table 2: Results of PMI and NMCP 2015 Insecticide Resistance Testing

(For each district, WHO bioassays were performed at 1-4 sites; the range for percent mortality is shown.)

An. funestus

District	deltamethrin	permethrin	bendiocarb	DDT	malathion
Nkhata Bay	11-14%	14%	-	-	-
Nkhotakota	0-8%	25%	-	-	-
Salima	8-41%	25-32%	-	-	-
Mangochi	37%	44%	-	-	-
Machinga	7%	0%	-	-	-
Chikwawa	12-26%	0-29%	19%	75%	100%

An. gambiae s.l.

District	deltamethrin	permethrin
Chitipa	100%	-
Karonga	95-97%	-
Kasungu	75%	53%
Mchinji	63%	-
Dedza	57%	-
Mangochi	84%	58%
Machinga	80%	-
Zomba	89%	-
Phalombe	65-78%	46-47%
Mwanza	97%	100%
Chikwawa	69%	44%

Plans and justification

To monitor the implementation of the Vector Control Strategy 2015-2019, PMI will continue to support entomological monitoring in targeted districts. In past years, the entomology team has had difficulty collecting enough *An. funestus* to carry out resistance assays in all districts. Because the GoM has no firm plans to conduct IRS in the previously sampled districts, PMI plans to reduce the number of districts from seven to five, while intensifying collections in these districts to ensure adequate mosquito sample sizes are collected for all resistance assays. In each district, PMI will continue to support insecticide resistance monitoring, including measurement of resistance intensity and synergist assays once per year as well as monthly measurements of species distribution and abundance, and mosquito behavior. PMI will also continue to provide technical assistance to the NMCP for its entomological monitoring program, which aims to map insecticide resistance in all districts on a rotating annual basis, and which will cover any potential IRS districts.

Proposed activities with FY 2017 funding: (\$379,000)

- Continued support for entomological monitoring in five targeted districts, including routine surveys of vector density, behavior, insecticide resistance frequency, resistance intensity, and sporozoite rate; technical assistance to the NMCP in support of their entomological surveillance program in additional districts (\$350,000); and
- CDC technical assistance for entomological monitoring (\$29,000).

b. Insecticide-treated nets

Progress since PMI was launched

PMI has consistently supported NMCP efforts through the procurement and distribution of ITNs for continuous distribution to pregnant women and children under the age of one year. The ITN policy includes free distribution of ITNs for pregnant women at their first visit to an ANC clinic and for newborns at delivery in health facilities. Over the past six years, an estimated 7 million ITNs have been distributed countrywide in Malawi through the routine channels. During the same period, PMI has provided Malawi with technical support for planning and management of routine and mass distribution mechanisms, as well as targeted funding for implementation to cover critical gaps and minimize delays. In addition, PMI has funded social and behavior change communication and community mobilization efforts to improve the uptake and utilization of ITNs.

Malawi conducted its first nationwide mass distribution of free ITNs in 2012 with financial support provided primarily by the Global Fund. PMI procured and distributed ITNs for rural areas of Lilongwe District and provided technical assistance for overall campaign planning and operations. In total, 5.6 million ITNs were distributed by all partners.

In 2014, NMCP conducted a “mini-mass campaign” using ITNs that were originally intended for a mop-up campaign following the 2012 mass distribution. Funding delays resulted in the postponement of this mop-up effort and the decision was eventually made to distribute these nets in the six districts that were among the first to receive ITNs in the 2012 mass campaign, where it had been three years since a mass distribution. PMI funded the registration and verification activities for this effort, in which over 1.2 million ITNs were distributed. This “mini-mass campaign” served as the first phase of a universal distribution campaign, which was eventually completed in 2016.

Between 2010 and 2014, household ownership of at least one ITN increased from 58% to 70% (MIS 2010, MIS 2014). In the 2015 DHS, household ownership decreased to 59%; however, this decrease was not surprising given that data collection for the DHS was completed two months prior to the distribution of approximately 8.7 million ITNs in 19 of Malawi’s 29 districts. Although not yet assessed, it is expected that ITN coverage following this distribution is substantially higher than reported in the 2015 DHS.

Compared to the 2012 MIS, reported ITN utilization in the 2014 MIS improved among children less than five years of age (from 56% to 67%) and pregnant women (from 51% to 62%). In line with the decreases in reported ownership, utilization in the 2015 DHS also decreased to 45 and 49% for children less than five years of age and pregnant women, respectively. In households where at least one ITN was available, 69% of children less than five years of age and 70% of pregnant women slept under an ITN the night before the survey (DHS 2015). Although this is a substantial decrease from the 2014 MIS (87% for children less than five years of age and 85% for pregnant women), it must be noted that the 2014 MIS was conducted toward the end of Malawi's rainy season, while the 2015 DHS was conducted during the hot, dry season. Thus, seasonal variation in ITN use may have contributed to this reduction. A similar reduction in ITN use was reported for children under five years of age between the 2010 MIS (82%) and 2010 DHS (59%), which were also conducted during the rainy and dry seasons, respectively.

Progress during the last 12-18 months

Continuous Distribution

In the past year, PMI funded the procurement and distribution of approximately 1.1 million ITNs to pregnant women and children less than one year of age through the routine distribution system. PMI also provided technical assistance to the NMCP for ITN quantification and distribution planning, monitoring of ITN distribution through spot checks, supportive supervision of ANC, and the implementation of an online data collection system for distribution monitoring of ITNs.

PMI continued to work with the NMCP to strengthen partnerships that exist between the NMCP and stakeholders around ITN procurement and distribution, including support for the quarterly meetings of the National Malaria Vector Control Sub-Technical Working Group. PMI continued to fund national mass media and print media campaigns to emphasize nightly ITN use by all household members, as well as proper care of nets. In addition, PMI funded community-based organizations and local non-governmental organizations to increase awareness, and promote correct and consistent use and proper care.

Mass Distribution

In addition to the 2014 NMCP/MoH campaign in six districts, the Against Malaria Foundation, through Concern Universal, managed the distribution of ITNs in four other districts. As of January 2016, Concern Universal distributed approximately 1.8 million ITNs over a period of 18 months.

In 2016, the NMCP/MoH conducted a universal coverage campaign in the 19 districts that had not recently been covered by NMCP/MoH or Concern Universal. In total, approximately 8.7 million ITNs were distributed in these 19 districts. The PMI in-country team provided significant technical assistance for the planning and implementation of this campaign. A PMI Resident Advisor served as chair of the ITN Mass Campaign Task Force. Furthermore, PMI Malawi provided funding for technical support by PMI's ITN distribution partner and the Alliance for Malaria Prevention.

Although the original plan was to complete distribution by October 2015, there were significant delays both in disbursement of funding for operational expenses, due primarily to difficulties with financial accountability within the Ministry of Health's Department of Finance, and planning and implementation of activities by NMCP. As a result, the campaign did not begin until March 2016 and was not completed until mid-May. This delay in distribution left beneficiaries unprotected during the peak of malaria transmission in Malawi and resulted in significant and avoidable malaria morbidity and mortality; an estimated 500,000 cases could have been averted but were not due to the delay.

PMI is supporting a post-campaign assessment in mid-2016, to glean lessons learned from the mass distribution campaign, ascertain retention and use following the campaign, and examine behavioral determinants to help inform future SBCC campaigns.

Commodity gap analysis

Table 3: ITN Gap Analysis

Calendar Year	2016	2017	2018±
Total targeted population	16,783,432	17,270,152	17,770,986
Continuous Distribution Needs			
Channel #1: ANC*	839,172	863,508	888,549
Channel #2: Newborn (Labor & delivery)**	342,222	352,873	363,715
<i>Estimated Total Need for Continuous</i>	1,181,394	1,216,381	1,252,264
Mass Distribution Needs			
Mass distribution campaign	8,730,000	0	12,872,224***
<i>Estimated Total Need for Campaigns</i>	8,730,000	0	12,872,224
Total ITN Need: Routine and Campaign	9,911,394	1,216,381	14,124,488
Partner Contributions			
ITNs carried over from previous year	0	426,106†	9,725
ITNs from MoH	0	0	0
ITNs from Global Fund	8,730,000	0	0
ITNs from other donors	0	0	0
ITNs planned with PMI funding‡	1,407,500	800,000	1,200,000
Total ITNs Available	10,137,500	1,226,106	1,209,725

* Number of pregnant women is estimated as 5% of the total population.

† In CY 2016, shipping delays caused a stockout of routine ITNs for 1.5 months. Based on average monthly consumption, those 2 months of missed distribution resulted in a pipeline of 200,000 ITNs, which is reflected in the 2017 carry-over figure.

§ Any savings due to reduced unit cost of ITNs will be used to cover the continuous distribution gap.

± Estimated donor and GoM contributions for a possible 2018 campaign are not yet known, but are anticipated to be on par with current / historical commitments.

*** Mass campaign needs are from the 2016 National Quantification; forecasted mass distribution needs are estimated based on 2008 census population data and adjusted upward based on previous mass distribution data.

‡ Currently, PMI planned LLINs are for routine distribution only.

Plans and justification

PMI will continue to support the NMCP's efforts to ensure high coverage of pregnant women and children less than one year of age through the procurement and distribution of ITNs through routine channels, and support for the training and supervision of health workers on ITN

distribution. At the time of writing, the future of the Global Fund’s commitment in Malawi in 2018 is unknown; it is hoped that funding will be forthcoming from the Global Fund or other partners to support procurement of ITNs for the next mass distribution campaign. PMI will also support continued ITN durability monitoring following the March – May 2016 mass campaign (see Table 4 for details on timing of the monitoring activities). SBCC activities will continue to be supported through national-level communication and the community-based small grants program that promotes ITN use among all household members and enhance net demand, use, and care (please see SBCC section).

Table 4: ITN Durability Monitoring in Malawi 2016 – 2019

Year	Period	Activities
Year 0 (baseline)	July 2016	Net tagging Net bioassays 0
Year 1 (12 months)	April 2017	Attrition and physical integrity survey 1 Net bioassays 1
Year 2 (24 months)	April 2018	Attrition and physical integrity survey 2 Net bioassays 2
Year 3 (36 months)	April 2019	Attrition and physical integrity survey 3 Net bioassays 3
	September 2019	Dissemination

Proposed activities with FY 2017 funding: (\$5,509,000)

- Procurement of 1.2 million ITNs for distribution to pregnant women and children under one through routine channels (ANC and labor & delivery) (\$3,984,000);
- Support management, oversight, and distribution of PMI-procured ITNs to health facilities for routine distribution. Includes customs clearing, warehousing, transport, distribution, and ITN tracking, as well as technical assistance to the NMCP for ITN quantification and distribution planning, monitoring of ITN distribution through spot checks, and supportive supervision of ANC staff (\$1,200,000);
- Year 2 ITN durability monitoring: Monitor ITN durability following the 2016 mass campaign (\$125,000); and
- Technical assistance for next mass distribution campaign: Based on lessons learned from the 2015-2016 campaign, PMI Malawi plans to support technical assistance for the NMCP/MoH in advance of the expected 2018-19 mass distribution campaign, to facilitate planning and preparation for the campaign (\$200,000)
- Support for national-level SBCC activities to improve demand for ITNs and increase use; (see Social and Behavioral Change Communication section).

c. Indoor residual spraying

Progress since PMI was launched

In 2007, PMI piloted IRS with a pyrethroid insecticide in a portion of one high transmission district in Malawi, eventually scaling up to cover two districts. Given the early success of the

PMI IRS program, the GoM began supporting IRS in an additional five districts in 2010, for a total of seven high burden districts. However, high levels of pyrethroid and carbamate resistance in *An. funestus* necessitated a shift to organophosphate insecticides in the two PMI districts in 2010. At that time, only a short-acting organophosphate was available. Given the high cost and short duration of residual efficacy, PMI suspended direct support for IRS in Malawi after the 2011 spray season.

Following the cessation of PMI-funded IRS, the GoM continued to implement IRS using pyrethroids, with limited technical assistance from PMI. However, in recent years, GoM funding for IRS has also declined, and GoM spray operations have experienced challenges due to budget reductions and disbursement delays. For the 2014 season, the GoM sprayed two districts, Karonga and Mchinji. However, operations were delayed until after the rainy season (mid-2015), and the subsequent 2015 campaign did not occur. Without committed funding and technical assistance, it is unclear whether the GoM will be able to effectively support IRS in the future.

Table 5: IRS activities in Malawi , 2013 – 2018

Calendar Year†	Number of Districts Sprayed	Insecticide Used	Number of Structures Sprayed	Coverage Rate	Population Protected
2013±	1	Alphacypermethrin	78,965	77%	302,938
2014	2	Alphacypermethrin	N/A	76-85%	N/A
2015*	0	N/A	N/A	N/A	N/A
2016*	0	N/A	N/A	N/A	N/A
2017**	3	Organophosphate	TBD	TBD	TBD
2018**	3	Organophosphate	TBD	TBD	TBD

† Although IRS campaigns are typically scheduled for October, IRS activities have routinely been pushed back due to disbursement delays, and have occurred in the following calendar year.

±PMI provided technical support through its implementing partner.

* NMCP planned to implement IRS in three districts for the 2015 and 2016 spray seasons using GoM funds. However, the 2015 campaign did not occur and NMCP has cancelled plans for a 2016 campaign due to a lack of GoM funding.

** Represents planning outlined in the draft implementation plan for the Vector Control Strategy 2015-2019, which calls for spraying with long-lasting organophosphates in up to three districts. NMCP is working to identify GoM funds for IRS for these spray seasons.

Progress during the last 12-18 months

Given the high levels of pyrethroid resistance observed in *An. funestus* and the recent recommendations of the WHO Global Plan for Insecticide Resistance Management, PMI provided support for the development of an evidence-based IVM strategy for Malawi. The

Malaria Vector Control Strategy 2015-2019 was completed in July 2014 and subsequently approved by GoM leadership.

The Malawi Malaria Vector Control Strategy outlines goals for IRS, including spraying with non-pyrethroid, non-carbamate insecticides, procurement of WHO Pesticide Evaluation Scheme-recommended insecticides and equipment, and district selection based on epidemiological and entomological data, likely in the high-burden areas primarily along the lakeshore and lower Shire Valley. In May 2015, the NMCP developed an implementation plan for the Malaria Vector Control Strategy, which details specific plans, timelines, budgets, and geographic scope for IRS and other vector control activities. At the time of writing, this implementation plan had not been officially adopted by the MoH.

The GoM planned for an IRS campaign in October 2014, using the remaining pyrethroid insecticide procured for previous campaigns. Due to delays in Global Fund disbursements, the campaign was not implemented until mid-way through 2015. The NMCP targeted the districts of Mchinji and Karonga. *An. gambiae* is the predominant vector in Karonga and given the pyrethroid resistance profile of *An. funestus* in other areas of the country, spraying with pyrethroids was still expected to be effective in this district. Mchinji was selected based on reports of recent increases in malaria transmission. The estimated household coverage was 85% in Mchinji and 77% in Karonga.

Plans and justification

The GoM has abandoned plans to implement IRS in 2016. Although the future of the IRS program is uncertain due to resource challenges, the NMCP has expressed their intent to pursue GoM funding for IRS with organophosphates in 2017 in up to three high-risk districts, and has indicated that they will attempt to procure insecticide and fund the operational expenses of the campaign. The NMCP has requested technical assistance from PMI to ensure that the campaign is implemented in a timely and effective manner and in compliance with accepted environmental and worker safety standards. If the GoM demonstrates that IRS is a priority, either by directly funding the campaign or by obtaining funding from another donor, PMI will support technical assistance, including assistance for microplanning, geocoding, training, environmental compliance, worker safety, and other logistical activities.

Proposed activities with FY 2017 funding: (\$300,000)

- Technical assistance to NMCP in support of the proposed GoM IRS campaign. Technical assistance will include: microplanning at national and district level, geocoding, training of spray operators, worker health and safety, and other logistical activities to support the campaign (\$250,000); and
- Environmental compliance support to NMCP for the proposed GoM IRS campaign (\$50,000).

2. Malaria in pregnancy

NMCP/PMI objectives

The MoH has a three-pronged approach to reducing the burden of malaria in pregnancy: use of IPTp during ANC, distribution of ITNs to pregnant women, and effective case management of malarial illness and anemia. PMI supports all aspects of this approach through focused ANC (FANC). The goal of FANC is to provide an integrated package of high impact interventions through four targeted ANC visits. For malaria, IPTp, use of ITNs (for prevention) and effective malaria case management are integrated into FANC. The MoH has updated the national policy on IPTp to reflect the new WHO guidelines. The MoH's objective for IPTp is for at least 80% of pregnant women to receive at least three doses of SP during pregnancy. In addition, behavior change messages are communicated at ANC visits and at the community level to maintain and expand demand for IPTp. ITNs are provided to pregnant women at their first ANC visit and again at delivery.

For uncomplicated malaria, the treatment guidelines recommend that during the first trimester quinine plus clindamycin be administered for seven days. In the second and third trimesters of pregnancy, AL is recommended. Malawi has updated the National Policy to recommend the use of parenteral artesunate for at least 24 hours for women in all trimesters of pregnancy. When the patient is able to take oral medication, she is transitioned to an oral antimalarial to complete the treatment; quinine and clindamycin are given in the first trimester and AL is given in the second and third trimesters of pregnancy.

The malaria in pregnancy guidelines recommend the use of iron and folic acid supplementation for the treatment of anemia during pregnancy. Currently, the MoH procures 400 microgram folic acid tablets through the Reproductive Health Directorate's essential drug program.

Progress since PMI was launched

PMI, in conjunction with the NMCP and Reproductive Health Directorate, has worked to increase uptake of IPTp through training and supervision of providers and assistance with directly observed treatment. Nearly all health workers in the country were trained in the updated IPTp guidance as part of case management trainings in 2014-2015. Furthermore, additional trainings were conducted in 2016 targeting IPTp service providers such as Safe Motherhood Coordinators, Maternal and Child Health Coordinators, and District Malaria Coordinators on new guidelines specifically designed for malaria in pregnancy. Through community-based organizations and the small grants program, funds have been made available at the local level to increase demand for ANC and IPTp, encourage women to attend ANC early in their pregnancy in order to receive at least three doses of SP, and promote ITN use among reproductive aged women. PMI has also provided significant support for nationwide SBCC efforts to encourage women to adopt these practices.

Nevertheless, despite two decades of IPTp policy in Malawi, coverage goals have yet to be met, even for two doses of IPTp. There are still systemic barriers to seeking ANC in the first trimester, which, in turn, constrain the number of women who can complete the recommended four ANC visits and three or more IPTp doses prior to delivery. Key barriers to ANC attendance

include: difficult geographic access to services, particularly in hard-to-reach areas where women may need to travel long distances; lack of supplies and services at facilities; poor attitudes and treatment by health workers, especially toward early care-seeking; traditions and cultural norms that discourage revealing a pregnancy in the first trimester; and lack of agency among women who must wait for consent of their husband or husband's relatives before seeking care.

The percent of women making four or more visits to ANC has remained largely unchanged, from 55% in 2000 (DHS 2000) to 51% in 2015 (DHS 2015). Coverage of two doses of IPTp-SP is high in Malawi relative to the rest of sub-Saharan Africa, with 63% of pregnant women receiving at least two doses in the 2015 DHS. However, this coverage has not changed substantially over the past five years (60% in the 2010 MIS, 54% in the 2012 MIS, and 63% in 2014 MIS). Since the change in policy, data from the DHIS 2 suggests that uptake of IPTp2 has improved slightly, from 55% in 2014 to 67% in 2015.

Increasing SP resistance represents another significant threat to IPTp in Malawi. In 2012, more than 94% of the malaria parasites in pregnant women with asymptomatic parasitemia presenting at an ANC visit at Machinga District Hospital had quintuple mutations for SP resistance, indicating that resistance is almost fixed in this population.⁸ A delivery cross-sectional survey at the same hospital found that two or more doses of IPTp with SP during pregnancy compared to zero or one dose was not associated with any reduction in placental malaria for any gravidity.⁹ However, two or more doses of IPTp with SP were found to reduce the prevalence of a composite birth outcome among primigravidae (i.e., any of the following: small for gestational age, prematurity, or low birth weight). The conclusion from this study is that two or more doses of IPTp with SP currently provides some small benefit to neonates but does not show the same effect seen in studies conducted when SP was more efficacious in treating *P. falciparum*. A second cross-sectional study in 2015 similarly found that 18% had evidence of malaria at delivery; however, preliminary results from this study suggest that malaria was more common among women who received fewer than three doses of IPTp-SP compared to those who received three or more doses. This finding was significant when assessing patent parasitemia, but not significant when infections detected by polymerase chain reaction were included. Furthermore, birthweight was significantly higher among women who had received three or more doses of IPTp-SP (3121gm) compared to those who received less than three doses (3032gm, p=0.03). This suggests that IPTp-SP continues to provide benefit to Malawian pregnant women. Laboratory studies assessing the prevalence of the sextuple mutant in this cohort are currently underway.

Recent studies from Tanzania and Malawi suggest that the presence of the sextuple mutation in the *P. falciparum* population can result in the failure of SP when given as IPTp. Currently, the presence of the sextuple mutant in Malawi is less than 10%; however, this prevalence is expected to continue to rise. In addition to monitoring the prevalence of SP resistance markers using samples collected from the 2014 therapeutic efficacy study (TES), PMI is supporting a study

⁸ Desai M, Gutman J, Taylor SM, Wiegand RE, Khairallah C, Kayentao K, et al. (2016) Impact of Sulfadoxine-Pyrimethamine Resistance on Effectiveness of Intermittent Preventive Therapy for Malaria in Pregnancy at Clearing Infections and Preventing Low Birth Weight. *Clin Infect Dis* 62: 323-333.

⁹ Gutman J, Mwandama D, Wiegand R, Ali D, Mathanga DP, Skarbinski J (2013) Effectiveness of intermittent preventive treatment with sulfadoxine-pyrimethamine in pregnancy on maternal and infant birth outcomes in Machinga District, Malawi. *J Inf Dis* 208: 907-916.

assessing the efficacy of a newer antimalarial, dihydroartemisinin-piperaquine (DP), as a replacement for SP to be given as IPTp.

Awareness campaigns and provision of ITNs through ANC clinics and at delivery support the use of ITNs during pregnancy and post-partum. In the 2014 MIS, 62% of pregnant women reported sleeping under an ITN the night before, however, this figure jumps to 85% when considering only pregnant women in households with at least one ITN. As access seems to be a significant factor in the overall utilization, use of ITNs among pregnant women is expected to improve following the mass distribution campaign; unfortunately, due to delays, this was only completed in 2016. Efforts to improve accountability for case management commodities will also include efforts to improve practices for routine distribution of ITNs at ANC (see pharmaceutical management section).

Progress during the last 12-18 months

During FY 2015, PMI distributed approximately 1.47 million treatments of SP for IPTp, and trained 6,604 health care workers in IPTp (no additional SP was procured due to previous overstock); the remaining health care workers were trained in previous years. With support from PMI, the MoH updated the national policy on IPTp to reflect the new WHO guidelines. The revised policy removes previous barriers to IPTp uptake, under which women were only to receive IPTp at specific intervals during pregnancy. This expanded guidance should improve the uptake of IPTp by allowing women visiting ANC later in their pregnancy to take three or more doses of SP (see *Malaria in Pregnancy: NMCP/PMI objectives*). Nearly all health workers were trained in these new guidelines during the case management trainings in 2014-15. In the past year, PMI has worked with the NMCP and Reproductive Health Division to modify the longitudinal ANC registers and data collection sheets to allow reporting of the proportion of women who received three or more doses of IPTp (previously only the proportion who received two doses of IPTp was captured on the summary form). This is in the process of being implemented. This change will allow the DHIS 2 to capture information on the proportion of women who receive IPTp3.

PMI continued to support routine distribution of ITNs through ANC and at labor and delivery (please see ITN section). PMI also continued to support appropriate case management of malaria in pregnant women through the procurement of antimalarial drugs, outreach training, supportive supervision in health facilities, and social and behavior change communication for prompt care-seeking through the integrated communication platform.

Although a high proportion of women attend ANC at least once in pregnancy, according to HMIS data, in 2015, only about 10% of women attended ANC in the first trimester, and only 56% attend at least 3 visits, limiting the number of women who could receive 3 or more doses of IPTp during pregnancy.

Table 6: Status of IPTp policy in Malawi

WHO policy updated to reflect 2012 guidance	2013
Status of training on updated IPTp policy	Completed
Number of health care workers trained on new policy in the last year	6,604
Are the revised guidelines available at the facility level?	Yes
ANC registers updated to capture three doses of IPTp-SP?	Yes
HMIS/ DHIS updated to capture three doses of IPTp-SP?	No; update in process

*Commodity gap analysis***Table 7: SP Gap Analysis for Malaria in Pregnancy**

Calendar Year	2016	2017	2018
Total population	16,783,432	17,270,152	17,770,986
SP Needs			
Total number of pregnant women attending ANC 1	839,172	863,508	888,549
Total SP Need (in treatments)*	2,712,138	2,214,488	2,412,750
Partner Contributions			
SP carried over from previous year	1,853,552	0	0
SP from MoH	0	0	0
SP from Global Fund	0	0	0
SP from other donors	0	0	0
SP planned with PMI funding	0	2,000,000	2,400,000
Total SP Available	1,853,552	2,000,000	2,400,000
Total SP Gap	(858,586)**	(214,488)	(12,750)

*Total SP Need is based on 2016 national quantification. Amount for 2016 is based on logistics data and reflects higher consumption due to stockouts of ACTs (i.e., health workers providing SP for treatment when no ACTs are available); 2017 and 2018 are based on RBM tool with increasing IPTp coverage over time.

**Given higher than expected consumption of SP in 2015 and 2016, PMI is attempting to bring 2017 SP forward to 2016, to alleviate the gap. If possible, future reprogramming will be identified to address resulting gaps in 2017 and fill the pipeline.

Plans and justification

Despite high first attendance at ANC clinics (95%), IPTp goals in Malawi have not yet been met. Although the integration of IPTp into focused ANC services helps assure that SP for IPTp is available in all health centers and administered by trained personnel, IPTp is but one among many services offered at ANC and there may be dilution of impact. PMI will continue to support supervision and mentoring of ANC providers on the revised IPTp guidelines.

With FY 2017 funding, PMI plans to continue integrated and malaria-specific social and behavior change communication activities in support of IPTp, case management, and ITN use at national and community levels (see SBCC section). In addition, PMI will continue to provide free ITNs for routine distribution at ANC visits and at labor and delivery for newborns (see ITN section). PMI will procure SP and supplies to ensure directly observed therapy and improved IPTp uptake at ANC. PMI will continue funding to support supervision activities for malaria in pregnancy interventions as part of the focused antenatal care package. Furthermore, through its support to strengthen the HMIS system, PMI will help improve the collection of data on IPTp.

In addition, PMI is funding a study comparing the effectiveness of IPTp with DP compared to IPTp-SP to help determine whether this is an alternative strategy as resistance increases, as well as a pilot of community delivery of IPTp-SP (see OR section for further details).

Proposed activities with FY 2017 funding: (\$658,000)

- Continue to support routine distribution of ITNs through ANC and maternity clinics (funding in ITN section);
- Procurement of SP for IPTp (2.4 million treatments) (\$288,000);
- Procurement of ANC supplies (cups and water buckets) to help improve IPTp uptake through directly observed treatment (\$50,000);
- Continued support for strengthening focused antenatal care in 10 PMI focus districts through production of SOPs, training, supervision visits, and mentoring health providers (\$300,000);
- Continue to support SBCC for malaria in pregnancy interventions: early case management, IPTp, and ITNs (funding in SBCC section);
- Continue to support central level routine HMIS to collect routine data on MIP (funding in SM&E section); and
- CDC technical assistance for MIP research (\$20,000); and
- Support for national-level SBCC activities to improve demand for ITNs and increase use among pregnant women and increase IPTp uptake (see Social and Behavioral Change Communication section).

4. Case management

a. Diagnosis and Treatment

NMCP/PMI objectives

Increasing capacity to ensure prompt and effective case management and reduce the presumptive use of antimalarial medications was a key priority in Malawi's Malaria Strategic Plan. To achieve this increased capacity, the MoH focused its efforts in the following areas:

- 1) Ensuring consistent availability of high-quality diagnostic and treatment commodities through proper quantification, procurement, and distribution
- 2) Strengthening quality assurance for malaria diagnostics
- 3) Training and supervising health workers on malaria case management at all levels of the health system

- 4) Supporting and expanding community case management in hard-to-reach areas (i.e., community level)

In the *Guidelines for the Treatment of Malaria in Malawi (2013)*, the MOH recommends testing all suspected malaria cases using an RDT prior to initiating treatment. Microscopy is recommended for the following purposes: 1) to confirm malaria diagnosis in hospitalized patients with suspected severe malaria; 2) to monitor treatment progress in severe malaria cases receiving parenteral treatment; and 3) to confirm first-line treatment failures. The *Guidelines for the Treatment of Malaria in Malawi* recommend AL as the first-line treatment and artesunate-amodiaquine (ASAQ) as the second-line treatment. Oral quinine plus clindamycin is recommended for the treatment of uncomplicated malaria in pregnant women in the first trimester and for children weighing less than five kilograms. For the management of patients with severe malaria, parenteral artesunate is recommended as the definitive treatment and as pre-referral treatment in health centers. In the coming months, the NMCP plans to revise the current treatment guidelines to include relevant changes consistent with the *WHO Guidelines for the Treatment of Malaria, Third Edition (2015)*. A draft policy covering the use of RDTs and rectal artesunate by HSAs at the community level is currently under review and is expected to be approved in the near future.

Progress since PMI was launched

Since Malawi became a PMI focus country in 2006, PMI has supported the procurement of malaria commodities including RDTs and malaria medicines. Through September 2015, PMI procured 27.9 million RDTs and 38.7 million ACT treatments.

In 2007, Malawi changed the first-line medication for uncomplicated malaria from SP to AL, with ASAQ as the second-line treatment. PMI has supported the training and supervision of health workers on the appropriate management of malaria and the promotion of appropriate care-seeking and treatment adherence behaviors through national-level mass media and community mobilization channels.

Malawi has monitored the efficacy of its first (AL) and second-line (ASAQ) antimalarial drugs through *in vivo* drug efficacy studies. The first TES was conducted in six sites (PMI and GoM contributed funds); data were collected in 2011. PCR-corrected cure rates at Day 28 were greater than 90% for both drugs.¹⁰ These results suggested that both medications remained efficacious and were consistent with the findings from five additional sites monitored during the same time period under a GoM-funded study. In 2014, PMI supported additional therapeutic efficacy monitoring for AL and ASAQ in three sites, one in each region of Malawi. This study demonstrated excellent efficacy of both AL and ASAQ, with PCR-corrected survival rates at Day 28 of 99.3% (95% CI: 98.3–100%) for AL, with 98–100% efficacy in each region, and 99% (95% CI: 97.2–100%) for ASAQ, supporting the continued use of these drugs as first and second line therapies.¹¹ No policy change was recommended based on these data.

¹⁰ Dambe R, Sande J, Ali D, et al. Monitoring the efficacy of artemether-lumefantrine for the treatment of uncomplicated malaria in Malawian children. *Malaria Journal* 2015;14:175.

¹¹ Magdalena Paczkowski, Dyson Mwandama, Daniel Marthey, Madalitso Luka, Georgina Makuta, John Sande, Doreen Ali, Peter Troell, Don P Mathanga, Julie Gutman (2016). *In vivo* efficacy of artemether-lumefantrine and

Before 2010, Malawi's national malaria policy recommended diagnostic testing prior to treatment only for individuals over five years of age. Guidelines recommended presumptive treatment for children less than five years of age, due in part to the high prevalence of malaria and limited diagnostic capacity in-country. In 2010, the GoM updated its policy to include the use of RDTs for malaria diagnosis for all suspected cases. To help ensure an effective transition from largely presumptive treatment to universal diagnostic testing, the MoH adopted a phased approach for the roll-out of malaria RDTs. Phase one, which began in July 2011 and is now complete, focused on the distribution and use of malaria RDTs at health facilities. PMI supported this phase of the roll-out, including technical assistance for guideline development, commodity procurement and distribution, and health care worker training. Following a successful feasibility study of the use of RDTs by HSAs and after extensive delays, phase two of the RDT roll-out, which extends the use of RDTs to the community level, is currently underway. Training of all HSAs who provide community case management of malaria is expected to be completed by the end of 2016.

To strengthen diagnostic capacity, in 2010, PMI supported the introduction of a quality assurance program designed to improve Malawi's clinical and laboratory diagnostic services. This program focused on the provision of outreach training and supportive supervision (OTSS) to laboratory and clinical supervisors. The OTSS intervention provides on-site training and long-term, ongoing support to strengthen diagnostic and treatment services in health facilities. During scheduled visits, supervisors identify areas for improvement and provide immediate feedback to laboratory and clinical staff. Currently, OTSS occurs at all health facilities in Malawi. In general, facilities receive four quarterly visits at enrollment and then two per year after minimum compliance standards are met.

In 2013, the MoH revised the *Guidelines for the Treatment of Malaria in Malawi* to replace quinine with parenteral artesunate for the pre-referral and definitive treatment of severe malaria at the health facility level and introduce rectal artesunate for pre-referral treatment of severe malaria at the community level. PMI provided technical guidance and funding for this policy change and the drafting and printing of the revised guidelines and associated training manuals.

Progress during the last 12-18 months

PMI has worked closely with the NMCP and the Global Fund to coordinate procurement and delivery schedules to ensure that appropriate central stock levels of antimalarials and RDTs were maintained. For the past year, PMI procured approximately 2.9 million RDTs and 2.2 million ACTs. The past year also saw the completion of training of over 8,000 facility-based health care workers, the training of recent graduates, and an update of case management curricula at training institutions to align with the updated guidance. To date, the roll-out of parenteral artesunate has been completed nationwide and roll-out of rectal artesunate is ongoing, with training expected to be completed by end of July 2016.

PMI continued to support the strengthening of diagnostic services through the OTSS program. During this past year, PMI supported the twelfth and thirteenth rounds of OTSS, including visits to 391 health facilities (approximately 60%) in 29 districts, the supervision and training of nearly

Artesunate-amodiaquine for uncomplicated *Plasmodium falciparum* malaria in Malawi, 2014. *Malaria Journal* 15:236e.

1,200 health workers, the training of 56 laboratory supervisors in advanced malaria diagnostic training, and orientation of 38 new district-level supervisors. These endeavors, in combination with previous efforts, have continued to focus on adherence to negative test results, RDT use (preparation and interpretation) in health facilities, and microscopy (preparation, staining, and reading). A new severe malaria component was incorporated into the OTSS supervision tool to support the recent introduction of parenteral artesunate and improve diagnosis and management of severe disease. Finally, to improve the efficiency of supervision and OTSS data collection and analysis, a tablet-based electronic data system was launched.

Currently, approximately 37% of all health facilities have the capacity to provide malaria microscopy by trained and qualified laboratory staff. Expansion of microscopy services to additional facilities is limited by the lack of trained health workers, inconsistent electrical supply, and inadequate laboratory equipment and supplies. Even within facilities with trained and qualified staff, power supply interruptions and supply stockouts limit the feasibility of extensive use of microscopy.

The roll-out of RDTs to all health facilities has expanded diagnostic capacity, particularly for facilities lacking the capacity to perform malaria microscopy. Overall, this has reduced the reliance on presumptive diagnosis and moved Malawi closer to universal diagnostic coverage. Through its implementing partner, PMI is supporting the development of a national slide archive and supported three qualified laboratory technicians to achieve WHO level 2 accreditation to assist with quality assurance for microscopy. Challenges to reaching the goal of universal diagnostic coverage include inadequate diagnostic technical capacity (including human resources), shortages of diagnostic supplies at health facilities, and the significant delays in completing the training of HSAs in the use of RDTs.

ACT consumption has continued to outpace reported malaria cases, with approximately 10 million ACTs consumed compared to approximately 6 million malaria cases (per HMIS data) in 2015. Investigations have identified the facility level—as opposed to central or district levels—as the most problematic. The consensus is that the problem is multifactorial, with continued presumptive treatment, poor record-keeping, and theft as the likely main contributors. A lack of legal enforcement (e.g., minimal fines for those caught with stolen medications) creates an enabling environment for continued theft. Other contributing factors include stock mismanagement, inadequate facilities for commodity storage, and patients often receiving a diagnosis and treatment at different locations within the facility, which leads to additional record-keeping challenges. An action plan has been created with the input from the NMCP, HTSS, and other stakeholders and is discussed in the Pharmaceutical Management section.

Malawi implements integrated community case management (iCCM), with national guidance emphasizing implementation in areas more than five kilometers from a health care facility. Approximately 3,190 village health clinics exist nationwide and PMI currently provides support to nearly all of the 1,738 village health clinics located in the 15 districts targeted by PMI's integrated service delivery partner. Activities include equipping village health clinics and providing training, printing registers, and supervision/monitoring of HSAs. HSAs, who are paid health workers, have been trained on a full package of iCCM including the administration of ACTs and are permitted to treat malaria among children under five years of age at the community. After initial delays, training of HSAs on use of RDTs and pre-referral use of rectal artesunate commenced in selected districts in 2015, with support from the RACE project.

Additional trainings are underway in the remaining districts with support from Global Fund and are expected to be completed by July 2016. PMI anticipates supporting follow-up supervision and quality improvement for iCCM after the training is complete. In addition, PMI supported community mobilization activities in the 15 targeted districts to increase malaria prevention and care-seeking behaviors by community members.

The NMCP plans to conduct additional therapeutic efficacy monitoring for AL and ASAQ in 2016 with Global Fund support. The PMI in-country team will provide direct technical support for this activity and discussions are underway regarding PMI technical and financial support for the inclusion of artemisinin resistance testing.

Commodity gap analysis

Table 8: RDT Gap Analysis

Calendar Year			
RDT Needs			
Total country population	16,783,432	17,270,152	17,770,986
Population at risk for malaria	16,783,432	17,270,152	17,770,986
PMI-targeted at-risk population	16,783,432	17,270,152	17,770,986
RDT Needs [†]	12,473,468	10,249,688	9,268,253
Pipeline needed [§]	4,200,000	4,200,000	4,200,000
TOTAL RDT NEEDS	16,673,468	14,449,688	13,468,253
Partner Contributions			
RDTs carried over from previous year	0	0	2,061,120
RDTs from MoH	4,429,850	4,105,404	0
RDTs from Global Fund	4,429,850	4,105,404	0
RDTs from other donors	0	0	0
RDTs planned with PMI funding	2,900,000	4,100,000	4,000,000
Total RDTs Available	11,759,700	12,310,808	6,061,120
<p>* Estimated donor and GoM contributions for 2018 are not yet known, but are anticipated to be on par with current commitments.</p> <p>[†] The total RDT needs are based on the 2016 National Quantification of Malaria Commodities (publication forthcoming), which utilizes past consumption and the Roll Back Malaria Gap Analysis tool as the basis for projecting need. The national health management information system does not currently have reliable malaria case or fever data, so past consumption has been used as a proxy for malaria cases. The quantification assumes a progressive decrease in malaria cases and therefore fever cases due to improved prevention and control.</p> <p>[§] A minimum of 4.2 million RDTs are estimated to be required in the pipeline at the end of each calendar year to ensure sufficient supply for the next year.</p>			

Table 9: ACT Gap Analysis

Calendar Year	2016	2017	2018*
ACT Needs			
Total country population	16,783,432	17,270,152	17,770,986
Population at risk for malaria	16,783,432	17,270,152	17,770,986
PMI-targeted at-risk population	16,783,432	17,270,152	17,770,986
ACT Needs [†]	9,456,998	8,676,477	7,936,084
Pipeline needed [§]	3,000,000	3,000,000	3,000,000
TOTAL ACT NEEDS	12,456,998	11,676,477	10,936,084
Partner Contributions			
ACTs carried over from previous year	939,102	0	0
ACTs from MoH	0	2,295,551	0
ACTs from Global Fund	4,750,000	1,731,732	0
ACTs from other donors	0	0	0
ACTs planned with PMI funding	2,200,000	3,500,000	3,000,000
Total ACTs Available	7,889,102	7,527,283	3,000,000
Total ACT Surplus (Gap)	(4,567,896)	(4,149,194)	(7,936,084)

* Estimated donor and GoM contributions for 2018 are not yet known, but are anticipated to be on par with current commitments.

[†] The total ACT needs are based on the 2016 National Quantification of Malaria Commodities (publication forthcoming), which utilizes past consumption and the Roll Back Malaria Gap Analysis tool as the basis for projecting need. The national health management information system does not currently have reliable malaria case data, so past consumption has been used as a proxy for malaria cases. The quantification assumes a progressive decrease in malaria cases due to improved prevention and control.

[§] A minimum of 3 million ACTs are estimated to be required in the pipeline at the end of each calendar year to ensure sufficient supply for the next year.

Current projections for supply of case management commodities in Malawi are very concerning. At the time of writing, the country is facing significant shortages of ACTs and RDTs for calendar year 2016. The causes are many: implementation of the 2015 ITN mass distribution campaign was delayed into second quarter of 2016, which resulted in an estimated 500,000 malaria cases that could have been, but were not, averted; activities to improve accountability and reduce theft have not yet stemmed leakage of ACTs or RDTs; and there appears to be a higher than usual burden of malaria cases in 2016. Furthermore, there was delayed acceptance of and action to address the looming problem on the part of GoM. During the National Quantification of Malaria Commodities exercise in April 2016, an anticipated gap of approximately \$12 million for all malaria commodities in 2016 was calculated. Currently,

actions are underway to mitigate this situation, but shortages are expected to continue through 2018.

Plans and justification

PMI remains committed to supporting MoH efforts to provide prompt, appropriate, and effective malaria treatment. With FY 2017 funding, PMI will continue to focus on improving community and facility-based case management services in ten priority districts, those with the highest malaria burden in the country. Case management commodities, specifically RDTs and ACTs, will still be supplied nationwide and supply chain technical assistance will be provided to all districts through zonal supply chain staff. Parenteral and rectal artesunate for severe malaria treatment will not be procured with PMI funds because other donor support for these commodities (e.g., Global Fund, Medicines for Malaria Venture) is expected.

The NMCP prefers to conduct biannual therapeutic efficacy monitoring for the first and second-line therapeutic agents and plans to implement additional testing in 2018. Based on the current overall needs and priorities, PMI and the NMCP have agreed that support from other donors will be sought to cover this activity.

PMI funding will also target SBCC interventions focused on appropriate care-seeking behavior and medication adherence for both uncomplicated and severe malaria at the community level (see SBCC section).

Proposed activities with FY 2017 funding: (\$6,640,000)

- Procure 4 million RDTs (distribution costs covered in Pharmaceutical Management section) (\$1,480,000);
- Procure 3 million AL treatment courses (distribution costs covered in Pharmaceutical Management section) (\$3,000,000);
- Procure ancillary diagnostic supplies (gloves and sharps containers) for RDT implementation (\$150,000);
- Diagnostic technical assistance in ten focus districts, concentrating on quality improvement/quality control for diagnostics in facility and community settings (\$300,000);
- Case management services support in ten focus districts, concentrating on improving RDT use and adherence to results, appropriate severe malaria case management and referral from community and lower health facility levels, and supervision and mentorship in facility and community settings, with approximately 80% effort to facility settings and 20% effort to the community level (\$1,700,000); and
- CDC technical assistance for case management activities (\$10,000)

b. Pharmaceutical Management

NMCP/PMI objectives

The 2011-2016 Malaria Strategic Plan calls for a reliable, secure, and accountable pharmaceutical and supply chain management system to ensure the consistent availability of essential commodities and supplies for malaria control and prevention activities. To achieve this

objective, the NMCP plans to conduct annual forecasting and quantification, strengthen the logistics management information systems in collaboration with HTSS, develop annual procurement plans in collaboration with partners, and support national and international efforts to strengthen the procurement and supply chain system.

Progress since PMI was launched

Supply chain issues have been a key concern in Malawi. Due to issues of leakage and general mismanagement, a PMI-Global Fund parallel supply chain was created in late 2010 to distribute all USG and Global Fund-supported malaria commodities. In August 2012, representatives from the GoM, CMST, and several partners, including WHO, the Global Fund, DFID, and PMI, conducted a review of the supply chain management system and developed a *Joint Strategy for Supply Chain Integration in Malawi*. This roadmap to reintegration of the parallel supply chains into CMST included four distinct phases: CMST recapitalization and reform, management of essential drugs supply chain, warehousing and distribution, and procurement functions. Thirty-six specific performance benchmarks were to be measured through *ad hoc* external assessments and a mid-term review of CMST's capabilities as pre-conditions for reintegration.

In addition to support for CMST reform, the USG has supported efforts to improve the overall supply chain through continued support to the MoH to strengthen planning and coordination centrally and improve commodity management and reporting at the district and facility levels. Support to the central level has included technical assistance to implement annual national quantification and forecasting of all essential medicines, conduct supply planning and commodity monitoring, maintain Supply Chain Manager and the National Stock Status Database, and provide financial support to employ two technical assistants seconded to HTSS, which has supervisory authority over the CMST and has responsibility for the overall supply system to public health facilities in Malawi. Support to the district, health center, and community levels have included quarterly supervision, mentoring, and EUV surveys; expanded access to and use of the logistics management information system (LMIS); and improved access to malaria commodities through iCCM.

Progress during the last 12-18 months

The NMCP and PMI continued to focus on improving accountability for malaria commodities at the facility level, minimizing stockouts of malaria commodities at service delivery points, and strengthening supply planning and commodity management through planning, training, and supportive supervision. PMI-supported activities conducted in 2015 included monthly commodity distributions, integrated supportive supervision and peer mentoring, LMIS reporting, and capacity building at the central, district, and facility levels. After dedicated efforts by PMI and the MoH to improve LMIS reporting, rates have remained high, at over 80%. A second annual data quality assessment (DQA) of LMIS data in 2015 found continued high quality, though reported some decline in correct recording and reporting of commodities compared to 2014. The DQA results suggest a need to redouble efforts to train, supervise, and mentor facility staff to correctly and consistently report commodity data.

PMI plans to continue using a parallel supply chain that distributes USAID-procured health commodities. After utilizing the PMI supply chain implementing partner for several years, the

Global Fund began a new warehousing and distribution contract for Global Fund-procured malaria commodities late in 2014. While this resulted in a consolidated parallel supply chain for all Global Fund-procured commodities (i.e., HIV and malaria), there are now multiple parallel supply chains for malaria. These multiple supply chains for malaria drugs have exacerbated supply management problems due to difficulties coordinating between distribution agents and varying distribution calendars and timing. The PMI-supported distribution occurs monthly and requires two weeks to reach all health facilities, while the Global Fund-supported distribution occurs every other month and takes a full month to reach all facilities. In 2015 highest stockouts of ACTs were experienced when the Global Fund-supported distribution delayed the start of the distribution cycle by a few weeks. The fact that Global Fund distribution takes a full month to complete has exacerbated the situation.

To assess progress on implementation of the *Joint Strategy for Supply Chain Integration*, an independent evaluation of CMST's progress toward the agreed-upon benchmarks was conducted in early 2016. The assessment found overall performance toward benchmarks to be limited, with only 39% of benchmarks achieved in the 4 years since the road map was developed. Given this slow progress, it is not clear when PMI will be able to transition the warehousing and distribution of malaria commodities to CMST. PMI, through the USAID Mission, will continue to advocate strongly for rapid and effective strengthening of the national supply chain system. Given the extended timeline for reintegration, as well as the difficulties of managing multiple parallel supply chains, the Global Fund and PMI are considering options to reintegrate the malaria supply chains when the current Global Fund contract ends in 2016. Additionally, the Global Fund, PMI, USAID, and DFID are exploring strategies to improve CMST's long term capacity for supply management.

After consumption of ACTs increased from 9 million in 2013 to over 10 million in 2014, consumption in 2015 remained steady at just over 10 million treatment courses. In the same period, the number of reported malaria cases has remained relatively stable and the very substantial gap between ACT consumption and reported cases has continued. Several assessments and spot checks found generally high consistency of data between facility records and the central LMIS and HMIS, indicating that poor data recording and theft of commodities at the facility, and perhaps community, level are the main drivers of discrepancies.

The GoM and stakeholders developed an action plan to improve commodity oversight and management – including improved supervision at the district, facility, and community levels; better use and review of data for decision-making; and audits of facilities with discrepancies between consumption and reported cases. PMI has been providing extensive support for the development and implementation of the action plan. From December 2015-February 2016, PMI supported malaria data reviews in each zone, with participation of the district health management team (DHMT) from each district, followed by data reviews in each district, with participation from each facility. DHMT and facility staff were trained in the correct recording of data, oriented on use of data, and created action plans to improve data and accountability for commodities. These data reviews will be repeated semiannually in each zone and quarterly in each district. Additionally, supervision activities are being scaled up with support from PMI and the Global Fund.

After significant pressure from the USG and other stakeholders, the MoH conducted an audit of ten facilities, which confirmed PMI's findings of significant numbers of unaccounted for ACTs. Subsequent audits of additional facilities have resulted in significant findings, and MoH staff at facilities have been arrested and presumably fired. Malawian leaders at the highest levels have consistently reinforced messages that drug theft and misappropriation must stop. In the Ministry of Health, the Minister and the Secretary for Health have been strong supporters of efforts to improve accountability.

Plans and justification

PMI remains committed to supporting the operation of the PMI-USAID parallel supply chain. In support of this, PMI will strengthen MoH commodity management and planning at all levels of the system. At the zonal, district, facility, and community levels, PMI will continue to focus on improving provider behavior, accountability for medicines, and improved data management. In response to commodity thefts and lack of accountability within the supply chain, the Government of Malawi has taken a number of actions in the past year, including audits of multiple facilities suspected of theft, suspension of government officials, prosecution of individuals, and establishment of the DTIU within the auditing branch of the MoH. In conjunction with other USG investments to improve accountability, PMI Malawi and other USAID health elements plan to support a supply chain technical advisor within the newly formed DTIU (see strategy updates, HSS, and SBCC sections).

Proposed activities with FY 2017 funding: (\$3,100,000)

- Technical assistance to improve management, oversight, and accountability for supply chain and logistics management at the central, zonal, and district levels; support to quantification and LMIS; and strengthening of the DTIU (\$1,300,000);
- Improve facility-level commodity storage capacity: PMI plans to complement other USG and other donor investments to improve storage conditions at select facilities with high malaria burden by providing support for a limited number of pre-fabricated storage containers for health facilities (\$300,000); and
- Provide support for receipt, warehousing, management and oversight, and physical distribution of PMI-procured case management commodities through the PMI supply chain management system directly to the health facility level (\$1,500,000).

3. Health system strengthening and capacity building

PMI supports targeted health system strengthening activities which cut across intervention areas, such as training of health workers, supply chain management and health information systems strengthening, drug quality monitoring, and NCMP capacity building.

NMCP/PMI objectives

The Malaria Strategic Plan 2011-2016 calls for strengthening capacity in program management at all levels of health service delivery by providing policy direction and leadership, building human resource capacity, mobilizing and utilizing resources more effectively, improving

coordination, and strengthening procurement and supply chain management. The NMCP plans to achieve these goals through strong leadership; creation of a supportive environment; improved infrastructure, equipment and supplies; and effective collaboration with partners.

Progress since PMI was launched

The USG has taken an integrated approach to contribute to efficient systems strengthening across the Malawian health sector. To that end, the USG has helped to train and retain health care workers; incentivized health workers to deliver higher quality services; built the capacity of the MoH to effectively utilize the LMIS and improve coordination of donor drug procurement; expanded health information systems and linked these systems across health programs; and provided broad-based support to the national laboratory system. The USG also has supported the development of leadership and management systems at the MoH and district levels, including systems for human resources; surveillance, monitoring and evaluation; and finance management.

USAID has leveraged and created synergies with many other partners, including the private sector. The USG agencies have served as chairs on the Education, Agriculture, and Nutrition Donor Groups in addition to the Health Donor Group. Furthermore, the USAID Mission Director is the donor representative on the Malawi Country Coordinating Mechanism for the Global Fund grants and USAID and PMI staff serve on several committees and task forces on critical health systems issues.

The Malawi 2011-2016 National HSSP builds upon the sustained gains made under the 2004-2010 Program of Work, and places an emphasis on primary health care. Considerable improvements in the delivery of an EHP have been reflected by reduced infant and child mortality rates, pneumonia case fatality and maternal mortality, and in maintaining high immunization coverage, among other areas. However, while overall curative services are improving, services are not yet spread equitably across the country and health promotion and prevention activities lag behind. Utilization of ANC and postnatal care is not increasing as planned, and quality and availability of essential obstetric care is limited by shortages of skilled human resources, equipment, and transport. In the absence of donor funding, the resources for general health services are minimal and the technical capacities of personnel are limited. Health centers and hospitals continue to struggle with shortages of medicines and supplies.

In the area of surveillance, monitoring, and evaluation, while systems have been developed, data quality and analysis remain weak, prompting several disease control programs to implement parallel surveillance systems. In principle, the available systems are capable of producing reliable and timely data, but the limited capacity at the facility and district level hinder successful implementation. The SM&E system in the MoH is not robust enough to handle the multitude of indicators in various programs and the CMED does not yet have the capacity to perform thorough analysis of progress in the health sector.

Progress during the last 12-18 months

Through its implementing partners, PMI provides technical support to the MoH to help improve policies, management and leadership, and fiscal responsibility. PMI promotes evidence-based policies, strengthens the management and technical capacity of the NMCP and other MoH divisions, supports development and strengthening of electronic data systems, strengthens the

zonal supervision structures, bolsters decentralized management of health services at the district level, and strengthens the government's capacity for financial planning and management and budget execution.

PMI builds human resource capacity through the training of health facility workers on malaria case management and prevention of malaria in pregnancy, laboratory technicians on diagnosis of malaria, and pharmacists and other relevant health workers on pharmaceutical management. In addition, PMI strengthens supply chain management systems by providing technical assistance to HTSS in the MoH as well as to the zonal, district, and facility levels (see Case Management section). Through its support to zonal data reviews, PMI helps build capacity of district staff on DHIS 2 and to use data for decision-making. In order to strengthen community-based services, PMI supports supervisory visits during which supervisors conducted community score card activities to assess the quality of services provided by HSAs and better understand the community's role with regard to commodity security and pilferage. Furthermore, PMI works with other USG health programs to improve health information systems through technical assistance and capacity building (see SM&E section).

Key PMI-supported activities during the past year include:

- *Human resources development:* Leadership and management training for MoH staff, including district malaria coordinators. PMI continued to support the two-year pre-service training program for pharmacy assistants.
- *Supportive supervision:* Provision of integrated supportive supervision in 15 districts, reaching 98% of targeted health facilities.
- *Electronic data systems:* Ongoing support to the DHIS 2 platform. In addition, an electronic data tool (using tablets and mobile phones) for integrated supportive supervision was finalized and is being used in 15 targeted districts as well as by zonal and national management teams. The GoM plans to scale up this tool to all districts. The tool includes malaria indicators for IPTp, ITNs, and adherence to case management guidelines.
- *Data collection and reporting:* Printing and distribution of malaria reporting books and ACT registers.
- *Document development:* Development of the following documents: *National Medicines Policy, Guidelines for Task-shifting to HSAs in Malawi, National Health Policy (draft), Management of Community Health Workers Guidelines, and National Physical Assets Management Policy.*

PMI supports a Peace Corps Malaria Response Coordinator, who works with the NMCP and helps to engage Malawi Peace Corps volunteers to make measureable and meaningful efforts in malaria prevention efforts. The Malaria Coordinator was actively involved with the ITN mass distribution campaign, serving as a member of the task force and providing logistical and technical support to the NMCP. PMI also provides support to Peace Corps volunteers through Small Project Assistance grants. Key activities in the past year included: conducting malaria health education sessions at health facilities, conducting Grassroots Soccer Malaria Skillz soccer tournaments with youth in communities, creating SBCC public service announcements for radio, conducting ITN care sessions with communities, and conducting awareness building activities during World Malaria Day such as mural painting and dramas and songs.

Plans and justification

Working closely with other USG programs in Malawi, PMI will support the implementation of the HSSP. As PMI continues to address malaria-specific challenges, nationwide progress still requires ongoing investment to strengthen the overall health system with in-country partners. Starting in FY 2016, PMI Malawi is focusing and concentrating its service delivery strengthening efforts in ten high malaria burden districts, building government capacity at the district level for facility-based case management; FANC and delivery of IPTp; community mobilization and iCCM; and surveillance, monitoring, and evaluation. These capacity building efforts will include training and expanded supportive supervision and mentoring to relevant cadres (e.g., facility and community health care workers, pharmacy technicians and assistants, etc.). Simultaneously, at the central level, PMI will support policy development and dissemination; strengthen pharmaceutical supply chain management; and reinforce the HMIS and surveillance, monitoring and evaluation; in addition to continuing to provide technical and operational support to the NMCP and other key parts of the MoH (such as CMED and IMCI).

Proposed activities with FY 2017 funding: (\$500,000)

- Support to malaria district coordinators, district health officers, and zonal health officers: PMI will support key district health staff to conduct facility and community-level supportive supervision, mentorship, coaching, and assistance with data collection and reporting, as well as support to the zonal offices for improved supervision and oversight (\$300,000);
- Pre-service training of pharmacy assistants: PMI plans to continue to provide scholarships for 48 pharmacy assistants (24 students per cohort in a 2-year pre-service pharmacy assistant training), so that this cadre will enter the workforce with the stock management skills necessary to help ensure commodity security at the facility level (\$200,000); and
- Provide support to Peace Corps: PMI continues to support small project assistance grants and two malaria coordinators (\$0 – supported with previous years funds).

Table 9: Health Systems Strengthening Activities

HSS Building Block	Technical Area	Description of Activity
Health Services	MIP	Strengthening FANC and improving IPTp uptake
	Diagnosis and treatment	Strengthening case management at facility and community levels
	Diagnosis and treatment	Supporting quality of diagnosis at facility and community levels
Health Workforce	HSS	Pre-service training of pharmacy assistants
	HSS	Support to district malaria coordinators, district health offices, and zonal health offices
	HSS	Building capacity of MoH Central Monitoring and Evaluation Division
	HSS	Through support to Peace Corps, build capacity to prevent malaria at the community level
	SM&E	Strengthen routine HMIS at the district and central levels
Essential Medical Products, Vaccines, and Technologies	ITNs	Procurement and distribution of ITNs
	IRS	Technical assistance to NMCP to support IRS, environmental compliance, and IVM implementation
	Diagnosis and treatment	Procurement and distribution of RDTs, ACTs, ancillary supplies
	Malaria in Pregnancy	Procurement and distribution of SP and DOT materials
	Pharmaceutical Management	Supply chain strengthening
Health Finance	N/A	N/A
Leadership and Governance	Pharmaceutical management	Technical assistance to GoM to improve management, oversight, and accountability for supply chain and logistics management

4. Social and behavior change communication

NMCP/PMI objectives

The HSSP 2011–2016 emphasizes the need to recognize and scale up health promotion interventions in the implementation of the EHP. The HSSP 2011–2016 identified the limited capacity of existing communication efforts to reach all segments of the population as a threat to the successful delivery of essential health packages through public health interventions. In line with the HSSP, the 2011-2016 National Malaria Strategic Plan calls for strengthening advocacy,

communication, and social mobilization capacities to move towards optimal coverage for all malaria interventions. This is aimed at achieving a target of over 80% of the population practicing positive behaviors that contribute to prevention and control of malaria by 2016. The 2011-2016 National Malaria Strategic Plan aimed to educate communities to practice appropriate preventive behaviors and to seek prompt diagnosis and treatment of malaria at the onset of signs and symptoms.

To achieve this, the NMCP has put in place the Malaria Communication Strategy (2015-2020) whose goal is to improve behavioral change interventions through advocacy and social mobilization. Advocacy is targeted at the national level to mobilize political commitment and resources for malaria prevention and control efforts, stimulate increased responsibility on the part of community members to adopt malaria control behaviors, and encourage clinicians to adhere to case management and malaria in pregnancy guidelines. This strategy uses the *Life is Precious, Take care of it (Moyo ndi Mpamba, Usamalireni)* slogan, which is popular among Malawians and has been adopted as the central vehicle for health promotion activities. It provides a harmonious platform that all program areas can leverage to effectively reach Malawians with comprehensive health information. This strategy is implemented through District Health Promotion Officers, Health Surveillance Assistants, Village Health Committees, and Village Development Committees.

The NMCP established a technical committee to support and guide the implementation of the Malaria Communication Strategy. This committee is comprised of key malaria and SBCC stakeholders, including PMI. During major events and massive interventions such as universal ITN campaigns, task forces under this committee spearhead SBCC efforts to support the intervention (e.g., logistics, resource mobilization, community engagement, technical direction).

Progress since PMI was launched

PMI Malawi supports an integrated approach to SBCC focused on ITNs, MIP, and case management. SBCC activities have included: national campaigns and door-to-door visits to promote year-round ITN use; large-scale campaigns to emphasize ANC attendance to improve IPTp uptake; and community-based campaigns that emphasize ITN utilization, as well as improved case management through the promotion of early care-seeking behavior.

Results from the MIS 2014 suggest that SBCC efforts have been effective in conveying information that led to adoption of positive behavior. Approximately 84% of Malawian women reported having knowledge that sleeping under a mosquito net can prevent malaria infections. In terms of behavioral practices, for instance, in households that own at least one ITN, ITN utilization among children under the age of five years and pregnant women was 1.2 times higher in 2014 than in 2012. Similarly, household ownership of ITNs increased to 70% in 2014 from 55% in 2012. Although the causal link and quantification of contribution is difficult to establish, it would be reasonable to assume that SBCC efforts contributed to improved ITN use in households in Malawi. Though the 2015 DHS showed decreased ITN ownership and utilization, this is not surprising given that the mass distribution campaign occurred two months after DHS data collection and the seasonal variation in ITN use (described in further detail in the ITN section). There is no reason to suspect that the decreased utilization reported in the 2015 DHS is

the result of overall changes in knowledge. These data do show, however, the need for continued SBCC efforts to improve year-round use of ITNs.

SBCC strategies have been employed from the national to the community level to target policy makers, health care providers, and community members. In promoting malaria interventions, PMI has utilized a variety of SBCC approaches, including educational meetings, mass media, print media, community drama, and interpersonal communication activities. At the national level, PMI has been implementing SBCC activities through an integrated SBCC mechanism. The objectives of this project are in line with the NMCP's strategic plan to build capacity of key national institutional partners, strengthen national and community level planning and coordination, develop and produce evidence-based SBCC packages under a multi-level media campaign, and identify and implement best practices.

The small grants program for community mobilization has remained a central component of the SBCC strategy to ensure good coverage and reach of SBCC activities at household level in all districts where PMI's implementing partners work. Under this Community Action Cycle program, teams consisting of HSAs and community health extension workers collaborate with the communities to identify key health issues. The teams then help the community identify solutions to these issues in an effort to bring about appropriate behavior for improved health outcomes. At the household and village level, communications teams have also concentrated on interpersonal communication activities to promote prevention behaviors including early and frequent ANC attendance, IPTp uptake, appropriate and prompt health-seeking behaviors, and ITN use.

Progress during the last 12-18 months

PMI-funded activities helped strengthen national-level and targeted district-level SBCC planning and coordination on EHP priorities. Specific activities included: support for inclusion of SBCC in health sector district implementation plans, health promotion and communication technical working group meetings, and the development of a National Health Promotion Policy.

PMI supported SBCC planning and coordination at national and district levels through the development of the National Health Communication Strategy (2015 – 2020), which is designed to coordinate health promotion and communication strategies across the Health Sector, and the National Malaria Communication Strategy (2015 –2020), which harmonizes communication approaches to encourage adoption of positive health behaviors.

PMI funding also supported the MoH's efforts to develop and produce evidence-based SBCC packages under a multi-level media campaign to ensure effective, integrated SBCC implementation through mass media and facility and community level interventions. The integrated project developed SBCC strategies and tools like the Social and Behavior Change Communication Strategy and the Community Mobilization Strategy. The following key mass media activities were conducted:

- i) ***Moyo ndi Mpamba* campaign:** Informed and guided by the SBCC strategy that was developed during the previous year, PMI supported the designing of a central, integrated SBCC campaign platform — *Moyo ndi Mpamba, Usamalireni*, “Life is Precious, Take care of it.” The campaign provides a platform to tie together messages from the six focus health

topics for the integrated platform (malaria; HIV/AIDS; maternal, neonatal and child health; family planning; water, sanitation, and hygiene; and nutrition). The MoH adopted the campaign as the brand identity for its health communication integration efforts. Twenty-seven radio episodes of *Moyo ndi Mpamba* were aired to promote ITN use, IPTp and early care-seeking for fever. Two episodes tackled pilferage of malaria medicines and commodities, while one radio spot discouraged use of ITNs for fishing. The program have received a total of 17,942 SMSs as feedback covering the two programs as follows: 5,714 SMSs from *Moyo ndi Mpamba* radio drama serial and 12,228 SMSs from *Moyo ndi Mpamba* radio magazine.

- ii) **Malaria-specific messaging:** A total of 1,214 radio spots, produced in collaboration with the NMCP and the Health Education Section, were aired. The spots promoted use of ITNs, supported the registration exercise for the universal ITN distribution campaign, prompt care-seeking, prompt diagnosis with RDTs, and appropriate treatment. These messages were broadcasted in the most widely spoken languages on the three national and most of the community radio stations; the radio spots reached approximately a quarter of the country's population.¹² In addition, 25,000 copies of the malaria comic book were revised, translated and printed (20,000 in Chichewa and 5,000 in English). A total of 74,953 leaflets and fliers on malaria were distributed for community health workers and volunteers.
- iii) **Make a Difference (MAD) campaign:** Through collaboration between PMI and the USAID Office of Inspector General, the MAD campaign was jointly launched with the Global Fund "I Speak Out Now" campaign in order to address efforts to fight drug thefts in Malawi. Malaria-specific messaging includes the design and placement of 48 newspaper strips in two national dailies over a period of 3 months. A radio spot on reporting drug theft was integrated in the *Moyo ndi Mpamba* program.
- iv) **Community mobilization Support:** With PMI support, partners conducted a three-day technical review meeting with all community mobilization Zonal Coordinators to review the implementation of the Community Action Cycle. Partners provided technical support on community mobilization to non-governmental organization sub-grantees, District Health Promotion Sub-committees, Community Mobilization district level trainers, Community Mobilization team members and Community Action Groups in SSDI focus districts where community mobilization is implemented. Partners conducted joint supervision visits with Health Education Services officials in four districts to showcase the community mobilization activities.
- v) **Media partnership:** The integrated project continued to build the capacity of key national-level institutional partners and district-level partners in 15 districts to ensure effective SBCC strategic planning and delivery through ongoing technical assistance and monitoring. The media is a crucial partner in promoting malaria prevention and control efforts and can provide a strong platform for advocacy with decision makers, as well as for changing attitudes and norms in the general population. However, airtime and print space are expensive and difficult to sustain in Malawi. *Media for Life* is an innovation for forging a mutually beneficial partnership between the health sector and the media with minimal costs to the MoH and the media partners. The integrated project supported the MoH through Health Education Services to conduct a Media for Life Conference. As part of the Media for Life Conference, four media houses signed a memorandum of understanding with the MoH. These memoranda of understanding aim to enhance the mutual contributions of

¹² Based on SSDI baseline estimates through Zodiak, MBC 1 and MBC 2 radios only in the 15 SSDI districts

media institutions and the MoH in health promotion efforts. The integrated project conducted a skills building workshop in health reporting aimed at (1) strengthening the skills of media practitioners in effective health reporting and (2) advocating for enhanced media focus/ interest on public health issues in Malawi. Furthermore, a national dialogue campaign orientation workshop was organized for field producers (volunteers or barefoot journalists with recorders) who collect stories from their communities that are aired in the *Moyo ndi Mpamba* radio program. The 2016 national dialogue sessions centered on the following topics: (1) What factors affect timely attendance for ANC Services (including early ANC), (2) Malawians and mosquito nets; how are we using them, and (3) Whose responsibility is it to prevent pilferage/ theft of drugs and commodities from our health facilities.

Although the country has made significant strides, more progress is needed. The MIS 2014 shows that some malaria prevention behaviors, like IPTp2 uptake, are stagnant at around 60%, despite Malawi being the first country in sub-Saharan African to attain high levels of IPTp2 coverage. Similarly, prompt care-seeking among children under the age of five still remains sub-optimal. These challenges represent opportunities to intensify community and health provider messaging to improve uptake of these interventions.

Plans and justification

PMI plans to support an integrated SBCC approach at the national level and at the community level in ten focus districts with ITN, IPTp, and case management messaging. National level efforts will focus on advocacy, mass media communication, and materials development, while community level efforts will focus on interpersonal, small group interventions and strategies to engage traditional authorities to support and promote the importance of malaria prevention activities.

Proposed activities with FY 2017 funding: (\$1,750,000)

- Support for national-level SBCC activities to improve uptake of malaria services and adoption of preventive and care-seeking behaviors; and technical assistance to community-based SBCC activities. SBCC is designed to promote prompt treatment of malaria, adherence to treatment, and early care-seeking behavior; to improve demand for ITN and increase use; and to improve IPTp uptake (\$950,000);
- Community-based SBCC activities to improve demand for services and uptake of core malaria prevention and control interventions. Small grants to community-based organizations to improve uptake of malaria services, adoption of preventive and care-seeking behaviors, and improvement of oversight and accountability for health services through engagement with traditional authorities, health facility advisory committees and the community (\$800,000).

5. Surveillance, monitoring, and evaluation

NMCP/PMI objectives

The 2011-2016 Malaria Strategic Plan calls for strengthening of surveillance, monitoring, and evaluation systems through routine health management information systems, malaria-specific

surveillance and special surveys to gather entomologic, epidemiologic, and coverage indicator data. This plan follows RBM M&E guidance to provide a comprehensive framework for obtaining reliable and consistent data in order to assess progress toward the achievement of universal coverage of malaria interventions and the reduction of disease burden. PMI provides targeted programmatic and technical support to the NMCP, HTSS, and CMED to support improvements to surveillance, monitoring, and evaluation systems; implement population-based surveys to measure progress on key malaria indicators; and enhance the coordination of GoM efforts.

Progress since PMI was launched

National household surveys

The UNICEF-funded 2006 MICS provides the baseline data for PMI's program. Although it collected information on net ownership and usage, as well as IPTp uptake, it did not include biomarker data. The NMCP, with assistance from the Malaria Control and Evaluation Partnership in Africa, completed Malawi's first MIS in April 2010. This survey documented increases in household net ownership, net usage in vulnerable groups, and uptake of IPTp. Nevertheless, high parasitemia (~43%) was noted. PMI provided support to the 2010 DHS, which provided district-level estimates of under-five mortality and malaria indicators. With FY 2012 funding, PMI supported the second MIS in Malawi and, with FY 2013 funding, PMI provided partial support and technical assistance to a third MIS. This most recent MIS was conducted during May-June 2014 and final results were disseminated in March 2015. A second MICS was also conducted during the first half of 2014 with support from UNICEF. Please see the strategy section *Progress on indicators to date* for more detail.

Health facility and other surveys

Health facility surveys: With FY 2010 and FY 2011 funding, PMI supported nationally representative health facility surveys to assess the quality of case management for uncomplicated malaria in outpatient facilities and severe malaria in tertiary care facilities. Results from the outpatient facility evaluation showed poor provider adherence to microscopy results. (This survey was conducted prior to the roll-out of RDTs in Malawi.) Only two-thirds of patients with uncomplicated malaria confirmed by microscopy received an ACT and 31% of patients without malaria were inappropriately treated with an ACT. Results from the tertiary care facility evaluation identified limited availability of medications and diagnostic supplies, as well as knowledge gaps among health workers, as key obstacles to providing quality care for patients with severe malaria. The case fatality ratio among patients admitted with suspected or confirmed malaria was 2.15% (95% CI 0.79-3.52) in patients of all ages.

The 2013-14 SPA was a census of all formal sector health facilities in Malawi. Please see *Strategy: Other relevant evidence on progress* for a summary of results.

End-use verification surveys: PMI began supporting end-use verification surveys with FY 2011 funds. Initial surveys identified high percentages of facilities reporting stockouts: 38 to 55% of facilities with stockouts of three or more days across each AL presentation and approximately

75% of facilities with stockouts of SP. As reporting through the logistics management information system was incomplete and inconsistent, the end-use verification surveys became an important tool to help guide and improve inventory management at the health facility level.

Malaria surveillance and routine systems

PMI supported health facility surveillance via sentinel sites in Malawi from FY 2007 through FY 2010. However, PMI discontinued this support in FY 2011, based on an evaluation that found a key indicator for data quality — the proportion of suspect malaria cases that were laboratory confirmed — remained low.

The HMIS has been the primary system for monitoring the implementation of services and collecting disease surveillance data for the MoH. The HMIS collects and reports data on more than 70 core indicators, including outpatient malaria cases and inpatient malaria deaths. However, reporting of malaria cases through HMIS has been incomplete and inconsistent and has often lacked parasitological confirmation. In an attempt to improve system performance, the MoH began to transition the HMIS platform from DHIS to DHIS 2 in 2009. The DHIS 2 is a web-based system for capturing data at district level; HMIS relies on paper-based reporting at health facility level. While the MoH was overhauling the HMIS, the NMCP was granted authority to develop a parallel reporting system for malaria surveillance in 2011. PMI supported this activity through training of district health management teams in the parallel system surveillance forms and mentoring visits from the NMCP monitoring and evaluation officers. With support from PMI and other partners, the NMCP worked with the CMED to ensure that appropriate malaria indicators (including commodity indicators) were included in the DHIS 2 malaria-specific platform, enabling subsequent reintegration of the malaria parallel surveillance system with HMIS in 2013.

With FY 2013 funding, PMI supported a pilot activity to incorporate malaria-specific data fields into an electronic medical records system, designed to provide patient-level malaria data at selected facilities and link clinical, laboratory, and pharmacy data.

Therapeutic efficacy monitoring

Please see the Case Management section for details of therapeutic efficacy monitoring.

Entomological monitoring

Please see the Vector Control section for details of entomological monitoring.

Impact evaluation

With funding and support from PMI and the RBM partnership, Malawi completed the *Progress and Impact Series* report, which was disseminated in April 2013. Key findings include a 41% reduction in under-five mortality from 188 to 112 deaths per 1,000 live births over the period 1996-2000 and 2006-2010. Modeling estimated that approximately 21,600 deaths among children under five years of age were prevented by malaria control interventions.

Progress during the last 12-18 months

National household surveys

With FY 2015 funding, PMI provided support and technical assistance to Malawi's second DHS. Data collection activities were conducted between October and January 2016. Please see *Strategy, section 8: Progress on indicators to date* for a summary of results from this survey. PMI planned to support a 2016 MIS that, in addition to providing information on progress for key malaria indicators, was intended to serve as a post-campaign ITN coverage and use assessment following the planned 2015 mass ITN distribution in 19 districts. However, the ITN distribution campaign met with significant delays and was not completed until May 2016. As a result, PMI and NMCP agreed to postpone the MIS until April-May 2017.

Malaria surveillance and routine systems

PMI continued to support improvements to the HMIS system, including improved quality of data collection at the health facility level and timely and complete data entry into HMIS using DHIS 2 at the district level. The GoM is increasingly concerned about the quality of routine monitoring and surveillance data and CMED, with support from PMI and other partners, has developed a strategy to improve Malawi's overall health information system. Substantial progress has been made toward streamlining the core and program-specific indicators collected. PMI provided technical support to the implementation of this strategy to improve the overall system and ensure appropriate inclusion and collection of malaria data. Under this strategy, DHIS 2 will be the central data platform for the MoH. Currently DHIS 2 is being used for routine data collection at the district level in all 29 districts in Malawi. Reporting from the community and facility levels to the district level is still paper-based. Overall, reporting rates for both the integrated HMIS reporting form and malaria-specific reporting form have improved over the last several years. In 2015, the reporting rates were 94% and 80% (substantially increased from 67% in 2014), respectively; however, considerable improvements in timeliness, completeness, and data quality still are needed.

The CMED has developed a longer-term strategy for the overall health information system and plans to use DHIS 2 as the central repository for information on all key health indicators. The existing parallel systems either will be absorbed into DHIS 2 or linked. Furthermore, there are plans to link the electronic LMIS with DHIS 2 to improve Malawi's ability to compare morbidity and commodity consumption data. In addition to these structural changes to the system, CMED has undertaken a review of HMIS indicators and PMI has worked closely with CMED, NMCP, Health Technical Support Services Unit, and other partners to select appropriate indicators and ensure that the appropriate tools are available to collect the data needed. Revision of these indicators and tools is nearly complete and will be piloted (with PMI support) and implemented in the coming months.

Table 10: Monitoring and Evaluation Activity Summary Table

Data source	Survey activities	Year												
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Household Surveys	Multiple indicator cluster survey	X*†								X*				
	Demographic and Health Survey					X§					X			
	Malaria Indicator Survey					X¶		X¶		X¶			X∞	
	Subnational anemia and parasitemia survey	X	X	X										
Health facility and other surveys	Health facility and related surveys				X**		X††	X††						
	Service provision assessment								X§§					
	End-use verification survey						X	X	X	X	X	X	X	X
Malaria surveillance and routine system support	Sentinel surveillance		X	X	X	X								
	Support to malaria surveillance system						X	X	X	X¶¶				
	Support to HMIS		X	X	X	X	X	X	X	X	X	X	X	X
Therapeutic	<i>In vivo</i> efficacy testing						X			X		X¥		X¥
Entomology	Entomological monitoring		X	X	X	X	X	X	X	X	X	X	X	X
	ITN durability											X	X	X

Other data sources	Malaria impact evaluation									X				
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* Not PMI funded

† MICS conducted by UNICEF. Report for 2006 available at http://www.childinfo.org/files/MICS3_Malawi_FinalReport_2006_eng.pdf. Report for 2014 pending.

§ 2010 DHS available at <http://www.measuredhs.com/what-we-do/survey/survey-display-333.cfm>

¶ 2010 MIS conducted with technical assistance from the Malaria Control and Evaluation Partnership in Africa (MACEPA), report available at http://www.givewell.org/files/DWDA%202009/AMF/Malawi_MIS_2010_Final.pdf. 2012 MIS conducted by ICF-MACRO, data and report available at <http://www.measuredhs.com/what-we-do/survey/survey-display-432.cfm>. 2014 MIS supported by the Global Fund with technical assistance provided by PMI and ICF-MACRO.

∞ MIS was originally planned for 2016 but shifted to 2017. PMI FY 2015 funding will still be used.

** Evaluation of IMCI program

†† The health facility survey in 2011 focused on the management of uncomplicated malaria. The subsequent health facility survey in 2012 focused on the management of severe malaria.

§§ SPA was conducted during the last two quarters of 2013 and first half of 2014

¶¶ Additional funding provided for one-time support to develop and incorporate malaria-specific indicators into an electronic medical records data management system.

¥ 2016 TES support in approved Global Fund New Funding Model grant, 2018 TES unfunded but NMCP plans to seek support outside PMI.

Table 11. Routine Health Information data

Indicators	Value	Comments
1. Total number of reported malaria cases Data source: HMIS-15 Report and Village Clinic Report (DHIS 2)	6,144,733	Includes approximately 4.9 million facility cases (inpatient and outpatient) for all ages, as well as approximately 1.2 million community level cases. Community level cases include only children less than five years. Nearly all of the community cases are presumptive given delays in RDT roll-out to community level.
Total diagnostically confirmed cases Data source: Malaria Facility Report and Village Clinic Report (DHIS 2)	3,946,493	Includes patients confirmed through microscopy and RDT at the facility and community level, where RDTs have been rolled out. Note: This number is partially derived from a different reporting form than the total number of reported malaria cases. Thus, this cannot be used to accurately reflect the percentage of the total cases that were diagnostically confirmed.
Total clinical/presumed/unconfirmed cases	N/A	Malawi not capturing this data at the moment; however the malaria reporting form is currently being updated.
2. Total number of reported malaria deaths Data source: Malaria Facility Report (DHIS2)	3,787	
3. Malaria test positivity rate (outpatients) Data source: DHIS 2 Malaria Facility Report	50.5%	
Numerator: Number of outpatient confirmed malaria cases	3,638,135	
Denominator: Number of outpatients receiving a diagnostic test for malaria (RDT or microscopy)	7,197,913	
4. Completeness of monthly health facility reporting Data source: Malawi DHIS 2	HMIS-15 form: 94% Malaria facility report form: 80% Village clinic form: 84%	

Plans and justification

National household surveys

PMI planned to support a 2016 MIS that, in addition to providing information on progress for key malaria indicators, was intended to serve as a post-campaign ITN coverage and use assessment following the planned 2015 mass ITN distribution in 19 districts. Given the significant delays in campaign implementation, PMI and NMCP agreed to postpone the MIS until April-May 2017. PMI intends to fully support the operational and technical costs of this survey using existing FY 2015 funds. PMI has no plans to support additional household level surveys until the 2020 DHS.

Health facility and other surveys

There are no plans for an additional health facility survey or SPA at this time. PMI plans to continue support for quarterly assessments of PMI-funded commodities at the health facility and community level.

Malaria surveillance and routine systems

PMI has been providing support to oversee data collection at the health facility level and data entry into DHIS 2. However, capacity is still not sufficient and further support is required to ensure timely and accurate data collection and reporting, and to improve analysis and use of malaria data for programmatic decision-making at all levels of the health system. In particular, PMI will continue to support district and zonal data review meetings, as well as technical assistance for health information strengthening at the central level (CMED and NMCP) and district levels.

ITN durability monitoring

PMI will support durability monitoring of ITNs distributed in the 2016 mass campaign (see ITN section for further details).

Proposed activities with FY 2017 funding: (\$1,094,000)

PMI plans to continue to support strengthening of routine health management information systems, with an emphasis on malaria-specific surveillance, as well as assessments of availability of commodities at health facilities. For district-level activities conducted in the ten PMI focus districts, PMI will work closely with CMED, HTSS, NMC, and other malaria partners to ensure that these activities are in-line with the priorities of the GoM, support national level initiatives, and are coordinated with the activities of other partners working in the non-focus districts. Additionally, PMI will continue support for an impact evaluation of the integrated district-level service delivery and systems strengthening activities, which will produce rigorous evidence of the impact of the project on the availability and quality of health services and the performance of health systems in the ten PMI focus districts.

Specifically, with FY 2017 funding, PMI will:

- Support quarterly monitoring of the availability of malaria commodities at health facilities (\$200,000);
- Continue efforts to strengthen routine data collection and use through training and supervision at

the district and health facility level, as well as data review meetings at the zonal level in the ten PMI focus districts (\$359,000);

- Strengthen routine HMIS at the central level, including support to MoH Central Monitoring and Evaluation Division (CMED) (\$350,000);
- Support an evaluation of the integrated health service delivery project (\$175,000);
- Provide CDC technical assistance for M&E (\$10,000); and
- Support ITN durability monitoring activities (budget in ITN section)

6. Operational research

Table 12: Operational Research supported by PMI Malawi

Completed OR Studies			
Title	Start Date	End Date	Budget (US\$)
IPTp effectiveness monitoring	2008	2012	40,000
SP drug resistance markers in pregnant women	2008	2012	0
Health facility surveys: management of uncomplicated and severe malaria	2008	2012	330,000
Pilot study of intermittent preventative treatments for infants	2008	completed	150,000
Patient adherence to first-line treatment of malaria	2009	2011	140,000
Pilot study of community ACT use through HSAs	2010	completed	200,000
Ongoing and planned OR Studies (prior to FY 2017)			
Title	Start Date	End Date	Budget (US\$)
Evaluation of mobile-telephone text messaging intervention to improve health worker performance	2014	Data collection completed, analysis ongoing	520,000
IPTp effectiveness monitoring in areas with high levels of resistance (delivery cross sectional study)	2015	Data collection completed, analysis ongoing	275,000
SP drug resistance markers in pregnant women	2015	Data collection completed, analysis ongoing	75,000
Study assessing the efficacy of IPTp-DP versus IPTp-SP	2016	2018	400,000
Pilot study of community delivery of IPTp-SP	2017	2019	TBD (\$200,000 currently available)

NMCP/PMI objectives

The 2011-2016 Malaria Strategic Plan calls for strengthening operational research through the support for local capacity building and the creation of stronger coordination between NMCP and researchers to harmonize and prioritize operational research efforts. PMI-funded operational research has provided important data for decision-making, including studies measuring the durability of long-lasting ITNs, the impact of IRS, the effectiveness of the IPTp strategy, the quality of health facility case management practices for uncomplicated and severe malaria, the ability of patients to complete recommended first-line treatment for malaria, the distribution of potentially drug-resistant parasites and mosquitoes and the effectiveness of ITNs in an area with significant pyrethroid resistance.

Progress since PMI was launched

Since PMI began, operational research investments in Malawi have produced important findings that have shaped NMCP and PMI policy and programs. The peer-reviewed publications from PMI-supported OR in partnership with the NMCP include:

- Shah MP, Briggs-Hagen M, Chinkhumba J, Bauleni A, Chalira A, Moyo D, Dodoli W, Luhanga M, Sande J, Ali D, Gutman J, Mathanga DP, Lindblade KA. Adherence to national guidelines for the diagnosis and management of severe malaria: a nationwide, cross-sectional survey in Malawi, 2012. Under review at *Malaria Journal*.
- Paczkowski M, Mwandama D, Marthey D, Luka M, Makuta G, Sande J, Ali D, Troell P, Mathanga DP, Gutman J. (2016) *In vivo* efficacy of artemether-lumefantrine and artesunate-amodiaquine for uncomplicated *Plasmodium falciparum* malaria in Malawi, 2014. *Malar J*. 2016;15(1):236.
- Mwandama D, Gutman J, Wolkon A, Luka M, Jafali J, Ali D, Mathanga DP, Skarbinski J. (2015) The use of intermittent preventive treatment in pregnancy and insecticide-treated bed nets for malaria prevention by women of child-bearing age in eight districts in Malawi. *Malar J*. 2015;14:316.
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- Gutman J, Kalilani L, Taylor S, Zhou Z, Wiegand RE, Thwai KL, Mwandama D, Khairallah C, Madanitsa M, Chaluluka E, Dzinjalumala F, Ali D, Mathanga DP, Skarbinski J, Shi YP, Meshnick S, Ter Kuile FO. (2015) The A581G Mutation in the Gene Encoding *Plasmodium falciparum* Dihydropteroate Synthetase Reduces the Effectiveness of Sulfadoxine-Pyrimethamine Preventive Therapy in Malawian Pregnant Women. *J Infect Dis*. 2015;211(12):1997-2005.
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- Zhou Z, Mitchell RM, Gutman J, Wiegand RE, Mwandama DA, Mathanga DP, Skarbinski J, Shi YP. (2014) Pooled PCR testing strategy and prevalence estimation of submicroscopic infections using Bayesian latent class models in pregnant women receiving intermittent preventive treatment at Machinga District Hospital, Malawi, 2010. *Malar J*. 2014;13:509.
- Taylor SM, Parobek CM, DeConti DK, Kayentao K, Coulibaly SO, Greenwood BM, Tagbor H, Williams J, Bojang K, Njie F, Desai M, Kariuki S, Gutman J, Mathanga DP, Mårtensson A, Ngasala B, Conrad MD, Rosenthal PJ, Tshefu AK, Moormann AM, Vulule JM, Doumbo OK, Ter Kuile FO, Meshnick SR, Bailey JA, Juliano JJ. (2015) Absence of putative artemisinin resistance mutations among *Plasmodium falciparum* in Sub-Saharan Africa: a molecular epidemiologic study. *J Infect Dis*. 211(5):680-8.

- LC Steinhardt, J Chinkhumba, A Wolkon, M Luka, M Luhanga, J Sande, J Oyugi, D Ali, DP Mathanga, J Skarbinski (2014). Patient-, health worker-, and health facility-level determinants of correct malaria case management at publicly funded health facilities in Malawi: results from a nationally representative health facility survey. *Malaria Journal* 13:64e.
- LC Steinhardt, J Chinkhumba, A Wolkon, M Luka, M Luhanga, J Sande, J Oyugi, D Ali, DP Mathanga, J Skarbinski (2014). Quality of malaria case management in Malawi: results from a nationally representative health facility survey. *PLoS One* 9(2):e89050.
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- C Hershey, D Ali, L Florey, A Bennett, M Luhanga, J Oyugi, Y Ye, G Jenda, C Nielsen, SR Salgado, DP Mathanga, A Bhattarai (2013). Secondary analysis of national and subnational survey data to evaluate the impact of the scale up of malaria control interventions in Malawi, 2000--2010 [meeting abstract]. *Lancet* 381(S2):S60.
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- DP Mathanga, ET Luman, CH Campbell Jr, C Silwimba, G Malenga (2009). Integration of insecticide-treated net distribution into routine immunization services in Malawi: a pilot study. *Tropical Medicine and International Health* 14(7):792-801.

Progress during the last 12-18 months

The PMI-funded evaluation of mobile-telephone text messaging to improve health worker performance was initiated in early 2015. A baseline survey of health worker case management practices was conducted, followed by a stakeholder workshop to design the content of the messages. The messages were delivered to health care workers for a period of six months, with the first end-line survey to assess the impact of the intervention conducted in November 2015, immediately after the delivery of messages concluded. Analysis of this end-line data revealed no significant improvement in health care worker performance in the intervention group. In light of these results, the second end-line survey planned for May 2016 was not conducted.

In 2015, PMI supported a repeat evaluation of the effectiveness of IPTp focusing on the effect of the sextuple (dhps581) mutation, which is associated with extremely high levels of SP resistance. The preliminary data suggests that SP remains effective at preventing patent, but not subpatent, parasitemia, and was associated with increased birthweight in women who received at least three doses compared to women who received fewer than three doses. Laboratory analyses assessing the prevalence of the dhps581 mutation are ongoing.

With previous years funding, PMI planned support to the NMCP to develop a research agenda and data dissemination platform to better coordinate and share research among partners in Malawi. However, this activity has met with significant delays and, at the time of writing, implementation had just started. It is expected that development of the research agenda will be completed by October 2016.

Plans and justification

PMI Malawi plans to support two studies with previous funding. The first will assess the efficacy of IPTp-DP compared to SP, to help determine whether this might be an alternative to IPTp-SP (planned to begin in 2016 using FY 2013 and FY 2016 funds). The second will focus on increasing IPTp uptake. As highlighted in the *Malaria in Pregnancy* section, IPTp coverage goals have yet to be met despite two decades of IPTp implementation in Malawi. Although a high proportion of women attend ANC at least once in pregnancy, according to HMIS data, in 2015, only about 10% of women attended ANC in the first trimester, and only 56% attend at least three visits, limiting the number of women who could receive three or more doses of IPTp during pregnancy. To address this, PMI Malawi plans to conduct a pilot assessment of the effect of community delivery of IPTp-SP on IPTp uptake and ANC attendance.

Proposed activities with FY 2017 funding: (\$0)

No proposed OR activities with FY 2017 funding.

7. Staffing and administration

Two health professionals serve as Resident Advisors (RAs) to oversee PMI in Malawi, one representing CDC and one representing USAID. In addition, three Foreign Service Nationals (FSNs) work as part of the PMI team. All PMI staff members are part of a single interagency team led by the USAID Mission Director or his/her designee in country. The PMI team shares responsibility for development and

implementation of PMI strategies and work plans, coordination with national authorities, managing collaborating agencies and supervising day-to-day activities. Candidates for RA positions (whether initial hires or replacements) will be evaluated and/or interviewed jointly by USAID and CDC, and both agencies will be involved in hiring decisions, with the final decision made by the individual agency.

The PMI interagency professional staff work 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.

The PMI lead in country is the USAID Mission Director. The day-to-day lead for PMI is delegated to the USAID Health Office Director and thus the two PMI RAs, one from USAID and one from CDC, report to the USAID Health Office Director for day-to-day leadership, and work together as a part of a single interagency team. Technical expertise housed in Atlanta and Washington complements PMI programmatic efforts.

The two PMI RAs are physically based within the USAID health office but are expected to spend approximately half of their time with and providing TA to the NMCPs and implementing partners, including time in the field monitoring program implementation and impact.

The number of locally-hired staff and necessary qualifications to successfully support PMI activities either in Ministries or in USAID will be approved by the USAID Mission Director. Because of the need to adhere to specific country policies and USAID accounting regulations, any transfer of PMI funds directly to Ministries or host governments will need to be approved by the USAID Mission Director and Controller, in addition to the U.S. Global Malaria Coordinator.

Proposed activities with FY 2017 funding: (\$2,070,000)

- Support to CDC for staffing (\$600,000); and
- Support to USAID for staffing (\$1,030,000) and administration (\$440,000) (\$1,470,000).

Table 1: Budget Breakdown by Mechanism**President's Malaria Initiative – MALAWI
Planned Obligations for FY 2017**

Mechanism	Geographic Area	Activity	Budget (\$)	%
GHSC-PSM	Nationwide	Procure and distribute ITNs; technical assistance for mass ITN campaign; procure RDTs, ACTs, SP, and ANC supplies; technical assistance for supply chain and improvement of commodity storage capacity; support for PMI parallel supply chain and stock monitoring.	13,652,000	62.1%
ONSE Athanzi	10 focus districts	Support for MIP and case management services; support for key district health staff to conduct supervision and other tasks; support for community-based SBCC; support for routine data collection via HMIS at district level.	3,459,000	15.7%
TBD - Case Management	10 focus districts	Support for technical assistance on malaria diagnostics.	300,000	1.4%
TBD - Durability	Selected areas	Monitor ITN durability following the 2016 mass ITN campaign.	125,000	0.6%
TBD - IRS Project	Selected districts	Provide technical assistance to the GoM-funded IRS campaign, including entomological monitoring.	600,000	2.7%
TBD - Environmental Management	Central level	Environmental compliance support for the GoM-funded IRS campaign.	50,000	0.2%
TBD - Pre-service training	Central level	Support for pre-service training of pharmacy assistants.	200,000	0.9%
HP+	Central level	Support for HMIS strengthening.	350,000	1.6%
SBCC-Health	Nationwide	Support for nationwide SBCC activities.	950,000	4.3%

Measure Evaluation	N/A	Support for year two of ONSE Athanzi evaluation.	175,000	0.8%
USAID	N/A	In-country staffing and administrative costs.	1,470,000	6.7%
CDC IAA	N/A	In-country staffing and administrative costs; technical assistance for entomology, case management, and M&E.	669,000	3.0%
Total			22,000,000	100%

Table 2: Budget Breakdown by Activity

**President's Malaria Initiative – MALAWI
Planned Malaria Obligations for FY 2017**

Proposed Activity	Mechanism	Budget		Geographic Area	Description
		Total \$	Commodity \$		
PREVENTIVE ACTIVITIES					
VECTOR MONITORING AND CONTROL					
Entomologic monitoring and insecticide resistance management					
Entomologic monitoring	TBD - IRS Project	350,000		Selected districts	Entomological monitoring and technical assistance to the NMCP's entomology program in additional districts.
CDC TDY	CDC IAA	29,000			Technical assistance for entomology activities.
Subtotal Ento monitoring		379,000	-		
Insecticide-treated Nets					
Procurement of ITNs for routine distribution	GHSC-PSM	3,984,000	4,316,000	Nationwide	Procure approximately 1.2 million ITNs for continuous distribution through routine channels.

Distribution of ITNs	GHSC-PSM	1,200,000		Nationwide	Support management, oversight, and distribution of PMI-procured ITNs to health facilities for routine distribution.
ITN durability monitoring	TBD - Durability	125,000		Selected	Continue to monitor ITN durability following the 2016 mass campaign.
Technical assistance for ITN mass campaign	GHSC-PSM	200,000		Central level	Provide technical assistance to the NMCP for the expected 2018/19 ITN mass campaign.
Subtotal ITNs		5,509,000	4,316,000		
Indoor Residual Spraying					
Technical assistance for IRS activities	TBD - IRS Project	250,000		Central level	Technical assistance to the government-funded IRS campaign.
Environmental compliance support for IRS activities	TBD - Environmental Management	50,000		Central level	Environmental compliance support for the government-funded IRS campaign.
Subtotal IRS		300,000	-		
SUBTOTAL VECTOR MONITORING AND CONTROL		6,188,000	4,316,000		
Malaria in Pregnancy					
Procurement of SP	GHSC-PSM	288,000	288,000	Nationwide	Procure approximately 2.4 million treatment courses (7.2 million tablets) of SP for IPTp.

Procurement of supplies for directly observed therapy for IPTp	GHSC-PSM	50,000	50,000	Nationwide	Procure ANC supplies (cups, water buckets) to help improve IPTp uptake.
Strengthening MIP services through support for FANC	ONSE Athanzi	300,000		10 focus districts	Support proper implementation of IPTp and ITN distribution through ANC in selected districts, including supportive supervision and mentorship.
CDC TDY	CDC IAA	20,000			Technical assistance for ongoing IPTp studies.
Subtotal Malaria in Pregnancy		658,000	338,000		
SUBTOTAL PREVENTIVE		6,846,000	4,654,000		
CASE MANAGEMENT					
Diagnosis and Treatment					
Procurement of RDTs	GHSC-PSM	1,480,000	1,480,000	Nationwide	Procure approximately 4 million RDTs for use in facilities and village health clinics.
Procurement of ACTs	GHSC-PSM	3,000,000	3,000,000	Nationwide	Procure approximately 3 million courses of first-line ACTs for use in health facilities and village health clinics.

Procurement of ancillary diagnostic supplies	GHSC-PSM	150,000	150,000	Nationwide	Procure gloves and sharps boxes for diagnostic services.
Diagnostic technical assistance	TBD - Case Management	300,000		10 focus districts	Provide technical expertise and training to ensure high quality diagnosis and laboratory training at the national level, with intensive focus in 10 districts.
Strengthen community and facility-based case management services	ONSE Athanzi	1,700,000		10 focus districts	Technical assistance and operational support to improve facility- and community-based case management services and systems in 10 districts.
Technical assistance for case management	CDC IAA	10,000			Technical assistance for case management activities.
Subtotal Diagnosis and Treatment		6,640,000	4,480,000		
Pharmaceutical Management					
Technical assistance to strengthen the national supply chain system	GHSC-PSM	1,300,000		Nationwide	Technical assistance to GoM to improve management, oversight, and accountability for supply chain and logistics management at the central, zonal, and district levels, as well as

					the DTIU. Support to quantification and LMIS.
Improve facility-level commodity storage capacity	GHSC-PSM	300,000		10 focus districts	Support for a limited number of pre-fabricated storage containers for health facilities within the 10 focus districts.
Support for PMI parallel supply chain	GHSC-PSM	1,500,000		Nationwide	Support management, oversight, and distribution of PMI-procured commodities to the health facility level.
Subtotal Pharmaceutical Management		3,100,000		-	
SUBTOTAL CASE MANAGEMENT		9,740,000		4,480,000	
HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING					
Support to district malaria coordinators, district health offices, and zonal health offices	ONSE Athanzi	300,000		10 focus districts	Support key district health staff to conduct facility and community-level supportive supervision, mentorship, coaching, and assistance with data collection and reporting, as well as support to the zonal offices for improved supervision and oversight.

Pre-service training for pharmacy assistants	TBD - Pre-service training	200,000		Central level	Support pre-service training for 48 pharmacy assistants (24 students/cohort in a 2-year program) to be placed in health facilities upon graduation.
Peace Corps	Peace Corps	-			Continue support to two Peace Corps malaria coordinators to work with NMCP and coordinate malaria activities with other volunteers, and support SPA grants; pipeline will be used to fund FY 2017 activities.
SUBTOTAL HSS & CAPACITY BUILDING		500,000		-	
SOCIAL AND BEHAVIOR CHANGE COMMUNICATION					
Support for nationwide SBCC activities	SBCC-Health	950,000		Nationwide	Support for national-level SBCC activities (e.g., mass media) to improve uptake of malaria services and adoption of preventive and care-seeking behaviors; development of SBCC materials to be used at the community level.

Support for community-based SBCC activities	ONSE Athanzi	800,000		10 focus districts	Small grants to community-based NGOs to improve uptake of malaria services and adoption of preventive and care-seeking behaviors; improvement of oversight and accountability for health services through engagement with traditional authorities, health facility advisory committees, and the community.
SUBTOTAL SBCC		1,750,000	-		
SURVEILLANCE, MONITORING, AND EVALUATION					
Supply chain monitoring	GHSC-PSM	200,000		Nationwide	Spot checks of PMI-funded commodities at health facilities and the community level; validation of LMIS data; support data quality audits.
Strengthen routine HMIS at the district level	ONSE Athanzi	359,000		10 focus districts	Strengthen routine data collection through training and supervision at the district and health facility level and data review meetings at zonal level.

Strengthen routine HMIS at the central level	HP+	350,000		Central level	Continue support for improving central-level HMIS, including support to CMED.
ONSE Athanzi Evaluation	Measure Evaluation	175,000			Continued support for year two of ONSE Athanzi evaluation.
M&E Technical Assistance	CDC IAA	10,000			Technical assistance for M&E activities.
SUBTOTAL SM&E		1,094,000	-		
OPERATIONAL RESEARCH					
SUBTOTAL OR		-	-		
IN-COUNTRY STAFFING AND ADMINISTRATION					
CDC	CDC IAA	600,000			
USAID	USAID	1,470,000			
SUBTOTAL IN-COUNTRY STAFFING		2,070,000	-		
GRAND TOTAL		22,000,000	9,134,000		