

PRESIDENT'S MALARIA INITIATIVE

CAMBODIA

Malaria Operational Plan FY 2018

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS.....	3
I. EXECUTIVE SUMMARY	5
II. STRATEGY.....	9
1. Introduction.....	9
2. Malaria situation in Cambodia.....	10
3. Country health system delivery structure and MOH organization	12
4. National malaria control strategy.....	13
5. Updates in the strategy section	16
6. Integration, collaboration, and coordination.....	16
7. PMI goal, objectives, strategic areas, and key indicators	18
8. Progress on coverage/impact indicators to date.....	19
III. OPERATIONAL PLAN	21
1. Vector monitoring and control.....	21
2. Malaria in pregnancy	26
3. Case management	28
4. Health system strengthening and capacity building.....	37
5. Social and behavior change communication.....	40
6. Surveillance, monitoring, and evaluation	43
7. Pre-elimination.....	47
8. Operational research	51
9. Staffing and administration.....	54
Table 1. Budget Breakdown by Mechanism.....	56
Table 2. Budget Breakdown by Activity.....	57

ABBREVIATIONS AND ACRONYMS

ACPR	Adequate clinical and parasitological response
ACT	Artemisinin-based combination therapy
ADB	Asian Development Bank
AFRIMS	Armed Forces Research Institute of Medical Sciences
ANC	Antenatal care
APLMA	Asia-Pacific Leaders Malaria Alliance
AS-MQ	Artesunate-mefloquine
BCC	Behavior change communication
BMGF	Bill & Melinda Gates Foundation
CDC	U.S. Centers for Disease Control and Prevention
CHAI	Clinton Health Access Initiative
CNM	National Centre for Parasitology, Entomology, and Malaria
DDF	Department of Drugs and Food
DHA-Pip	Dihydroartemisinin-piperazine
DHIS-2	District Health Information System 2
ERAR	Emergency Response to Artemisinin Resistance
FSN	Foreign Service National
G6PD	Glucose-6-phosphate dehydrogenase
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GMS	Greater Mekong Sub-region
HMIS	Health management information system
hsRDTs	Highly sensitive rapid diagnostic tests
IPTp	Intermittent preventive treatment for pregnant women
IPC	Interpersonal communication
ISO	International Organization for Standardization
ITN	Insecticide-treated mosquito net
LDPQ	Low-dose primaquine
LLIHN	Long-lasting insecticide-treated hammock net
LLIN	Long-lasting insecticide-treated net
LMIS	Logistic Management Information System
K13	Kelch 13 propeller
MEAF	Malaria Elimination Action Framework
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MMP	Mobile and migrant population
MMW	Mobile malaria worker
MOH	Ministry of Health
MOP	Malaria Operational Plan
NFM	New Funding Model
NMCP	National Malaria Control Program
NSP	National Strategic Plan
OD	Operational district
OR	Operational research

PCR	Polymerase chain reaction
PHD	Provincial Health Department
PMI	President's Malaria Initiative
PSI	Population Services International
QA	Quality assurance
RAI	Regional Artemisinin Initiative
RBM	Roll Back Malaria
RDMA	Regional Development Mission Asia
RDT	Rapid diagnostic test
SBCC	Social and behavior change communication
SM&E	Surveillance, monitoring, and evaluation
SSF	Single Stream Funding
UCSF	University of California, San Francisco
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
VMW	Village Malaria Worker
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 Sub-region (GMS) 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 Roll Back Malaria (RBM) Partnership’s second generation global malaria action plan, *Action and Investment to defeat Malaria (AIM) 2016-2030: for a Malaria-Free World* and the World Health Organization’s (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.

Although considerable progress has been made in malaria control in Cambodia during the past 10 years, malaria remains a major concern for the international community, the Ministry of Health, and the people of the country. This is due primarily to the development and spread of resistance to artemisinin drugs, the principal component of the combination therapies for malaria that now are the first-line treatment for malaria throughout the GMS and the world. *Plasmodium falciparum* resistance to artemisinin drugs was first confirmed in western Cambodia; treatment failures to ACTs have been reported from multiple sites on the Thai-Cambodian border; and an early warning sign of artemisinin resistance — prolongation of parasite clearance times — has been reported throughout the region.

The U.S. Government has supported malaria control efforts in Cambodia since 2000, originally under the regional program funded by the United States Agency for International Development (USAID). These regional efforts have focused on antimalarial drug resistance monitoring and drug quality surveillance. Cambodia has received Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) support. Cambodia became a PMI focus country in 2012, as part of PMI’s GMS regional program. In 2015, support for PMI in Cambodia transitioned to direct bilateral support. The other major sources of funding for malaria in Cambodia include the Asian Development Bank, and the Bill & Melinda Gates Foundation.

This FY 2018 Malaria Operational Plan (MOP) presents a detailed implementation plan for Cambodia, based on the strategies of PMI and the National Centre for Parasitology, Entomology, and Malaria (CNM). It was developed during a planning visit in March 2018 by representatives from USAID, the U.S. Centers for Disease Control and Prevention, in consultation with the CNM, and with the participation of major donors and partners involved in malaria prevention, control, and elimination in the country. The activities that PMI is proposing to support align with the Malaria Elimination Action Framework (MEAF) 2016—2020, and build on investments made by PMI and other partners to improve and expand malaria-elimination activities, including the Global Fund malaria grants and the Gates Foundation investments. This document briefly reviews the current status of malaria control and elimination policies in Cambodia, describes progress to date, identifies challenges and unmet needs to achieving the targets of the MEAF and PMI, and provides a description of activities that are planned with FY 2018 funding.

This FY 2018 MOP will support scale up of elimination activities that were piloted in one operational district in Western Cambodia and up to 6-8 operational districts in the neighboring two provinces. PMI will also consider commodity gap filling, and provide technical assistance for surveillance, case management, supply chain management, and social and behavior change communication (SBCC) and capacity building for malaria elimination in Cambodia. In addition, PMI will support surveillance for antimalarial drug resistance, insecticide resistance and vector monitoring activities. The activities PMI is proposing to support with FY 2018 funding are in line with the MEAF of Cambodia and are intended to complement ongoing Global Fund malaria grants and contributions from other donors.

The proposed FY 2018 PMI budget for Cambodia is \$9 million. PMI will support the following intervention areas with these funds:

Entomologic monitoring and insecticide resistance management: Malaria transmission in Cambodia is rapidly changing and closely associated with two major malaria vectors that inhabit the forest and forest fringe, *Anopheles dirus* and *An. minimus*. The MEAF 2016-2020 calls for development of a vector management strategy and strengthening of entomological surveillance for malaria elimination, including routine insecticide resistance monitoring. In this context, with FY 2018 funding, PMI will support entomological surveillance that focuses geographically on targeted areas with an emphasis on improved insecticide resistance monitoring and routine vector surveillance and foci investigations, where epidemiologically appropriate. PMI will also provide support to develop capacity through training at the county level to implement entomological surveillance and insecticide resistance monitoring.

Insecticide-treated nets: As the primary vector control strategy, the CNM plans to distribute long-lasting insecticide-treated nets (LLINs) and long-lasting insecticide-treated hammock nets (LLIHNs) to all populations at risk in prioritized areas, based on risk strata. There is a strong culture of bed net use in Cambodia and net ownership is quite high, especially in farming areas, though many of those nets are untreated. The Global Fund contributed the majority of the LLINs/LLIHNs with PMI supporting the remaining gap. With FY 2015 and FY 2016 funding, PMI procured and distributed 168,553 LLINs/LLIHNs, to fill gaps in Global Fund grants in the PMI focus areas and developed innovative SBCC approaches to improve LLIN use among vulnerable migrant and mobile populations.

With FY 2018 funds, PMI will procure approximately 150,000 LLINs and LLIHNs for filling potential gaps and to distribute among migrant and vulnerable populations in targeted focus areas in Western Cambodia. The funds also support distribution of LLINs/LLIHNs to intended beneficiaries. In addition, PMI will support a longitudinal LLIN durability assessment in conjunction with the planned mass campaigns in 2018.

Malaria in pregnancy: While IPTp is not part of national policies for Cambodia, given the low prevalence of malaria in the country, PMI will support promotion of universal LLIN coverage and prompt diagnosis and treatment of clinical cases of malaria in pregnant women as they remain a vulnerable group in the region. With FY 2018 resources, PMI will support procurement of LLINs, training and supervision of facility staff in malaria case management with particular focus on management of malaria during pregnancy, and updating training materials and job aids to strengthen malaria case management at all levels and prevention activities provided through antenatal clinics in Cambodia.

Case management: The MEAF aims to provide universal access and robust coverage of high quality early diagnosis and effective treatment services delivered through public health facilities, trained village malaria workers at community level, licensed private providers, military/police, and selected border check-points according to the national guidelines. In Cambodia, diagnosis of malaria is based on microscopy or rapid diagnostic tests (RDTs). Treatment of uncomplicated malaria is with ACTs, although treatment failures to dihydroartemisinin-piperaquine have been documented in Western and Northern provinces of Cambodia, leading to a change in first-line treatment to artesunate-mefloquine. Case management of malaria in Cambodia is further complicated by the fact that *P. vivax* and *P. falciparum* are co-endemic. Since the launch of PMI, a total of 285,500 RDTs and 140,190 ACT treatment doses have been procured and distributed. In addition, in collaboration with regional and district health offices, PMI has supported health worker training, mentoring and supervision for quality malaria diagnosis using microscopy, and the management of malaria at health facility and community level.

The majority of RDT and ACT needs in Cambodia are anticipated to be sufficiently met by the Global Fund RAI2 grant. With FY 2018 funding, PMI will procure small quantities of RDTs to fill gaps and strengthen laboratory capacity in targeted areas. PMI will also procure ACT treatments to fill any gaps and respond to urgent needs in the country. PMI will support in-service training, accreditation of microscopy trainers, maintenance of a slide bank, and quality assurance of the parasitological diagnosis of malaria. In addition, PMI will continue to provide technical assistance support in malaria commodity forecasting, quantification, and supply planning. PMI will continue to support drug therapeutic efficacy monitoring at six sites (alternating every other year) in selected locations in Cambodia.

Health system strengthening and capacity building: PMI works in close partnership with the CNM to build capacity of key staff at national, provincial and district levels. PMI also assisted in establishing a cadre of village malaria workers as a critical extension of the public health system at the village level and among targeted private sector providers. In addition, PMI has supported the implementation of a community supply system linked to health facilities and a quality assurance system for malaria microscopy and RDTs, in the public and private sectors and at village level. In the past year, PMI provided technical assistance to establish an International Organization for Standardization (ISO)-certified drug quality testing laboratory and has also continued to support capacity building of malaria program managers and staff through trainings such as case management, quality of malaria laboratory diagnosis, and malaria commodities supply chain management. PMI

also provided coordination support to existing provincial-level working groups on malaria elimination in Battambang, Oddar Meanchey, Pursat, and Steung Treng Provinces.

With FY 2018 funding, PMI will continue to work closely with the CNM, PHD and ODs to identify and fill capacity gaps, including enhancing SM&E capacity, developing capacity to effectively manage various aspects of malaria control and elimination, enhancing the CNM's capacity to effectively coordinate malaria stakeholders, and manage malaria tools and reports generated by CNM partners.

Social and behavior change communication: Implementing comprehensive SBCC approaches that facilitate treatment-seeking for fever within 24 hours at health facilities or from approved providers and utilization of an appropriate protection tool by at-risk populations is a key strategy in the MEAF. PMI will continue to provide technical support to the CNM to facilitate development and use of effective communication strategies and appropriate SBCC approaches. As Cambodia moves from malaria control to elimination, SBCC interventions will need to be more tailored and targeted for hard-to-reach populations that remain at risk, including mobile and migrant populations. PMI supports integration of SBCC activities in the delivery of malaria services (e.g., distribution of LLINs and case management). A multi-pronged, comprehensive approach for SBCC interventions will be emphasized to sustain community involvement, support promotion of healthy behaviors, and reduce risk-taking in the context of malaria exposure. With FY 2018 funding, PMI will support implementation of effective SBCC approaches for elimination in targeted areas of Cambodia.

Surveillance, monitoring, and evaluation (SM&E): In the context of malaria elimination, accurate and timely data are essential to identify cases, mount a timely response, inform policy decisions, and focus resources to areas of ongoing malaria transmission. PMI provides support to the CNM to enhance the surveillance system to detect and immediately notify all malaria cases, and investigate, classify, and respond to *P.falciparum* cases and foci to move toward malaria elimination.

With FY 2018 funding, PMI will focus efforts on targeted areas to implement systems and practices to foster timely collection and use of quality surveillance data. At the national level, PMI will provide technical support to the CNM on their national monitoring and evaluation plans, and build SM&E capacity at provincial and district levels, including technical support for surveillance systems and databases. In Cambodia, where many patients seek care in the private sector, PMI will continue to strengthen collection and integration of malaria data from private providers.

Operational research (OR): PMI has supported key OR activities in Cambodia previously to address key programmatic and policy needs. This includes a field evaluation of the performance of point-of-care tests to screen for glucose-6-phosphate dehydrogenase (G6PD) deficiency, a qualitative study to identify determinants of net preference and acceptability, and an assessment of the safety and tolerability of low-dose primaquine in patients with uncomplicated *P. falciparum* infections who are G6PD-deficient and non-deficient. PMI currently plans to implement two OR studies with FY 2018 funding. The first study is to evaluate the use of highly-sensitive RDTs in the context of foci identification/investigation and the second study is to assess the feasibility of the scale up of radical cure treatment for *P.vivax* utilizing next generation point-of-care tests for G6PD deficiency.

II. STRATEGY

1. Introduction

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 Sub-region (GMS) 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.

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In 2012, PMI support extended to the GMS, which is made up of six countries: Burma, Cambodia, China (Yunnan Province), Lao People’s Democratic Republic (PDR), Thailand, and Viet Nam.

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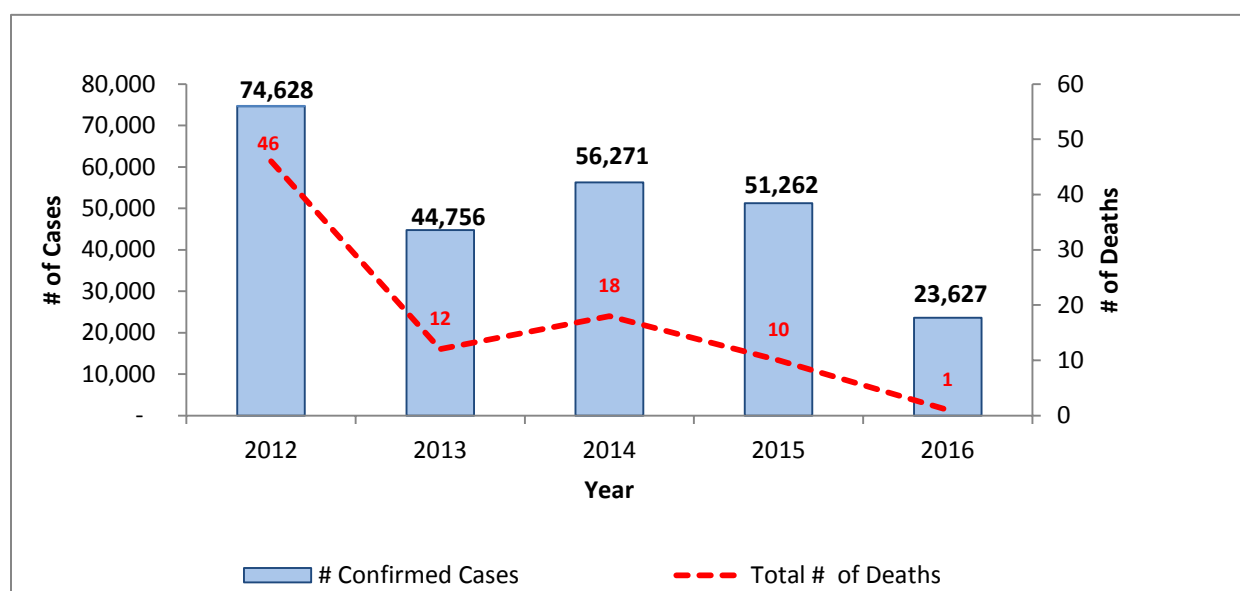
(MEAF) 2016—2020, and build on investments made by PMI and other partners to improve and expand malaria-elimination activities, including the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants and the Gates Foundation investments. This document briefly reviews the current status of malaria control and elimination policies in Cambodia, describes progress to date, identifies challenges and unmet needs to achieving the targets of the MEAF and PMI, and provides a description of activities that are planned with FY 2018 funding.

2. Malaria situation in Cambodia

Over the last decade, many of Cambodia’s key health indicators have improved as the country’s economy has developed. Cambodia has also made huge progress in malaria prevention and control and is poised to move from control to elimination by 2025. Malaria deaths have decreased dramatically by 95.4% from 219 deaths in 2009 to only 1 death in 2016. Malaria cases treated at public facilities also declined from 71,814 in 2009 to 23,627 cases in 2016 resulting in a decrease in malaria incidence reported in the public sector from 5.2 cases per 1,000 population to 1.5 cases per 1,000 population, respectively.

Despite this success, the spread of artemisinin resistance and adequately reaching mobile populations remain challenges to achieving the national elimination goals. Because of high failure rates to the previous first-line treatment, dihydroartemisinin-piperaquine (DHA-Pip), in several provinces, artesunate-mefloquine (AS-MQ) is now first-line treatment for uncomplicated malaria nationwide.

Figure 1: Trend of malaria confirmed cases and deaths in public health facilities in Cambodia (2012-2016)

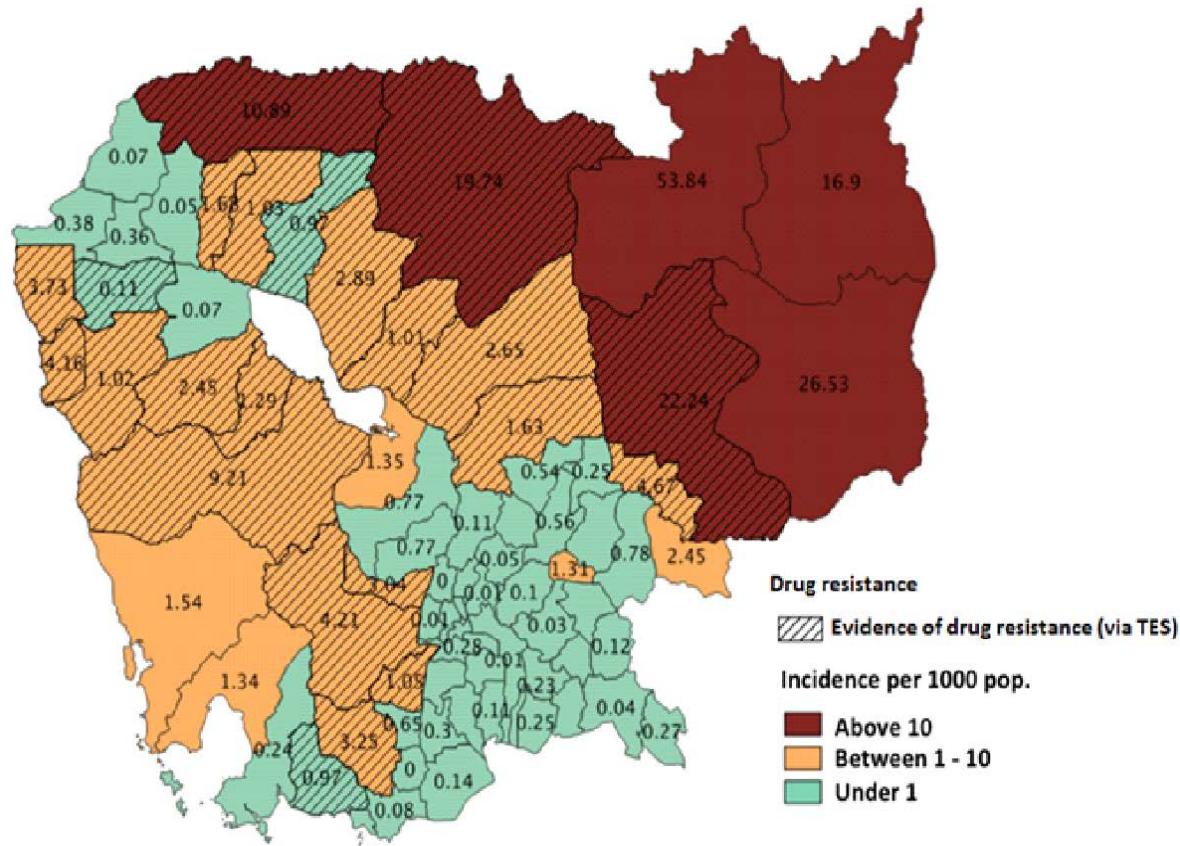


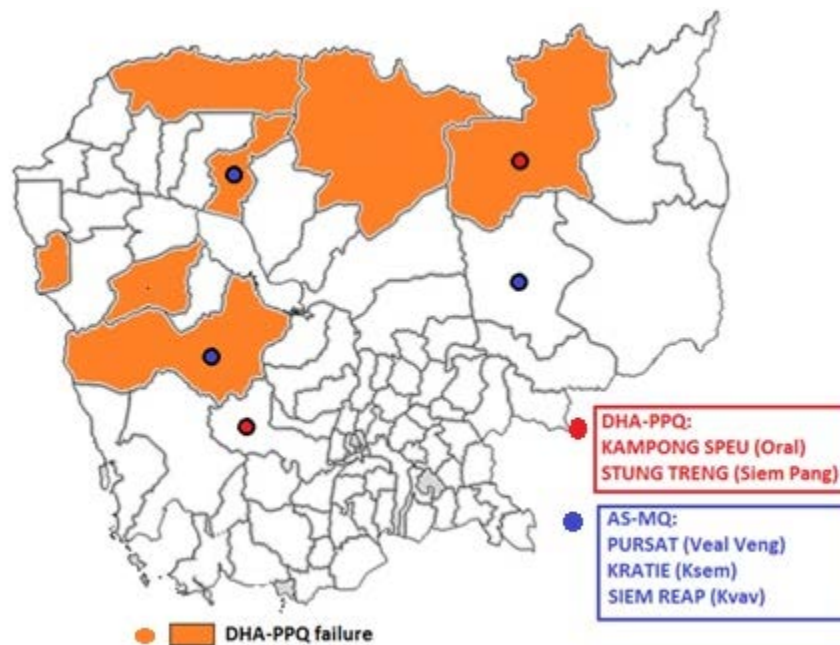
Source: CNM

Geographically, malaria is endemic in 21 out of Cambodia’s 25 provinces. The incidence is highest in the Northeastern parts of the country and lower in the Western provinces. Peak malaria transmission is between July and November which is a transition period from the hot to the rainy season. Malaria predominantly impacts males 15-49 years of age (incidence rates in adult males are five times higher than adult females) while only 3.7% of cases are in children less than five years of age. Many of the affected men are mobile workers who move from low to high transmission areas and lack access to malaria services and education making them vulnerable to malaria infection.

Below is a district level map indicating where therapeutic efficacy monitoring sentinel sites have shown evidence of drug resistance and designated as DHA-Pip resistance areas. The provinces with resistance to DHA-Pip are Pailin, Pursat, Siem Reap, Preah Vihear, Kampong Speu, Stung Treng, Oddar Meanchey, Tbong Khmum, and Battambang.

Figure 2: TES sites and drug resistance in Cambodia in 2015, by operational district (OD)





Source: CNM/MOH, 2016

In Cambodia, ACTs are used to treat both uncomplicated *P. falciparum* and *P. vivax* malaria infections. The national treatment guidelines approved by Cambodia's Ministry of Health (MOH) in 2015 recommended quality diagnosis and treatment of positive cases with DHA-Pip or AS-MQ (based on whether TES had demonstrated treatment failures to DHA-Pip in that Province), which were made available in public health facilities countrywide and dispensed through trained Village Malaria Workers (VMWs). In December 2016, the Cambodia Case Management Working Group reviewed the TES data. Based on these findings, the CNM issued interim guidance to replace DHA-Pip with AS-MQ nationwide.

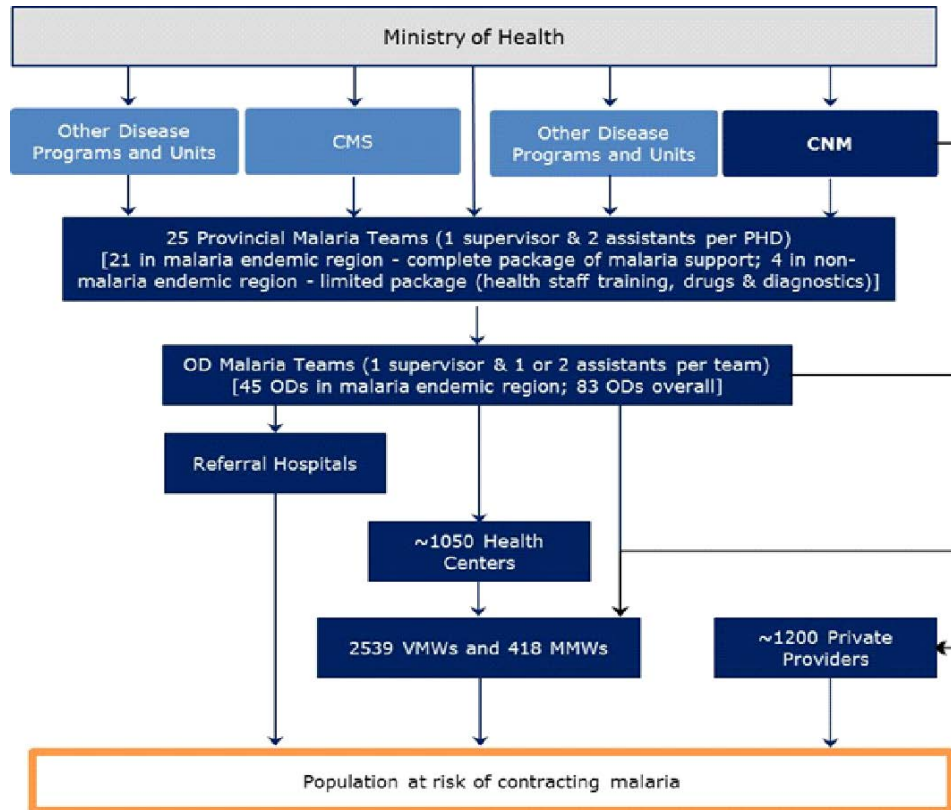
Cambodia's malaria burden continues to be disproportionately borne by ethnic minority groups and mobile, migrant, and cross-border populations, representing a huge challenge for control and elimination of malaria. Artesunate and other monotherapies can still be found in the unregulated private sector in Cambodia, although efforts to ensure availability of high-quality ACTs and a ban on oral artesunate monotherapies have had some success in improving the quality of treatment in the private sector. Certain sectors, particularly the military, continue to use non-WHO pre-qualified antimalarials for first-line treatment.

3. Country health system delivery structure and MOH organization

The CNM sits within the MOH. The leadership for malaria control activities within Cambodia rests at the central level; however, with the decentralization of the MOH, Provincial Health Department (PHD) and operational district (OD) malaria supervisors are involved with planning and implementing activities. VMWs, Mobile Malaria Workers (MMWs), and local authorities have been deployed to improve the availability and accessibility of malaria services, including

early diagnosis and treatment, long-lasting insecticide-treated net (LLIN) distribution, and malaria health education.

Figure 3: Structure of the National Malaria Program within the Ministry of Health, Cambodia



Source: MOH/CNM

4. National malaria control strategy

In 2011, the Prime Minister of Cambodia endorsed the National Strategic Plan (NSP) for Elimination of Malaria for 2011–2025. This strategy, the NSP for Elimination of Malaria, is based on the following goals:

- **Short-Term (by 2015)**
To move towards pre-elimination of malaria across Cambodia with special efforts to contain artemisinin-resistant *P. falciparum* malaria.
- **Medium-Term (by 2020)**
To move towards elimination of malaria across Cambodia with an initial focus on *P. falciparum* malaria and ensure zero deaths from malaria.

□ ***Long-Term (by 2025)***

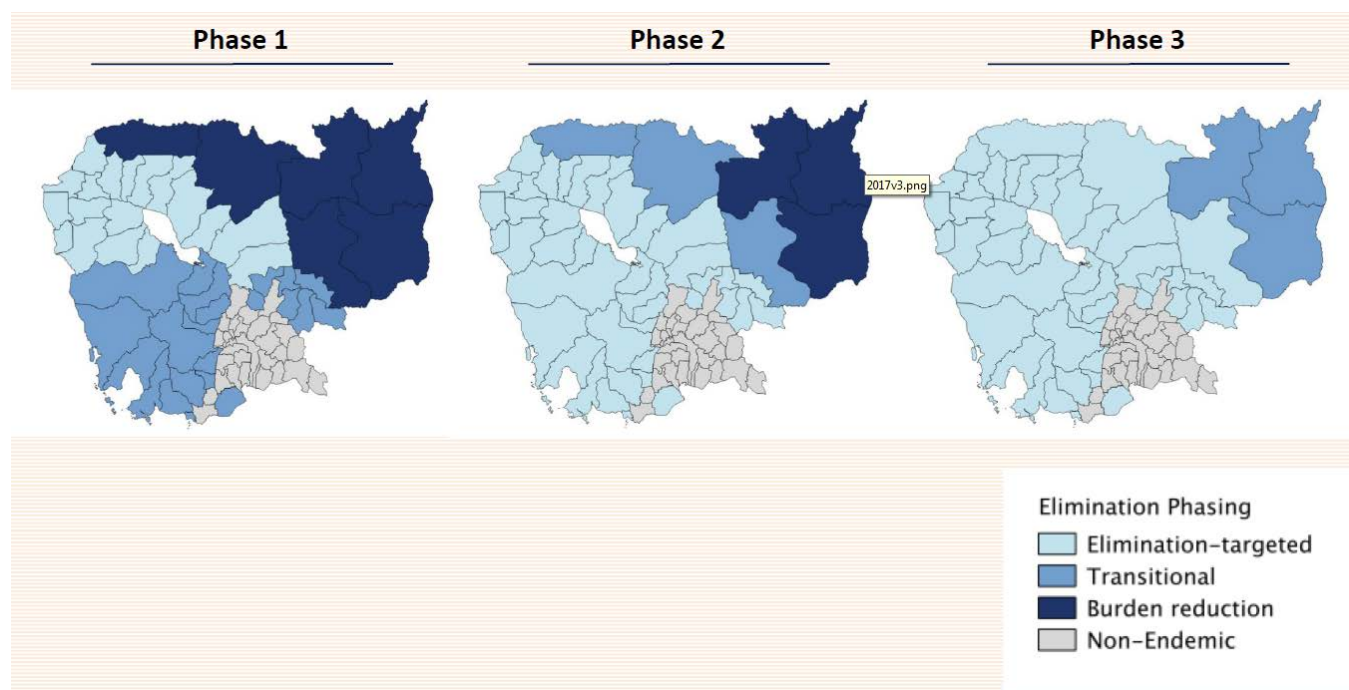
To achieve phased elimination of all forms of malaria in Cambodia.

In 2014, Malaria Elimination in the GMS was developed as a coordinated strategy for malaria elimination by 2030. As a result, the National Malaria Program developed the MEAF 2016 -2020 to update national strategies within the NSP for malaria elimination to align it with the GMS Malaria Elimination strategy.

Under the MEAF 2016 – 2020, malaria control and elimination activities are managed through three phases (Figure 4):

- **Phase 1 in 2016:** The elimination activities will be concentrated in 18 ODs in the northwest of Cambodia where surveillance activities will be intensified to follow up cases, investigate focal areas, and conduct response interventions. The National Malaria Program will develop evidence-based approaches that can be scaled up to these 18 ODs targeting elimination. Simultaneously, the National Malaria Control Program (NMCP) will strengthen control and prevention activities in the other 21 ODs, classified as the transitional phase, to drive down malaria incidence toward the elimination phase, and 6 ODs where there is high malaria burden will aggressively use control and prevention activities.
- **Phase 2 in 2017:** The 21 transitional ODs will be included in the targeting elimination ODs and 3 out of 6 ODs with high malaria burden will move to transitional.
- **Phase 3 in 2018:** The elimination target area will then cover 42 ODs and 3 ODs for control activities. By 2019, the entire country will be targeted for elimination strategies and ultimately to eliminate *P. falciparum* by 2020.

Figure 4: Phased approach to malaria elimination in Cambodia



Source: CNM

Table 1: Phase 1, CNM targets 12 ODs in four provinces for elimination activities in 2017

Province	OD name
Battambang	Thmar Koul
	Maung Russei
	Sampov Loun
	Battambang
Pailin	Pailin
Banteay Meanchey	Ou Chrov
	Preah Net Preah
	Thma Puok
Siem Reap	Kralanh
	Siem Reap
	Sot Nikum
	Ankor Chhum

The CNM has requested PMI to support all ODs in Battambang and Pursat provinces. PMI will continue to elimination activities in one OD, Sampov Loun, where PMI had successfully piloted an elimination package in 2015 and 2016 (see details under Pre-elimination section). In the remaining ODs in these two provinces, malaria control activities will be scaled up until the epidemiologic situation becomes appropriate to transition to elimination activities, using the elimination package and the lessons learned in Sampov Loun.

At the center of PMI's support for elimination in Cambodia is universal coverage with LLINs and rapid identification and treatment of all malaria infections in targeted areas. This includes rapid diagnosis and prompt effective treatment of all malaria cases at health facilities and in villages through the network of VMWs. Because of widespread resistance to artemisinins, efforts are made to directly observe treatment and follow up patients to document clearance of infection.

In addition, all cases in targeted elimination areas are investigated to gather key information, particularly recent travel history, to help differentiate possible imported cases from cases of probable local transmission. Furthermore, investigations of fellow travelers (for imported cases) and febrile household contacts are conducted. The collection and analysis of these data in Sampov Loun has provided the CNM and OD health authorities with detailed information and maps indicating residual foci of transmission and areas where transmission appears to have been interrupted.

Once these activities have been scaled up in a given OD, further interventions that could be considered would include vector surveys and interventions in residual and new foci. Behavioral interventions could be employed to reduce or mitigate high-risk behaviors as well as sustain malaria awareness.

5. Updates in the strategy section

The CNM has issued interim policy guidance and is planning to formally update the national treatment guidelines to replace DHA-Pip with AS-MQ, due to increased treatment failures with DHA-Pip. It also plans to introduce single, low-dose primaquine (LDPQ) to the treatment of *P.falciparum*. The surveillance manual for malaria elimination and strategy for mobile and migrant populations (MMPs) also has been finalized. The CNM plans to develop an Operational Manual for the malaria surveillance system for 12 target elimination ODs and transitional ODs. In addition, social and behavior change communication (SBCC) strategies will be updated to reach MMPs.

6. Integration, collaboration, and coordination

Funding

The Global Fund has been the major donor for malaria control since 2005. The following Global Fund mechanisms are in place in Cambodia: the Regional Artemisinin Initiative (RAI) is currently active and will end in December 2017 and the New Funding Model (NFM) will end in December 2017. The United Nations Office for Project Services (UNOPS) serves as the principal recipient for both the RAI and the NFM grants. A funding request for a new RAI2E grant from 2018-2020, has been submitted to the Global Fund. PMI is the second largest donor supporting malaria control and elimination activities in Cambodia. The Bill & Melinda Gates Foundation (BMGF) supports the CNM with the development of new tools to accelerate towards elimination, strategies to prevent infection and block transmission, and technical assistance and capacity building on surveillance and monitoring and evaluation. The main donors in Cambodia are the

Global Fund, PMI, BMGF, and Asian Development Bank (ADB). PMI plays a key coordinating role directly engaging each of the main donors to coordinate activities and leverage funding to more efficiently support the CNM's control and elimination activities.

A major concern is the slow implementation of Global Fund activities, particularly malaria case management through VMWs. This MOP anticipates that Global Fund will continue to support key commodities and, therefore, plans only for procurements of emergency or gap filling commodities.

Table 2: Current malaria funding in Cambodia

Funding	Total Budget in \$ (Funds Disbursed)	Duration	Key Implementing Partners	Key Activities
Domestic	\$3,484,029			Treatment services for Cambodian citizens (2012 funding)
Global Fund SSF	\$50,953,325 (\$37,370,392)	2013-2015	CNM, UNOPS (Principal recipient)	Pre-elimination
Global Fund RAI	\$15,000,000	2014-2016	CNM, UNOPS (Principal recipient)	Artemisinin resistance containment
Global Fund NFM	\$30,000,000	2015-2017	UNOPS (Principal recipient)	Malaria control and prevention
ADB Grant	2 nd GMS Regional Communicable Diseases Control Project (CLV) \$9,500,000 for GMS CDC2 CLV \$4,000,000 for Cambodia	Jan 2016 – 30 June 2017	Grant to Departments of Communicable Disease Control, MOH in GMS countries and Cambodia Malaria National Program Center	Contribute to the containment of artemisinin resistance and malaria elimination in Preah Vihear Province. Strengthen and harmonize national malaria programs. Enhance regional cooperation in malaria and strengthen focal points for regional cooperation for malaria control in each MOH. Support WHO and the ministries in rolling out regional strategies for

				malaria control.
BMGF	GMS specific investment \$76,925,595 and investment with GMS component \$86,404,751	2013-2020	WHO-ERAR AFRIMS CHAI PSI UCSF MORU APLMA	Research and innovative tools to control and eliminate malaria. Support to WHO ERAR Hub and Asia-Pacific Malaria Leaders Alliance. Direct BMGF engagement in Global Fund RAI.

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 WHO criteria for national or sub-national pre-elimination.¹

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

- Achieving and sustaining scale-up of proven interventions
- Adapting to changing epidemiology and incorporating new tools
- Improving countries' capacity to collect and use information
- Mitigating risk against the current malaria control gains
- 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

¹ http://whqlibdoc.who.int/publications/2007/9789241596084_eng.pdf

- 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

8. Progress on coverage/impact indicators to date

Cambodia continues to make progress against malaria by continually enhancing approaches to reach key affected populations. Mass distribution of LLINs and long-lasting insecticide-treated hammock nets (LLIHNs) has been implemented and VMWs deployed, particularly in the western part of the country, to increase case management coverage.

During 2016, one malaria-related death was reported; a drop from 219 in 2009. In 2016, the total number of malaria cases from public facilities and those treated by VMWs decreased to 23,627 cases compared to 92,769 in 2009, representing a 75% reduction. National incidence of confirmed malaria decreased from 7 per 1,000 to 1.5 per 1,000, demonstrating progress towards elimination. In total, 53 out of 98 ODs are classified as malaria endemic ODs and the CNM selected 12 ODs for elimination activities in 2017 due to the progress in scaling up malaria control activities and recent epidemiological data. Those 12 ODs are Thmar Koul, Maung Russei, Sampov Loun, Battambang, Pailin, Ou Chrov, Preah Net Preah, Thma Puok, Kralanh, Siem Reap, Sot Nikum, and Angkor Chum.

Between 2004 and 2013, the CNM conducted nationwide Malaria Indicator Surveys (MIS) to measure the progress of the malaria program and to help the program make strategy and implementation shifts. These household and outlet surveys provided useful trend information on key malaria indicators of malaria prevalence, ITN coverage and use, as well as treatment-seeking behaviors over time. Future MIS surveys are no longer planned, given the very low malaria prevalence, increasingly focal nature of malaria transmission in the country, and the strengthened malaria surveillance system providing real-time malaria case information.

Table 3: Key indicators from Malaria Indicator Surveys (2004, 2007, 2010, and 2013)

Indicator	2004	2007	2010	2013
Malaria prevalence by microscopy (%)	4.4	2.6	0.9	0.1*
Households with at least one mosquito net (%)	95	100	99.4	99.7
Households with at least one ITN (%)	35.8	42.6	74.7	89.5
Persons who slept under an ITN the previous night (%)	29.3	25.3	52.6	59.6
Children under five years old who slept under an ITN the previous night (%)	26.4	28.0	56.3	63.3
Pregnant women who slept under an ITN the previous night (%)	13	N/A	59.1	61.5

*1.5% prevalence by polymerase chain reaction (PCR)

III. OPERATIONAL PLAN

1. Vector monitoring and control

NMCP/PMI objectives

According to the 2016 MEAF, the CNM plans to develop a vector management strategy and an insecticide resistance monitoring plan in collaboration with PHD/OD staff, WHO, and other stakeholders. Utilizing entomological surveillance along with insecticide effectiveness and resistance information at the local level, the vector management strategy will implement potential intervention packages for reducing human-vector contact by geographic target area and will be updated on an *ad hoc* basis based on information about ongoing transmission in each targeted area. The current vector management strategy includes the distribution of LLINs/LLIHNs to all populations at risk and focal IRS around index cases in areas of low transmission.

The CNM aims to cover at least 90% of populations at risk of malaria with an appropriate vector control intervention, the primary vector control tools being LLINs and LLIHNs. The CNM target is to provide one LLIN per 1.8 persons and 1 LLIHN per household in at-risk areas. Risk stratification will be done annually for each village. LLINs were distributed through mass campaigns in 2015 and a campaign will be conducted again in 2018. In addition, LLINs/LLIHNs will be distributed continuously through health centers and VMWs to persons or households without LLINs or with LLINs in need of replacement. LLINs/LLIHNs will also be distributed to places of employment, such as farms, plantations, and industrial sites as identified by the CNM. In addition, LLIHNs will be distributed continuously to forest goers at selected access points near the forests.

Between 2015 and 2016, 2,087,999 LLINs and 594,111 LLIHNs were procured and distributed with funding from Global Fund NFM and RAI grants, through continuous distribution systems and through a mass campaign which took place in 2015. In 2016, 594,650 LLINs and 183,000 LLIHNs were distributed through continuous distribution systems. The next mass distribution campaign is planned for 2018 with ITNs procured from RAI and RAI2E grants.

Based on surveys at six sites conducted by other partners, twenty-five malaria vector species have been identified in Cambodia. The primary vectors are *An. dirus*, *An. maculatus* s.l. and *An. minimus* s.l. *An. dirus* is more prevalent in the northeast in forested mountains and foothills as well as cultivated forests such as rubber plantations. *An. minimus* is more prevalent in the west where it is found in areas outside of the forests or in areas where the forests have been cleared. *An. maculatus* s.l. is widespread throughout Cambodia. Other vectors such as *An. barbirostris*, *An. epiroticus*, *An. philippinensis*, *An. vagus*, and *An. hircanus* are also present in Cambodia. Recently, additional potential vectors were identified using cattle baited traps in villages near forest fringe areas in

Rattanakiri, Preah Vihear, and Pursat Provinces, suggesting alternative vectors may transmit malaria in cleared areas near the forest. These vectors bite during all hours of the evening, but peak biting hours are usually between 8 pm and 12 am. Resistance to insecticides is thought to be low among most vector species, but this requires verification, particularly given the scale-up of LLINs and LLIHNs.

In ODs where elimination is planned, vector control has relied on the top-up of LLINs/LLIHNs to cases identified by the surveillance system and surrounding households. For those cases without a history of travel, it is unclear if transmission was peri-domestic or whether it occurred while farmers slept outside where they were tending their fields.

a. Entomological monitoring and insecticide resistance management

Progress since PMI was launched

PMI has previously supported the training of one CNM staff member on the use of the WHO susceptibility test kits and the bottle bioassay for detecting insecticide resistance. However, due to logistical constraints, little programmatically linked entomological monitoring has occurred in Cambodia. To date, most of the entomological information is derived from *ad hoc* data collected through specific research projects.

Progress during the last 12-18 months

PMI and the CNM have identified entomological monitoring as a priority to assist in the targeting of vector control interventions in Cambodia. In addition, PMI provided technical assistance and developed a plan for entomological surveillance as part of foci investigation in malaria elimination areas. Monitoring activities are expected to be initiated in late 2017/early 2018.

Plans and justification

There is a need for better entomological monitoring to identify potential vectors in elimination and burden reduction areas, document their bionomics and behavior as they relate to malaria transmission and control and to assess their susceptibility to insecticides, particularly pyrethroid insecticides on LLINs/LLIHNs. These activities are increasingly important given recent reports of newly identified potential malaria vectors in forest fringe areas. Furthermore, in elimination districts, it is essential to determine whether local transmission is peri-domestic or whether locally acquired infections occur in residents who spend nights outdoors, often on farms that are some distance away from their domiciles. Therefore, PMI will support two sites for longitudinal entomological monitoring and will provide support for entomological surveillance as part of foci investigations in elimination districts with residual pockets of local transmission. Longitudinal monitoring will include monthly estimates of mosquito densities and species composition as well as annual estimates of insecticide susceptibility. For the entomological surveillance conducted as part of foci investigations, the aim will be to assess the reason for residual transmission and will include an assessment of the coverage of vector control interventions, a rapid determination of

species composition and, when coverage of vector control interventions is high but malaria vectors are found, a measurement of insecticide resistance. Recommendations to eliminate transmission from the foci will be provided, including scaling up ITNs or other vector control measures, as deemed appropriate. The foci investigations are intended to be short term but may be extended if residual transmission continues after recommendations are implemented.

Proposed activities with FY 2018 funding: (\$392,000)

- **Entomological and insecticide resistance monitoring:** PMI will support entomological monitoring to increase the capacity and range of surveillance for mosquito abundance, behavior and insecticide resistance, as well as entomological surveys as part of foci investigations to improve information on malaria transmission risk in residual foci and burden reduction areas. (\$363,000)
- **Entomological monitoring technical assistance:** Two TDYs will be conducted by a CDC entomologist who will provide technical assistance to build entomological capacity for insecticide resistance and to conduct entomological surveys in foci investigation and burden reduction areas. (\$29,000)

b. Insecticide-treated nets

Progress since PMI was launched

Since its launch in Cambodia, PMI has procured and distributed 238,095 LLINs to fill gaps in PMI-target districts and to reach MMPs. Target districts include those identified for elimination by the CNM, as well as some districts with higher transmission. Most often, PMI LLINs are distributed through community channels targeting migrant populations (e.g., VMWs, MMWs, plantation malaria workers, and employers of migrants) to reach high-risk populations without access to LLINs.

A PMI-supported rapid household net coverage assessment was conducted in 45 villages in May 2012 to measure the effectiveness of the LLIN distribution campaigns. Results showed that more than 95% of the LLINs expected to be distributed were indeed received at the household level. A shortage of LLINs at the health facilities was the main reason some households did not receive an LLIN during the campaign. Also, use of LLINs by permanent household residents (the night before the survey) was found to be very high (~89%).

Progress during the last 12-18 months

During FY 2016, PMI supported the distribution of 45,742 ITNs (28,800 LLINs and 16,942 LLIHNs) through VMWs/MMWs as top-up to any households or farms that did not have sufficient LLINs, based on data collected during monitoring visits. In the first quarter of FY 2017, 1,891 farms were visited, and 20,768 ITNs (13,343, LLINS and 7,425 LLIHNS) were distributed for the farm workers and their families.

A PMI-supported net preference study to determine the factors associated with net choice and net use was concluded. This qualitative study has revealed a strong preference for large, “family-sized” bed nets and most preferred the ‘softer’ LLIN (polyester) over the ‘harder’ LLIN (polyethylene). Preference for polyester nets was reportedly due to their softer textures, as well as their smaller mesh holes, which were considered preferable due to the perception that larger mesh would allow for entry by mosquitoes and other pests. Information from this study will help to ensure high utilization of ITNs in Cambodia, and may stimulate further research to determine how to improve utilization of LLINs. Based on these results, the CNM has requested resources from the Global Fund RAI2 grant to conduct a quantitative study assessing utilization of LLINs based on net characteristics.

Commodity gap analysis

Malaria is endemic in 21 of the 25 provinces in Cambodia with an estimated at-risk population of approximately 3,023,197. Current CNM guidance is to no longer distribute LLINs to areas with an annual parasite index below 1. Needs of LLINs and LLIHNs for mass distribution are estimated at 2,347,750 for 2018. Those projections are based on malaria risk categorization and expected LLIHNs for estimated MMPs. These will be more than covered by planned procurements from the Global Fund and PMI. PMI-procured nets are for both mass campaign and continuous distribution, primarily targeted to the ODs supported by PMI and to MMPs that were missed in the mass campaigns. In addition, PMI LLINs will also be targeted to areas that are no longer receiving nets through the campaign, but where residual transmission continues.

For the 2018 mass campaign, a total of 2.3 million nets are needed to cover the entire at-risk population of approximately 3 million people. To fill this gap, a pipeline of 2.5 million LLINs has been allocated by the Global Fund. The quantification for the mass campaign includes an additional 5% (approximately 117,387 nets) which are set aside for continuous distribution, i.e. top-up activities through VMWs. VMWs distribute these ITNs after they identify the gaps in the post-campaign period. Given the unique nature of mobile populations in Cambodia (in many cases, MMPs are seasonal workers), in 2019, the CNM allocated 264,004 LLINs/LLIHNs for mass distribution to mobile populations through health workers and VMWs, in addition to continuous distribution of nets to established worksites through VMWs/private providers.

Table 4: ITN Gap Analysis

Calendar Year	2017	2018	2019
Total targeted population*	2,721,289	3,023,197	3,069,754
Continuous Distribution Needs			
Channel #1: VMWs and worksites to reach MMPs**	214,000	117,387	153,511
<i>Estimated Total Need for Continuous</i>	214,000	117,387	153,511
Mass Distribution Needs			
2018 mass distribution campaign***	0	2,230,363	264,004
<i>Estimated Total Need for Campaigns</i>	0	2,230,363	264,004
Total Calculated Need: Continuous and Campaign	214,000	2,347,750	417,515
Partner Contributions			
ITNs carried over from previous year	431,884	2,527,684	179,934
ITNs from Government	0	0	0
ITNs from Global Fund (NFM)	2,309,800	0	0
ITNs from other donors	0	0	0
ITNs planned with PMI funding****	0	0	150,000
Total ITNs Available	2,741,684	2,527,684	329,934
Total ITN Surplus (Gap)	2,527,684	179,934	(87,581)

* Data source: CNM

** Data source: UNOPS

*** Includes LLINs and LLIHNs for MMPs

**** PMI plans to procure small quantities of rapid diagnostic tests (RDTs) in 2017 and 2018 to fill gaps and conduct top-up activities in PMI-supported areas on an as needed basis.

Plans and justification

PMI will procure approximately 150,000 LLINs and LLIHNs for distribution in selected ODs, primarily through health centers and VMWs for filling potential gaps, and targeting MMPs. If required, LLINs/LLIHNs may also be distributed as part of malaria case/foci investigations.

Proposed activities with FY 2018 funding: (\$800,000)

- **Procurement of LLINs and LLIHNs:** PMI will procure approximately 150,000 LLINs and LLIHNs (hammocks) for focus areas, the mass campaign, filling potential gaps, and targeting MMPs in selected ODs. (\$500,000)
- **Community-level support for distribution, promotion, and use of LLINs/LLIHNs:** PMI will provide support for the distribution and delivery of LLINs and LLIHNs through health centers and through VMWs in target ODs. The anticipated cost of distribution is approximately \$1 per LLIN and \$2 per LLIHN. (\$200,000)

- **LLIN durability monitoring:** PMI will support second year implementation of durability monitoring of LLINs distributed by various partners including PMI and the Global Fund. Monitoring activities will include assessment of physical durability and insecticide activity/content, to inform future LLIN forecasting needs. (\$100,000)

2. Malaria in pregnancy

NMCP/PMI objectives

With more than 80% of malaria cases occurring in adult men, malaria during pregnancy is uncommon. When malaria does occur during pregnancy, though, there is an increased risk of severe disease in the mother and low birth weight and an increased risk of neonatal mortality in the newborn—similar to the risks that occur in higher prevalence settings. These risks occur both with *P. falciparum* and *P. vivax* infections. Although 89% of pregnant women attended antenatal care (ANC) at least once, only 27% of pregnant women attended the recommended four visits.

PMI support for preventing malaria in pregnancy (MIP) focuses primarily on ensuring universal coverage of LLINs and providing appropriate messaging to promote sleeping under an LLIN throughout pregnancy. The 2013 national malaria survey noted that 61.5% of pregnant women slept under an ITN the previous night. In addition, PMI has supported scaling up of diagnosis and effective treatment of malaria at health facilities and through VMWs at community level, with particular targeting of MMPs. National malaria treatment policies for pregnant women with uncomplicated malaria follow WHO recommendations: quinine is used in the first trimester and ACTs in the second and third trimesters. For severe malaria, injectable quinine is recommended in the first trimester (although injectable artesunate can be used if quinine is not available) and injectable artesunate or artemether in the second and third trimesters. Primaquine is contraindicated during pregnancy. Because of the overall low prevalence of malaria during pregnancy, IPTp is not recommended. However, the MEAF recommends that pregnant women residing in endemic areas be screened for malaria during their first antenatal visit, although this is not recommended by WHO. In practice, this recommendation is not being implemented.

Progress since PMI was launched

District-level campaigns supported by the Global Fund and PMI have resulted in high household LLIN ownership in all malaria-risk areas of Cambodia. With PMI support, almost one million interpersonal communication (IPC) encounters have been conducted to encourage regular use of LLINs.

In addition, approximately 680 facility health workers and VMWs per year underwent refresher training in malaria case management, which includes specific guidance on management of malaria in pregnant women.

An assessment conducted in 2013 demonstrated that knowledge about the prevention of malaria among pregnant women was found to be good where VMWs were present. Limited coordination between the maternal and child health and malaria control departments within the ministries of health, as well as limited training of maternal and child health staff on MIP were noted as major hurdles. The risk of malaria infection in pregnancy was highest in the most remote areas with least access to services for prevention, diagnosis, and case management. The assessment also noted the challenges associated with the case management of *P. vivax* malaria, which was equally likely to be the cause of infection in pregnant women.

To better assess the burden of malaria among pregnant women in Cambodia, PMI conducted a rapid assessment in 2015 by instituting malaria screening at 13 ANCs across three provinces in differing malaria risk areas of Cambodia (Battambang, Mondulhiri, and Pursat). A detailed analysis of these data was conducted to assess the feasibility of this policy. Of the 8,875 ANC visits recorded from the 13 health facilities, 22% (1,911) of visits took place in the first trimester of pregnancy (≤ 13 weeks) and 43% (3,818) during the second trimester (14–26 weeks). According to ANC records completed by health care providers, in 86% (11,122) of the ANC visits, health education was delivered to pregnant women on malaria testing, treatment, and prevention. Less than 1% (43 women) of those screened with a malaria rapid diagnostic test (RDT) tested positive. Among these cases, 49% (21 women) were due to *P. vivax*, 23% (10 women) were *P. falciparum*, and 28% (12 women) were mixed infections.

Progress during the last 12-18 months

PMI continues to support training of VMWs and facility staff in targeted areas on malaria case management, which includes specific training on the management of malaria during pregnancy. VMWs supported by PMI also provide LLINs to community members who otherwise did not receive an ITN or whose ITNs are no longer serviceable. Pregnant women are prioritized for these top-up activities.

Commodity gap analysis

IPTp is not implemented in Cambodia. Therefore, SP is not required.

Plans and justification

PMI will continue to support LLIN distribution to pregnant women, IPC to encourage LLIN use, and training and supervision of health workers and VMWs in malaria case management of pregnant women. PMI will support closer coordination with the maternal and child health program to ensure quality case management of MIP.

Proposed activities with FY 2018 funding: (\$0)

- **LLIN distribution and promotion:** PMI will continue to support distribution of LLINs and IPC for pregnant mothers to promote LLIN use through district-level campaigns and

top-up activities conducted by VMWs, in coordination with the Global Fund. (see ITN and SBCC sections)

- **Strengthen case management of malaria in pregnancy:** Support will continue for training of facility health workers and VMWs in malaria diagnosis and treatment, including specific guidance on the treatment of malaria during pregnancy. (see Case Management section)

3. Case management

Diagnosis and treatment

NMCP/PMI objectives

Cambodia has already made great progress toward the objective contained in the MEAF of achieving universal coverage of case management services, to ensure 100% parasitological diagnosis of all suspected cases, and effective treatment of all confirmed cases, particularly at public health facilities and at community level. VMWs increasingly have been the first point of care for management of uncomplicated malaria, diagnosing 100% of all reported malaria cases in Cambodia.

In PMI-supported areas, VMWs are trained to provide the first dose of treatment under direct observation and visit patients to ensure adherence to full treatment. In the pilot elimination OD, Sampov Loun, all treatment doses are provided under observation and blood slides collected on Day 3 and Day 28 to ensure complete cure of blood stage infection.

With the development of treatment failures to DHA-Pip in Western and Northern Cambodia, the national malaria treatment policy was updated in February 2015 with AS-MQ replacing DHA-Pip in the Western and Northern provinces. Subsequent to that policy change, treatment failures to DHA-Pip were identified in other areas of the country. Currently, AS-MQ has been adopted as first-line treatment throughout the country.

Low-dose primaquine (LDPQ) is recommended in the national treatment policy for all confirmed *P. falciparum* cases in elimination areas, but has yet to be implemented over concerns about adverse events in glucose-6-phosphate dehydrogenase (G6PD)-deficient patients. A PMI-supported primaquine safety study was completed and preliminary evidence is that LDPQ can be implemented safely without prior G6PD testing, coupled with monitoring of adverse events. Based on this study, pilot implementation of this policy is planned.

With the success of control efforts in Cambodia, both severe malaria and malaria-related deaths are now rare, with only one reported death in 2016. Hospital staff have been trained in severe malaria management and small amounts of injectable artesunate and quinine are stocked for these rare occurrences.

Table 5. Status of Case Management Policy in Cambodia

Status of Case Management Policy in Cambodia according to <i>National Treatment Guidelines for Malaria in Cambodia, December 2014</i>	
What is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria?	<i>P. falciparum</i> : DHA-Pip in areas with no evidence of treatment failure, AS-MQ in areas with evidence of treatment failure to DHA-Pip <i>P. vivax</i> : DHA-Pip plus full-dose primaquine (for non-G6PD deficient)
What is the second-line treatment for uncomplicated <i>P. falciparum</i> malaria?	Quinine (7 days) plus doxycycline/tetracycline
What is the first-line treatment for severe malaria?	IV artesunate
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester?	<i>P. falciparum</i> and <i>P. vivax</i> : Quinine (7 days)
In pregnancy, what is the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters?	<i>P. falciparum</i> : DHA-Pip or AS-MQ, as above. <i>P. vivax</i> : DHA-Pip
In pregnancy, what is the first-line treatment for severe malaria?	IV artesunate
Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?	IM artesunate or artemether
Is pre-referral treatment of severe disease recommended for community health workers? If so, with what drug(s)?	Rectal artesunate
If pre-referral rectal artesunate is recommended, for what age group? (note: current international guidelines do not recommend administering to those ≥ 6 years)	All ages

Progress since PMI was launched

Since its launch, PMI has provided procured 285,500 RDTs and 149,190 ACTs to fill gaps that were not covered by the Global Fund or government resources. In the last five years, refresher training and routine supervision has been provided to relevant staff of all 181 health facilities and 588 VMWs/MMWs in 11 targeted ODs. In those ODs, PMI also assisted with maintaining a buffer stock and *ad hoc* delivery of commodities to health facilities and VMWs to prevent stockouts. PMI has supported regular monitoring of stock levels at OD warehouses, reinforcing and strengthening logistic management at the peripheral level.

PMI has provided support for quality assurance (QA) and case reporting to a network of 430 registered private sector providers, leveraging support from the Global Fund that supports training and provides subsidized RDTs and ACTs to these providers. Use of RDTs in these outlets has increased significantly since their introduction.

Progress during the last 12-18 months

In FY 2016, no RDTs or ACT treatments were procured with PMI funding given adequate quantities were procured with Global Fund resources. Health workers from 89 health facilities and 502 VMWs in PMI-targeted ODs were trained and received supervision in malaria diagnosis and treatment. Another 18 laboratory staff received refresher training in malaria microscopy.

Through PMI support and with Global Fund and domestic resources, 36,045 persons were tested with an RDT or microscopy in PMI-supported ODs in 2016; 10,285 (28%) of those tested were confirmed to have malaria. Of all cases, 57% were diagnosed by VMWs and 98% of all confirmed cases were treated with an ACT.

To date, PMI has supported more than 2,800 quality assurance visits to more than 400 participating private sector providers throughout the country. The percentage of those providers who received the highest quality assessment score (Class A) has almost doubled between 2014 (33%) and 2016 (61%).

Therapeutic efficacy studies (TES) for DHA-Pip efficacy conducted in 2016 showed only 44% adequate clinical-parasitologic response (ACPR) in Kampong Speu, 83% in Ratanakiri, and 70% in Steung Treng. In contrast, ACPR to AS-MQ was 100% in TES sites in both Kampong Speu and Kratie in the same year. In addition, TES with AS-amodiaquine was carried out in sites in Mondulakiri and Pursat, demonstrating 77% and 86% ACPR, respectively.

Table 6. PMI-funded TESs

Completed TESs		
Year	Site name	Treatment arm(s)
2015-2016	Steung Treng	DHA-Pip
2015-2016	Kampong Speu	DHA-Pip
2015-2016	Siem Reap	AS-MQ
2015-2016	Pursat	AS-MQ
2015-2016	Kratie	AS-MQ
2016-2017	Ratanakiri	DHA-Pip
2016-2017	Stueng Treng	DHA-Pip
2016-2017	Kampong Speu	AS-MQ
2016-2017	Kratie	AS-MQ
2016-2017	Pursat	AS-AQ
2016-2017	Mondulakiri	AS-AQ
Ongoing TESs		
Year	Site name	Treatment arm(s)

-	-	-
Planned TESs FY 2018		
Year	Site name	Treatment arm(s)
2017	Steung Treng	AS-MQ
2017	Pursat	AS-MQ
2017	Kampong Speu	AS-MQ
2017	Ratanakiri	AS-Pyronaridine
2017	Mondulkiri	AS-Pyronaridine

Commodity gap analysis

Table 7: RDT Gap Analysis

Calendar Year	2017	2018	2019
RDT Needs			
Total country population	16,204,486	16,449,519	16,702,842
Population at risk for malaria*	9,350,929	9,494,933	9,637,540
PMI-targeted at-risk population	1,136,901	1,154,409	1,172,187
Total number of projected fever cases	935,093	949,493	963,754
Percent of fever cases tested with an RDT	70%	75%	80%
Total RDT Needs **	654,565	712,120	771,003
Partner Contributions			
RDTs carried over from previous year	782,425	127,860	42,990
RDTs from Government	0	0	0
RDTs from Global Fund	0	627,250	604,249
RDTs from other donors	0	0	0
RDTs planned with PMI funding***	0	0	150,000
Total RDTs Available	782,425	755,110	797,239
Total RDT Surplus (Gap)	127,860	42,990	26,236

* A significant percentage of the population of Cambodia lives in areas with no malaria transmission and, therefore, are only tested for malaria if they report travel to an area with malaria transmission. In addition, approximately half of all malaria cases are diagnosed by microscopy. These factors account for the low overall rate of fever cases tested with an RDT.

**RDT needs are based on consumption data, and not based on the morbidity data listed in the first part of this table. The projected need incorporates projections of future utilization, including the planned increase in numbers of VMWs and projected decrease in malaria burden/fever over time.

*** Support from the Global Fund should cover all RDT requirements for 2017 and 2018. During those years, PMI is allocating a small amount of funding to cover potential gaps. If no gaps exist, PMI will re-program to other priorities.

Table 8: ACT Gap Analysis

Calendar Year	2017	2018	2019
ACT Needs			
Total country population	16,204,486	16,449,519	16,702,842
Population at risk for malaria	9,350,929	9,494,933	9,637,540
PMI-targeted at-risk population	1,136,901	1,154,409	1,172,187
Total projected number of malaria cases	64,036	57,633	48,988
Total ACT Needs*	70,440	63,396	53,886
Partner Contributions			
ACTs carried over from previous year	140,898	70,458	8,482
ACTs from Government	0	0	0
ACTs from Global Fund	0	1,420	48,015
ACTs from other donors	0	0	0
ACTs planned with PMI funding**	0	0	0
Total ACTs Available	140,898	71,878	56,497
Total ACT Surplus (Gap)	70,458	8,482	2,611

*ACT needs accounts for buffer stock, a small contingency for possible outbreaks or upsurge in cases, planned increase in numbers of VMWs, and the potential shift in treatment-seeking away from the private sector to the public sector.

** Support from the Global Fund should cover all ACT requirements for this three-year period. PMI is allocating a small amount of funding to cover potential gaps. If no gaps exist, PMI will re-program to other priorities.

In 2017 and 2018, it is expected that almost all requirements for RDTs, ACTs, and severe malaria drugs will be covered by the Global Fund. In FY 2017, PMI plans to procure small quantities of RDTs and ACTs for district level buffer stocks and to fill gaps not otherwise covered by the Global Fund, which would include stocks needed to support reactive case detection and other active case finding activities in PMI-supported elimination ODs. (see SM&E section for more details)

Plans and justification

PMI will continue support for diagnostic testing and treatment at facility and community level in targeted ODs in Battambang and Pursat Provinces, including provision of commodities to fill gaps, and refresher training and supervision of health facility staff and VMWs. This support also will include intensified case finding and reactive case detection activities in targeted elimination ODs.

Proposed activities with FY 2018 funding: (\$3,520,000)

- **Procure RDTs and microscopy supplies:** PMI will procure approximately 150,000 multi-species RDTs, plus limited quantities of reagents and supplies for microscopy to fill gaps in country requirements, particularly for MMPs and for expanded reactive case detection and active case finding in elimination ODs. (\$200,000)
- **Procure ACTs:** PMI will procure approximately 17,000 treatments of AS-MQ to fill gaps not otherwise covered by the Global Fund and for district level buffer stocks in PMI-supported ODs. (\$50,000)
- **Training, supervision, and quality assurance of malaria diagnosis and treatment at facility and community levels.** PMI will support its network of VMWs and health facilities in 6 to 8 targeted ODs in Battambang and Pursat Provinces, which will include refresher training and supervisory visits. PMI also will continue support for quality assurance of malaria diagnosis at targeted health facility laboratories. In the planned four elimination ODs in Battambang, this will include support for directly-observed treatment and 28-day follow up of all clinical cases to monitor for resolution of parasitemia. (\$2,400,000)
- **Private sector quality assurance:** PMI will continue support for supervision and case reporting of all registered private providers in the targeted eight ODs in Battambang and Pursat, leveraging support from the Global Fund which provides subsidized RDTs and ACTs. (\$600,000)
- **Conduct TES monitoring:** PMI will continue to support TES monitoring at six sites per year (12 sites every two years) at sentinel sites throughout the country. (\$270,000)

a. Pharmaceutical management

NMCP/PMI objectives

The Central Medical Store is responsible for distributing essential medicines and medical commodities to PHDs and ODs on a quarterly basis. Malaria commodities are largely purchased through the Global Fund and the national budget. Health facilities re-stock their commodities using a “pull” system from OD warehouses. In general, stocks are relatively well maintained through this system. An ACT Watch survey in 2015 found that 78% of health facilities and 75% of VMWs had stocks of antimalarials, with nearly 100% of those stocking recommended ACTs.

If the OD store is severely overstocked with a particular commodity, some OD stores will push commodities out to health centers, sometimes causing overstocking at that level. Cambodia’s Central Medical Store will also resort to “push” policies if it has commodities on its shelves that are nearing six months until expiry. As a result, these stocks will often expire at lower level warehouses or health facilities. Undersupply and stockouts also occur, but with the drop in malaria burden, these are much less common than in the past.

PMI has supported buffer stocks of commodities in targeted ODs and delivers those commodities on an *ad hoc* basis to health centers and VMWs with imminent stockouts. This approach has largely ensured a continuous supply of commodities at service points in PMI-supported ODs.

Malaria diagnostics and treatment services are free in public health facilities. However, many people prefer to seek treatment at private sector clinics, pharmacies, and drug sellers for various reasons, including convenience and perceptions of a higher quality of care. As stated earlier, the Global Fund, PMI, and the CNM support training and supervision of registered private providers, as well as providing them with subsidized quality-assured ACTs and RDTs.

Progress since PMI was launched

Given the limited role that PMI played in supplying commodities, PMI support for commodity management has been limited to support for quantification of malaria commodities, as well as monitoring pipelines, so potential bottlenecks in procurement and distribution of malaria commodities (including Global Fund-financed commodities) can be quickly addressed. PMI also has supported a regional logistics advisor to provide technical assistance on forecasting, supply chain management issues, and manage regional procurements.

An assessment conducted in 2014 on data and commodity flows from village to central level to assess the availability and quality of data from Cambodia's Logistic Management Information System (LMIS) concluded that the Drug Inventory Database, a component of the LMIS, was a fairly robust system. One weakness that was identified was that information in the Drug Inventory Database is not sufficiently disaggregated to be used by key decision-makers at national level. For example, the CNM only has access to quarterly data aggregated by OD, hindering efforts to identify and mitigate shortages and stockouts of malaria commodities. Stockouts of ACTs have resulted from procurement constraints or lack of access or availability of consumption data.

In FY 2015, PMI supported a two-day logistics quantification overview workshop. The workshop focused on strengthening CNM staff capacity in the use of malaria forecasting data and methods, and supply planning concepts and tools. Subsequent to this workshop, PMI has been supporting the CNM to conduct a national quantification exercise for malaria commodities with the CNM and malaria partners. This included supporting the quantification of commodities that fed into the budget attached to the MEAF. In PMI-supported ODs, 198 health workers were trained on logistics and malaria commodity management.

Progress during the last 12-18 months

In FY 2016, PMI initiated a discussion with the CNM and partners regarding technical assistance in supply chain management, registration of commodities, and capacity building support to CNM staff in commodity forecasting, quantification, and stock management.

Plans and justification

PMI will provide increased support to CNM for malaria commodity forecasting, quantification and stock management. The weaknesses outlined in the LMIS affect not only malaria commodities. Therefore, a number of U.S. Government-supported programs and initiatives, including PEPFAR and USAID's TB and maternal and child health programs, have prioritized funding for activities to strengthen the LMIS system over the next few years.

Proposed activities with FY 2018 funding: (\$700,000)

- **Support for pharmaceutical management and logistics:** PMI will continue to strengthen CNM's capacity to conduct periodic national quantification and coordination of malaria commodities and support distribution of PMI-procured commodities to OD or PHD level. (\$500,000)
- **Support for strengthening the LMIS:** PMI will leverage the investments of other U.S. Government programs and contribute to this broader effort to support strengthening and updating of Cambodia's LMIS system. (\$200,000)

b. Drug Quality

NMCP/PMI objectives

In the past, poor quality and counterfeit drugs have been a significant challenge in Cambodia, particularly in the private sector. PMI and other partners have prioritized efforts to improve the quality of malaria treatments available in the private sector, including removal of artemisinin monotherapies. For example, the Global Fund supports the Department of Drugs and Food (DDF) to eliminate banned oral artemisinin monotherapies, combat counterfeit and substandard malaria drugs through sample screening at public and private pharmacies, and strengthen the national pharmacovigilance system. These activities, while focused on malaria, will also help to ensure access of quality-assured essential medicines for TB, HIV/AIDS, and other health priority programs.

In addition to these efforts, the Cambodian government's Counter Counterfeit Committee was established in 2014. This cross-sectoral task force is comprised of representatives from the Ministries of Interior, Justice, Health Finance, Commerce, and Defense. The Counter Counterfeit Committee is dedicated to combatting counterfeit products, unregistered or unlicensed providers, and substandard clinical services. In January 2015, the Counter Counterfeit Committee facilitated the development of a joint action plan between Cambodian Ministries of Interior and Health centered on performing inspections in private markets.

Progress since PMI was launched

In past years, USAID and PMI had supported market surveys to collect samples from public and private sector outlets and conduct quality testing on those samples. PMI worked closely with the DDF and other local partners to ensure that regulatory authorities continued to make routine drug inspections and field visits. With assistance from PMI, the DDF successfully launched raids on facilities selling unregistered and falsified antimalarial medications. Additionally, to ensure a continuous stream of professionals aware of the problem with substandard and falsified medicines, PMI supported the updating of the quality assurance/quality control and medicine regulations curriculum for Cambodian pharmacy and medical students. These market surveys have now been phased out as poor quality drugs were rarely identified.

In addition, as mentioned previously, the Global Fund and PMI also support a network of more than 400 registered private providers. Participating providers are trained and supplied with quality-assured ACTs and RDTs at subsidized prices. Periodic supervisory visits are carried out to monitor the quality of these services.

As a result of these interventions, the situation in private sector outlets has improved in recent years. In 2015, a survey by ACT Watch found that among private sector outlets that stocked antimalarials, ACTs were stocked in 30% of private health facilities, 21% of pharmacies, 7% of drug stores and 15% of itinerant drug vendors. A recent study of antimalarial quality in Cambodian outlets², though, illustrated a mixed picture with respect to drug quality. The study analyzed drugs purchased from retail outlets, categorizing them as being of “acceptable” quality, “falsified (fake drugs which do not contain the stated active pharmaceutical ingredient)” or “substandard (genuine medicines produced by authorized manufacturers which do not have the correct amount of active pharmaceutical ingredient)”. Although no falsified drugs were detected, 31% were classified as substandard.

Progress during the last 12-18 months

With PMI support, the DDF’s National Health Products Quality Control Center laboratory is making progress towards their goal of International Organization for Standardization (ISO) 17025 certification. This has included developing a draft quality assurance manual, standard operating procedures, and several of the necessary monographs that will be required to receive ISO certification. PMI also supported the National Health Products Quality Control Center’s participation in an Asia-Pacific inter-laboratory quality assurance program.

Plans and justification

The Global Fund and WHO have funding to support DDF’s National Health Products Quality Control Center to implement its roadmap towards the attainment of ISO certification by 2018. Therefore, PMI will no longer support these activities, but will continue to collaborate with the DDF and funding partners on these efforts.

² Yeung, et al. Am J Trop Med Hyg **2015** 14-0391

Proposed activities with FY 2018 funding: (\$0)

No activities are planned.

4. Health system strengthening and capacity building

NMCP/PMI objectives

The MOH's Third Health Strategic Plan (2016–2020) sets out an operational framework that ensures the Cambodian health strategy is consistently implemented across all health institutions at all levels of the health system and available resources are targeted to priority areas in their operations. This framework identifies four priority program areas and five cross-cutting health system strategies. The four priority program areas include: reproductive, maternal, newborn, child health, and nutrition; communicable diseases (including HIV/AIDS, tuberculosis, malaria, dengue, neglected tropical diseases, and other emerging infectious diseases); non-communicable diseases and public health concerns; and health system strengthening. One of the objectives in the four focus areas is to reduce morbidity and mortality mainly due to HIV/AIDS, tuberculosis, and malaria by 2020. The five health system strategies include: health service delivery; health care financing; human resources; health information systems; and health system governance.

In support of the Third Health Strategic Plan, NMCP's 2016 – 2020 MEAF sets an ambitious agenda to achieve elimination of *P. falciparum* and multi-drug resistant malaria by 2020. To reach these goals, the NMCP will build the capacity of community and facility-based health care workers to actively find malaria cases and improve case management while strengthening linkages with the private sector. In addition, the NMCP will need to strengthen surveillance and information systems to meet the need for real-time data to support an elimination strategy.

PMI works in close partnership with the CNM to build capacity in the form of technical assistance and training to the CNM, PHD, and OD staff. PMI also supports VMWs as these staff are critical extensions of the public health system and are essential for the treatment of malaria cases at the village level – where the burden of disease remains highest. Another important component of the health system is the private sector, where PMI supports data quality improvement and quality of services.

Although some improvements have been made in the health care system, Cambodia still faces many challenges, such as decentralization and integration of malaria control into existing health care services, which places an additional management burden on the provincial and district levels. Low salaries of government health staff results in limited availability of public services. VMWs who provide front-line services in communities for early detection and treatment of malaria are covering many malaria-endemic parts of the country, but receive insufficient support from district and provincial management. In addition, quality of care with regard to diagnostics and treatment faces many challenges in both the public and private sectors.

PMI's capacity building efforts are also complemented by broader health systems strengthening activities using other U.S. Government funding. For example, USAID is also providing technical

assistance: to implement and expand Cambodia's social health protection scheme; to strengthen the health management information system (HMIS) and LMIS; to support the MOH in licensing and registration of private health care providers; and to develop new health financing approaches. USAID is supporting reproductive, maternal, newborn, and child health, nutrition, HIV/AIDS, tuberculosis, and neglected tropical diseases activities as well. All USAID and PMI-supported health systems work is in line with the MOH's Third Health Strategic Plan.

Progress since PMI was launched

PMI has supported health systems strengthening activities at the VMW, health facility, private provider, CNM, PHD, and OD levels. At the community level, PMI has supported training and skills strengthening of VMWs in performing multi-species RDTs to diagnose malaria and provide correct treatment. In addition, PMI has supported the implementation of a community supply system linked to health facilities, close monitoring of diagnostic stock levels at operational division warehouses, reinforcing and strengthening logistic management at peripheral level, and maintenance of buffer stocks of laboratory commodities in PMI-targeted areas.

At the health facility level, QA systems for microscopy have been established with regular supervision visits. PMI has also provided support for QA and case reporting for a network of private sector providers. At PHD and OD levels, PMI also supports the development of annual operations plans that promote government ownership of health activities at lower levels of the health system and are used to plan, coordinate, and monitor malaria and other health activities at sub-national level.

In September 2015, PMI supported a four-day national quantification workshop and exercise to prepare a two-year forecast and supply plan of the total commodity and funding needs both for the public and private sector in Cambodia for 2016 and 2017. The technical assistance included the use of different forecasting methodologies for estimating commodity requirements, and training for the CNM in PipeLine®, a supply planning software tool.

With regard to drug efficacy, TES implementation emphasizes use of high-quality diagnostic testing, and builds the CNM's capacity to conduct research, such as protocol development, study monitoring, and QA practices.

PMI also provides direct technical assistance in field entomology, emphasizing training in vector bionomics, monitoring of insecticide resistance, and assessment of LLIN durability.

Progress during the last 12-18 months

PMI provided technical assistance to DDF on plans to establish an ISO-certified drug quality testing laboratory that would provide the country with the capacity to ensure drug quality in the country.

PMI has also continued to support capacity building of malaria program managers and staff through trainings such as case management, quality of malaria laboratory diagnosis, and malaria commodities supply chain management. PMI also provided coordination support to existing provincial-level working groups on malaria elimination in Battambang, Oddar Meanchey, Pursat, and Steung Treng Provinces which serve as a platform for stakeholder coordination on elimination activities. A District Special Working Group for malaria elimination was established to support an elimination package model in Sampov Loun. PMI also continued to roll out a QA system and tools to improve the quality of malaria diagnosis and care in the private sector. More than 400 private providers have been assessed so far.

Plans and justification

PMI will continue to work closely with the CNM to identify and fill capacity gaps. Such discussions have identified needs in technical areas such as enhancing SM&E, developing capacity to effectively implement various aspects of malaria control and elimination, enhancing the CNM’s capacity to effectively coordinate malaria stakeholders, and manage malaria tools and reports generated by CNM partners (such as standard operating procedures and study reports). Health systems strengthening activities are implemented through relevant PMI core technical areas, with the aim of strengthening the CNM’s capacity in various aspects of diagnosis and case management, supply chain and logistics, quality improvement, and SM&E.

Proposed activities with FY 2018 funding: (\$300,000)

- **Program management capacity building:** PMI will support the CNM and targeted ODs and PHDs to strengthen their capacity in program and supply chain management and monitoring and evaluation. These activities will be expanded to additional ODs in Battambang and Pursat Provinces, including three ODs which will begin implementing elimination activities in 2018. (\$300,000)

Table 9: Health Systems Strengthening Activities

HSS Building Block	Technical Area	Description of Activity
Health Services	Case Management	<ul style="list-style-type: none"> ● PMI will continue support for supervision and case reporting of a network of private providers who are supported by the Global Fund. ● PMI also will continue support for quality assurance of malaria diagnosis at targeted health facility laboratories.
Health Workforce	Case Management	<ul style="list-style-type: none"> ● Build, through training and technical assistance, a cadre of community health workers /VMWs to properly diagnose, treat, and report on malaria cases into the

	SBCC	<p>public health system. This will include refresher training and supervisory visits. Additional training to be added for treatment of malaria during pregnancy.</p> <ul style="list-style-type: none"> • New communication tools, materials, and job aids will be developed for health care providers to help improve acceptance and implementation of elimination activities around diagnosis, case investigation, and treatment. IPC for each patient will also be tailored to specific risk behaviors of individual patients, households, and villages.
Health Information	<p>Pharmaceutical Management & Logistics</p> <p>Monitoring and Evaluation</p>	<ul style="list-style-type: none"> • The LMIS will be modernized to provide real-time data to decision-makers and avoid stockouts. Technical assistance will be provided to enhance the system, conduct a pilot and support planning for scale up. • The malaria information system will be updated to a web-based system.
Essential Medical Products, Vaccines, and Technologies	Pharmaceutical Management & Logistics	<ul style="list-style-type: none"> • PMI will monitor and address potential bottlenecks in procurement and distribution of malaria commodities (including Global Fund-financed commodities). Technical support will focus on supply chain strengthening, forecasting, quantification, management, and distribution of pharmaceuticals and RDTs.
Leadership and Governance	Elimination	<ul style="list-style-type: none"> • PMI will strengthen sub-national committees (PHDs/ODs) to manage elimination activities in target ODs.

5. Social and behavior change communication

NMCP/PMI objectives

In the MEAF 2016 -2020, the national malaria SBCC strategy was revised and linked to control and elimination activities to protect at least 95% of all populations residing in malaria active foci with an appropriate vector control intervention. The key objectives of the new SBCC interventions in this MEAF are to increase consistent use of ITNs among target communities, improve health-seeking behaviors among at-risk populations, improve compliance with medication, and increase awareness of risks related to artemisinin monotherapies. In Cambodia, SBCC efforts play a crucial role in reaching hard-to-reach populations, which are often at the highest risk of malaria. High-risk populations include residents of forested areas, new settlers, internal migrant workers, and people crossing border areas. Currently there is a Behavior Change

Communication (BCC) Working Group that is organized and chaired by the CNM. With increased mobility within and beyond national boundaries, the above strategy outlines components specific for MMPs that focuses on providing tailored SBCC interventions to migrants at four stages/settings: 1) where they live prior to migration, 2) *en route* along the migration path, 3) at arrival points, and 4) at cross-border areas. In each OD, the CNM will work with all partners to conduct a mapping exercise to identify source communities for MMPs, and will use community mobilization or IPC approaches to educate them on malaria prevention and treatment.

Progress since PMI was launched

PMI has supported several innovative approaches targeting MMPs, including tailored mass media, messaging through taxi drivers around migrant corridors, as well as strengthening cross-border collaboration. Malaria awareness campaigns targeting local residents, mobile seasonal workers, and people traveling into endemic areas have been conducted through various channels for reinforcement. Travelers into endemic zones receive and discuss malaria prevention issues and messages with trained malaria volunteers at key transit points and taxi drivers participating in the program. VMWs and MMWs provide counseling and treatment services to patients in villages, at farms, and plantations. PMI also trains registered pharmacists and drug sellers in cities and towns on diagnostic testing and rational drug use.

Progress during the last 12-18 months

With FY 2016 funding, building upon successes of prior years, PMI intensified SBCC efforts, particularly IPC, among MMPs. In FY 2016, a total of 67,438 residents (65% female) and 48,123 migrant workers (44% female) were reached with malaria messages. As PMI is piloting elimination activities in Sampov Loun, SBCC activities were streamlined and focused less on control efforts across large geographic areas. A variety of SBCC materials in multiple languages were produced for VMWs, MMPs, and health care providers including posters, leaflets, flipcharts, stickers, t-shirts, banners, bags, signboards, and billboards. Early diagnosis and treatment and health education were provided by 196 health facilities and 588 VMWs/MMWs. As of September 2016, in collaboration with CNM, PMI supported IPC and counseling trainings for 116 staff (target of 178 staff) from 63 health facilities in the 5 target ODs.

PMI also produced BCC materials to support malaria pre-elimination activities in Sampov Loun OD. These materials included job aids, posters, and leaflets with tailored messages targeting malaria patients and at-risk populations. Moreover, the project developed other BCC materials to support routine implementation in Cambodia such as raincoats to promote malaria elimination messages in preparation for outreach activities during the rainy season, VMW job aids books and SBCC materials, and monthly planners to facilitate activity planning.

At border areas in the west, to which Cambodians travel for work, PMI supported the provision of materials in the Khmer language explaining malaria services in Thailand and possible side effects from malaria treatment. PMI has also supported semi-annual meetings between Cambodian and Thai health authorities along border provinces to discuss harmonization of

bilingual SBCC materials and to share malaria information about cross-border migrant populations. It is anticipated that information-sharing will continue with local resources.

Plans and justification

PMI will focus SBCC efforts and messages to serve both control and elimination goals. In malaria control settings, PMI will support routine community-based SBCC to improve knowledge and foster behavior change related to malaria prevention and care-seeking as well as adherence to treatment. Activities include training of health and community workers and conducting community outreach to promote early diagnosis and prompt treatment, as well as ITN use and care, which will be coordinated with the national universal coverage campaign. In addition, PMI will support school health education programs, drama shows on malaria prevention, distribution of printed messages (posters and leaflets) and organize community discussions in affected villages/communities.

As Cambodia is moving from malaria control to elimination in certain ODs, SBCC interventions will focus increasingly on supporting elimination efforts, including: developing targeted SBCC messages specific to the highest risk migrant groups within elimination ODs and increasing acceptance of reactive/active case detection efforts. A multi-pronged, comprehensive approach for SBCC interventions to educate malaria patients, their families and co-travelers on the importance of case follow-up and regimen adherence, etc. and ITN use will be implemented. New communication tools, materials, and job aids will be developed for health care providers to help improve acceptance and implementation of elimination activities around diagnosis, case investigation and response, and treatment. IPC will also be tailored to specific risk behaviors of individual patients, households, and villages.

Proposed activities with FY 2018 funding: (\$500,000)

- **SBCC community-level implementation in target areas:** PMI will support development and implementation of effective SBCC approaches for target elimination and control ODs. Careful consideration will be given to training of health workers and VMWs, and tailoring of SBCC messages according to identified risk factors. PMI will assist the CNM to identify those risk factors and to refine approaches in support of the National SBCC Strategy. In elimination areas, SBCC efforts will also focus on increasing acceptance of reactive/active case detection in the context of declining infections. In control areas, PMI will continue supporting SBCC activities (IPC and media) to reach the highest risk groups by focusing on improving coverage and use of malaria prevention measures (LLINs/LLIHNs), increasing awareness of MIP, dangers of counterfeit antimalarials, as well as ensuring prompt diagnosis and effective treatment. (\$500,000)

6. Surveillance, monitoring, and evaluation

NMCP/PMI objectives and general SM&E information

Cambodia's 2011—2025 NSP for Elimination of Malaria has set a national goal to eliminate all forms of malaria by 2025. To support the NSP, Cambodia has developed and launched the MEAF (2016—2020) to guide the country's transition to elimination in a phased approach (Figure 4). One of the objectives of the MEAF aims to enhance the surveillance system to detect, immediately notify, investigate, classify, and respond to all cases and foci by 2017 to move toward malaria elimination.

Cambodia relies on the HMIS to collect data from public health facilities throughout the country. In addition, a parallel malaria information system developed on an Access® platform has been used to capture malaria caseload data in malaria-endemic areas. The malaria information system captures aggregate data mostly from VMWs/MMWs, health centers, some private providers, and receives aggregate numbers of cases from the military annually. District and provincial hospital data are only captured in the HMIS. Data from the HMIS are currently automatically extracted and incorporated into the malaria information system to provide a complete picture of the malaria burden in the country. The HMIS currently uses a web-based platform.

The CNM utilizes a “Day 0 surveillance” system as a foundation for real-time individual case reporting in all low endemic ODs targeted for elimination. The Day-0 alert system, which relies on mobile phones, ensures that all cases are reported on the day of diagnosis. In Sampov Loun OD, confirmed cases are notified/reported through the Day-0 SMS alert system within 24 hours and through the malaria information system to the VMW for follow-up and to the OD, PHD, and CNM for further action. Each report triggers a case investigation within three days and a response within seven days including foci investigation and geo-tagging of locally-acquired cases.

The CNM prioritizes data collection through a variety of methods, including routine program monitoring, baseline, mid-term, and end-line quantitative and qualitative surveys. Cambodia had conducted periodic national malaria household surveys in 2004, 2007, 2010, and 2013. These data have shown decreasing malaria prevalence by microscopy and increasing ITN coverage and use. National household surveys for malaria have been discontinued given the rapid decline in burden and malaria risk areas in the country, and the increasing coverage of the routine malaria information system.

Progress since PMI was launched

PMI has supported routine malaria surveillance data collection at the facility and community level, provided technical support for household malaria surveys, and national-level surveillance system strengthening. As part of its case management activities, PMI also works with CNM personnel to build capacity and ensure that malaria data from case management activities, such as number of tests conducted and malaria cases diagnosed by VMWs, are captured by the health centers and ODs. PMI has worked closely with public health personnel from the provincial level

to the community level as well as registered private providers to collect, verify, and analyze monthly malaria data.

For routine passive case reporting, PMI supported the CNM's malaria information system that incorporates health facility and community-level malaria data reported by VMWs/MMWs. This system was designed to include relevant program data (e.g., bed net distribution, malaria drug and diagnostic stock, and listing of private sector providers) and link to the national HMIS.

Progress during the last 12-18 months

In an effort to improve data flow from communities to the central level, PMI has begun working with the CNM and other partners to assess alternative surveillance platforms designed for real-time malaria surveillance.

Since many malaria cases are treated in the private sector, Cambodia's malaria surveillance data underestimates the true malaria burden. PMI therefore continues to engage with private sector providers to improve malaria case reporting as well as quality case management. PMI has supported the development of a tablet-based quality assurance tool to improve case management and facilitate collection of malaria case data. This system was built off a District Health Information System 2 (DHIS-2) software platform, with the intention that it would be able to feed private sector case data directly into the national malaria information system. A smartphone app also has been developed to enable providers to enter their case data directly into the system, greatly reducing the time and effort required to collect and electronically enter paper-based data. Although the engagement with and current coverage of 430 participating registered private providers are dynamic and currently under transition, the reporting system is now fully scaled-up to all participating providers and case information, for the first time this year, is being captured in the malaria information system. In 2016, through the PMI-supported platform in Sampov Loun OD, the registered private providers suspected 1,124, tested 1,060 (94.3%), and confirmed 31 malaria cases (test positivity rate 2.9%). All the 31 confirmed malaria cases were referred to health facilities or VMWs for treatment and follow up. To improve collection of data from MMPs, a cadre of MMWs has been deployed and their malaria data are now incorporated into the malaria surveillance system. The private sector providers in non-PMI areas treat uncomplicated malaria cases and refer only severe and complicated patients to the public sector facilities.

In Sampov Loun, the PMI-supported OD for malaria elimination, elimination activities were launched in July 2015. From then until September 2016 (18 months), 398 of 7,417 malaria tests were positive (test positivity rate=5%). Using the "1-3-7" approach, 86% of cases were reported within one day, 82% of positive cases were investigated within three days, and 85% of response activities were conducted within seven days. As part of the response, all persons in the index case's household, persons with fever in surrounding households, and co-travelers were screened (N=1,224) and 11 were found to be positive (test positivity rate=1%), all in co-travelers.

Table 10: Surveillance, Monitoring, and Evaluation Data Sources

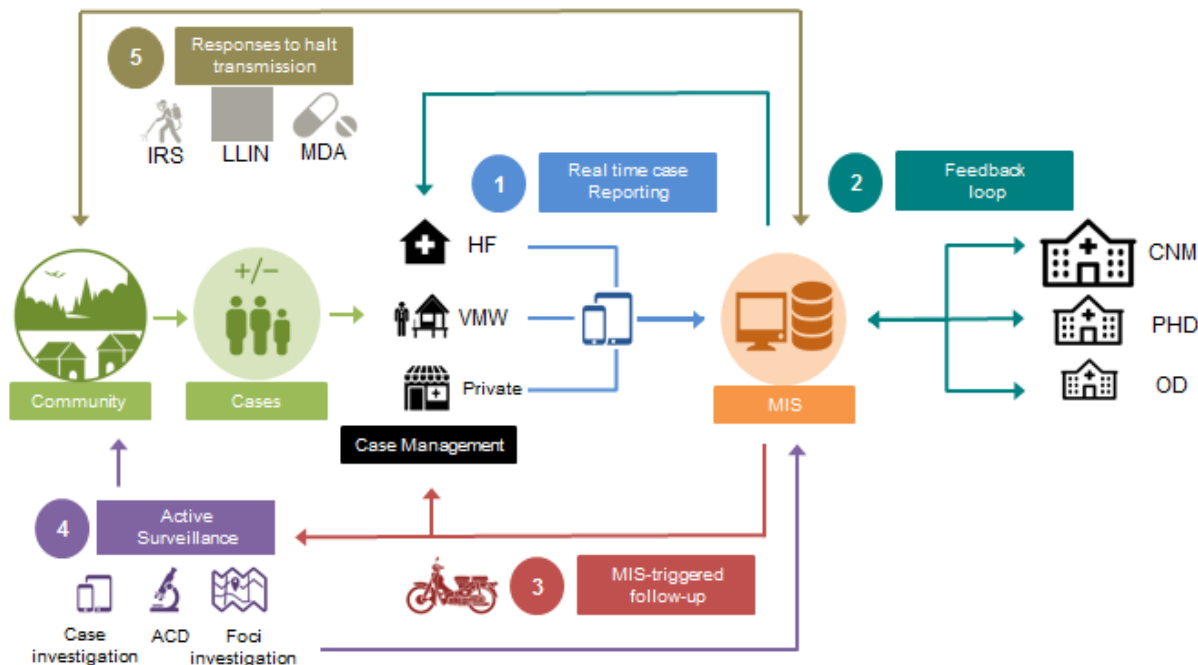
Data Source	Survey Activities	Year								
		2011	2012	2013	2014	2015	2016	2017	2018	2019
Household surveys	Demographic Health Survey (DHS)*				X					(X)
	Malaria Indicator Survey (MIS)*			X					(X*)	
Malaria surveillance and routine system support	Support to malaria surveillance system			X	X	X	X	X	(X)	(X)
Therapeutic	<i>In vivo</i> efficacy testing	X	X	X	X	X	X	X	(X)	(X)
Entomology	Entomological surveillance and resistance monitoring		X*	X*	X*	X*	X*	X	(X)	(X)

*The survey planned is not a full MIS, but rather a targeted malaria survey that is based off the MIS methodology. It is not PMI-funded.

Plans and justification

As the CNM implements its elimination action framework, access to timely malaria information becomes critical. As malaria cases decrease, PMI will work with the CNM to ensure rapid reporting of malaria cases, initiate timely case investigation and response activities, including reactive surveillance, and eliminate transmission foci as laid out in the MEAF (Figure 5). PMI will continue to support the CNM’s two-pronged approach of strengthening the passive malaria information system in endemic areas, as well as increase its support for enhanced, real-time surveillance in elimination areas.

Figure 5: Schematic of proposed Cambodia malaria surveillance system



Source: MOH/CNM 2017

Although the current malaria information system platform is functioning and able to provide comprehensive malaria data, it is not yet equipped to handle case investigation and response data that will be collected in elimination districts. The majority of the funding to upgrade the current malaria information system, likely using DHIS-2, will be provided by the Global Fund and the BMGF. PMI's contribution will be to provide technical assistance on developing the monitoring and evaluation plan, ensuring that PMI's experiences in elimination implementation inform the national operational guidelines, manuals, and data collection forms. PMI's support will focus on training provincial and district level staff to collect and utilize the new platform for decision-making.

Proposed activities with FY 2018 funding: (\$1,020,000)

- **Support for national-level SM&E strengthening:** PMI will provide technical assistance to update the national monitoring and evaluation plan; ensure that CNM's operational guidelines, manuals, and standardized data collection forms are informed by current elimination activities; and develop a new web-based malaria information system platform and to support the transition by training PHD/OD level staff. (\$200,000)
- **Support for implementing enhanced SM&E in elimination settings:** Support for refining and implementing a case-based, real-time reporting system in four to six elimination ODs (including Sampov Loun), including training of provincial and district level staff to use real-

time data to inform response activities. In all focus ODs, PMI will support training costs for all levels, software and hardware, data collection at the community level, and monthly meeting costs. In addition, the selected elimination ODs in consultation with CNM will implement the “1-3-7” approach which will require notification of passively detected cases within one day, case investigations within three days, and response activities within seven days, currently including distribution of LLINs for those without them and screening household members with fever and co-travelers. Throughout the project life cycle, findings will be used to inform the national strategy and plans for scale-up to additional ODs targeted for elimination with mainly Global Fund support. (\$800,000)

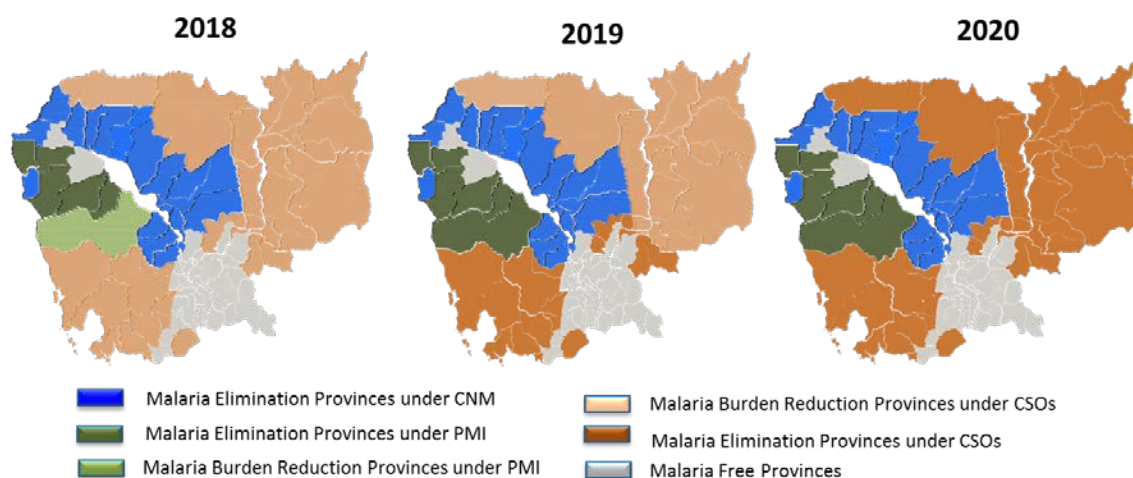
- **Private sector malaria data collection:** PMI will provide targeted support to improve case management QA activities in the private sector, and implement a reporting system to capture information about confirmed malaria cases, which will be increasingly incorporated into the Cambodian malaria information system at lower levels. (see Case Management section)
- **Technical assistance with SM&E:** Two CDC TDYs are planned to provide technical assistance for SM&E activities. (\$20,000)

7. Pre-elimination

NMCP/PMI objectives

In 2015, the CNM, in collaboration with its technical, implementing and donor partners developed the MEAF 2016-2020 with a vision of a malaria-free Cambodia. This guiding document aligns with the national malaria response to the WHO technical strategies highlighted in the Malaria Elimination in the Greater Mekong Sub-region 2015–2030 that contribute to the overall interruption of *P. falciparum* transmission in areas of multi-drug resistance and malaria elimination in the GMS. This Framework describes the strategic approach by which the CNM and its partners will progressively pursue elimination in low-transmission areas, while strengthening interventions to reduce the burden of disease in moderate and high transmission areas with the goal that those areas transition towards malaria elimination. The plan is to roll out these interventions in a phased approach between 2016 and 2019 as described below (Figure 6) in an effort to achieve elimination of *P. falciparum* and multi-drug resistant malaria by 2020 and ultimately eliminate all forms of human malaria in Cambodia by 2025.

Figure 6: Elimination Phase Approach for Cambodia



Malaria Elimination Phase	2017 Population	Number of PHDs	Number Of ODs	Global Fund supported PHDs	Global Fund supported ODs
1- 2018 Start	3,832,268	6	18	5	14
2- 2019 Start	3,545,956	9	26	8	22
3-2020 Start	1,230,814	6	9	6	9

Source: CNM, 2017

The goal of the MEAF 2016-2020 is to reduce the incidence of malaria to less than one infection per 1,000 people at risk in each OD and eliminate *P. falciparum* malaria including multidrug resistance by 2020. The MEAF includes the following specific objectives;

- Provide effective program management and coordination at all levels by 2017 to efficiently deliver a combination of targeted interventions for malaria elimination
- Achieve universal coverage of case management services by 2016 to ensure 100% parasitological diagnosis of all suspected cases and effective treatment of all confirmed cases
- Protect at least 90% of all populations at risk of malaria with an appropriate vector control intervention by 2017
- Enhance the surveillance system to detect, immediately notify, investigate, classify, and respond to all cases and foci by 2017 to move toward malaria elimination
- Implement a comprehensive information, education, communication/BCC approach that facilitates at least 90% of people seeking treatment for fever within 24 hours at a health facility or from a qualified care provider and at least 85% of at-risk population utilizing an appropriate protection tool by 2017

The MEAF proposes to target elimination activities in low endemic areas by progressively implementing a robust surveillance system that facilitates immediate case reporting and

investigation followed by foci investigation and response. In high burden areas, efforts will be focused on scaling up access to and strengthening the quality of diagnosis and treatment in both the public and private sectors and ensuring universal coverage with appropriate vector control interventions. Special efforts will be made to extend services to MMPs, including increasing the number of access points through VMWs, MMWs, and plantation malaria workers. Cross-cutting support, including program management, monitoring and evaluation, and behavior change communication, will be strengthened to support the core interventions.

In 2018, with funding from the Global Fund, the CNM will target five provinces (Banteay Meanchey, Kampong Chhnang, Kampong Thom, Pailin, and Siem Reap) for malaria elimination and PMI will fully implement the malaria elimination package in one province (Battambang) and expand elimination activities to appropriate areas in Pursat Province in 2019.

Progress since PMI was launched

The PMI strategy 2015-2020 aims to assist at least five PMI-supported countries to meet the WHO criteria for national or sub-national pre-elimination by 2020. In view of this, PMI in collaboration and coordination with the CNM and PHDs/ ODs, supported Cambodia to pilot a malaria elimination package in Sampov Loun OD in Western Cambodia. The basic essential package of activities developed for malaria elimination (also known as the Model Elimination Package) include universal coverage of LLINs and early diagnosis and treatment (EDAT); and implementation of individual case reporting and investigation of passively detected cases, case and foci investigations, and conducting appropriate response activities when active foci are identified, such as distribution of LLINs and IPC. Known as the “1-3-7” approach, all malaria cases detected should be reported to a health center within one day using the SMS Alert System for real-time reporting, a case investigation should be conducted (including determination of whether the case was locally-acquired or imported) within three days, and case finding and response activities should be implemented within seven days for all cases.

PMI’s OD-centered approach supported the development, implementation, and monitoring of OD annual operational plans, introducing data visualization to support data use to build capacity for ongoing malaria control and elimination activities. PMI supported conducting training on diagnosis and treatment for health facility workers and VMWs, and enhanced support supervision at all levels to strengthen both the quality of care and routine reporting in the elimination target areas.

Progress during the last 12-18 months

PMI continued the implementation of the Model Elimination Package in Sampov Loun OD. This district has a population of 158,680 people living in 127 villages. There are nine health centers, one former district hospital, one referral hospital, 168 VMWs, and 32 private providers.

During the 2015-2016 period, out of total 348 cases reported (168 *P. falciparum*/mix +180 *P. vivax*), health facilities detected 224 cases (64%) and VMWs detected 124 (36%) cases. Of these cases, 293 (85%) were notified within one day, 279 cases (81%) investigated with the three-day period and 289 (84%) of the cases received response actions within the seven-day period. The

majority of cases (47%) were reported during the December-February period and the lowest number of cases was reported (13%) during the March-June period. Compared to the previous year, there was a 33% reduction of overall malaria cases observed in Sampov Loun OD and API was reduced from 3.26 in 2014-2015 to 2.17 in 2015-2016. The case reduction, mainly *P. falciparum*, was observed after AS-MQ was introduced in February 2016. A decrease in *P. vivax* infections was also noted.

Among 348 confirmed cases in 2015-2016, 300 cases were categorized as imported, 28 cases as indigenous and 20 cases marked as unclassified. These unclassified cases were those recorded during the first 2 weeks of July 2015 and had traveled out of Sampov Loun before the case investigation procedures were fully in place. It was also found that only 38 cases (12.6%) were imported to Sampov Loun from Thailand and the rest of the cases (87.4%) were imported from other provinces within Cambodia mainly from Pursat (18%), Preah Vihear (10%), Kampong Speu (10%), Battambang (5%), and Oddar Meanchey (5%). During the response actions of index cases, 1,126 people were screened and only 10 malaria cases identified (8 *P. falciparum* +2 *P. vivax*) among 322 co-travelers. No malaria cases were reported from household members and surrounding households screened suggesting that there is no peri-domestic transmission in Sampov Loun. Patient interviews conducted during the case investigations noted that most of the case-patients had visited other districts for the purpose of forest work (Oddar Meanchey, Pursat, and Preah Vihear) or agriculture (Battambang and Kampong Speu).

During the response actions, those who did not possess an ITN were provided an LLIN or LLIHN. In addition, IPC activities regarding proper and complete treatment and constant and correct use of nets were also conducted.

Table 11: Pre-Elimination Activities

Technical Area	Description of Activity	Geographic Coverage
Prevention	Provide LLINs for the static population and LLIHNs for the mobile and migrant workers.	Battambang and Pursat Province
Case management	Passive case detection through all health facilities both government and registered private providers and VMWs. Investigate all <i>P. falciparum</i> cases, employ directly observed therapy strategy and follow up cases up to seven days. During case investigation, family members and fever patients nearby and fellow travelers will be tested using RDT (reactive case detection). Support for implementation of single-dose primaquine for <i>P. falciparum</i> and primaquine radical cure for <i>P. vivax</i> , if policy in place.	Battambang and Pursat Province
SBCC	Conduct IPC and specific SBCC activities to make sure consistent use of ITNs among target communities, improve health-seeking behaviors among at-risk populations (migrant workers and mobile populations), improve compliance with medication, and increase awareness of risks related to artemisinin monotherapies.	Battambang and Pursat Province

SME	Individual case reporting of all malaria cases within one day, investigate within three days, and conduct response activities within seven days in elimination ODs. Strengthen aggregate case reporting in transmission reduction ODs. Report data through SMS system to health centers/OD office and compile for malaria information system/DHIS-2 system.	Battambang and Pursat Province
OR	<ol style="list-style-type: none"> 1. Test feasibility of new generations G6PD point-of-care test 2. Assessment of behaviors around malaria prevention among forest populations 3. Evaluate use of high sensitive RDTs in the context of case investigations in elimination areas 4. Feasibility of scale-up of radical cure treatment for <i>P.vivax</i> infections using new point-of-care G6PD tests 	Battambang and Pursat Province

Plans and justification

In line with the CNM's MEAF, PMI is planning to implement elimination-targeted interventions in a phased manner based on API, specifically improving the surveillance system and employing case investigation/foci investigation and appropriate response. In 2018, PMI will continue to implement the elimination program initiated in Battambang and consider expanding into Pursat Province. In addition, PMI will provide technical assistance to the CNM and build their capacity to plan, implement, manage, monitor and evaluate, and sustain malaria control and elimination efforts particularly at the OD level.

Proposed activities with FY 2018 funding :(\$0)

Since PMI supports Cambodia to implement a comprehensive model malaria elimination package and expansion in all supported areas, activities proposed under malaria elimination are listed in other sections. Please see entomological monitoring, ITN, diagnosis and treatment section, SM&E and OR sections for more details.

8. Operational research

NMCP/PMI objectives

The MEAF aims to strengthen operational research (OR) for malaria and set forth several activities to improve coordination and procedures. Priority research topics include new, sensitive field diagnostics, improved surveillance for malaria drug resistance, and scale-up of cost-effective personal prevention measures. The CNM plans to conduct the following activities: 1) review and finalize the Policies and Guidelines to Conduct Malaria Research in Cambodia; 2) name a focal point for coordinating all OR for malaria; 3) once guidelines are established, collaborate with partners to conduct trainings for all staff on research design and implementation; 4) establish a malaria research working group under the CNM research network

to review protocols and provide technical input and direction for the country's research agenda; and 5) require all partners to submit research data on a regular basis and share information widely to inform changes in strategy.

Progress since PMI was launched

PMI supported an evaluation of a third generation point-of-care RDT to assess G6PD deficiency. A point-of-care test that could safely guide treatment with primaquine both for the clearance of *P. falciparum* gametocytes, as well as for the prevention of relapses by *P. vivax*, will have tremendous programmatic implications. The third generation RDT had high sensitivity in detecting G6PD enzymatic activity of <30% comparable to the fluorescent spot test, which is the current laboratory standard³. This information confirmed the potential use of the product for use in radically curative regimens for *P. vivax* malaria, particularly in those with severe deficiency (i.e., men and homozygous women).

Progress during the last 12-18 months

WHO now recommends that a single low-dose of 0.25mg/kg primaquine (LDPQ) be given to patients with *P. falciparum* to reduce transmission without G6PD deficiency testing⁴. Given the presence of severe variants of G6PD deficiency (e.g., Vien Chang variant) in Cambodia and limited G6PD testing capacity at the peripheral level, Cambodia has not yet adopted either LDPQ or radical-cure primaquine therapy for *P. vivax* over safety concerns. To address those concerns, PMI supported the “Tolerability and safety of LDPQ for transmission blocking in symptomatic *P. falciparum*-infected Cambodians” study in 2015—2016. Preliminary results indicate that LDPQ is likely to be safe to administer without G6PD testing and deployment may be able to move forward. PMI plans to support the CNM's roll-out of LDPQ for *P. falciparum* cases coupled with monitoring of adverse events, starting in areas targeted for elimination (see Case Management section for more information).

Related to vector control, PMI supported a qualitative study in 2015—2016 to identify determinants of net preference and acceptability in Cambodia. Findings included “widespread antipathy for distributed LLINs” based on 1) small interior size, 2) low height, 3) polyethylene material (associated with hardness and discomfort), and 4) large mesh-hole size. This study will help inform future PMI LLIN procurements, as well as a planned Global Fund-supported study to assess utilization of LLINs.

³ Roca- Feltrer et al; PlosOne, 2014, Field Trial Evaluation of the Performances of Point-of-Care Tests for Screening G6PD Deficiency in Cambodia.

⁴ WHO Policy Brief on single-dose primaquine as a gametocytocide in *P. falciparum* malaria, January 2015

Table 12: PMI-funded operational research studies

Completed OR Studies				
Title	Start date	End date	Budget	Justification
Test performance of the CareStart® G6PD RDT	January 2013	December 2013	\$100,000	Initial evaluation of newly marketed test to screen for G6PD deficiency
Tolerability and safety of LDPQ for transmission blocking in symptomatic <i>P.falciparum</i> -infected Cambodians	February 2015	September 2016	\$150,000	Assists CNM in decision to deploy LDPQ as part of national policy
Qualitative study to identify determinants of net preference and acceptability in Cambodia	February 2015	December 2016	\$100,000	Gathering qualitative data to identify reported net usage practices and the characteristics and determinants of mosquito net preference and acceptability
Ongoing OR Studies				
Title	Start date	End date	Budget	Justification
n/a				

Plans and justification

Foci identification and investigation activities to date in Cambodia have revealed little to no onward transmission of *P. falciparum* in index or surrounding households using RDTs. It is unclear to what degree sub-patent infections contribute to transmission. As the country moves toward elimination, new tools may be required to detect and treat every person with parasitemia. The CNM has expressed interest in using more sensitive field diagnostics to identify such low-level parasitemias in elimination areas, and this is consistent with PMI's OR priorities.⁵

As such, PMI is proposing to determine the utility and applicability of using highly sensitive rapid diagnostic tests (hsRDTs) in a reactive case detection setting. These hsRDTs will be compared with conventional RDTs and PCR to determine whether these more sensitive tests identify infections that otherwise would have been missed by conventional RDTs. One objective will be to determine whether household or neighbor contacts have any risk of malaria, given the transmission dynamics in the region. A second objective is to determine whether hsRDTs could

⁵ *<https://www.pmi.gov/docs/default-source/default-document-library/tools-curricula/pmiorstrategicguidance.pdf?Sfvrsn=14>

improve case detection among co-travelers linked to an index case. It is only in this population that additional cases have been identified when conducting reactive case detection in our pilot elimination district. If hsRDTs do identify significantly more infections than conventional RDTs in this population, then this would likely be the preferred tool for use in this specific context.

The CNM's goals are to eliminate *P. falciparum* malaria by 2020 and *P. vivax* by 2025. As Cambodia becomes successful in its goals, *P. vivax* will become proportionately an increasing focus of malaria efforts, and radical cure treatment will be essential to achieve elimination. Improved point-of-care G6PD tests will likely be more widely available soon, as will new radical cure treatments. With FY 2018 funds, PMI will support testing the feasibility of the scale-up of new semi-quantitative point-of-care G6PD tests coupled with radical cure treatments for *P. vivax* to determine whether these tests can be safely and effectively used in a field setting.

Proposed activities with FY 2018 funding: (\$920,000)

- **Evaluate use of hsRDTs in the context of case investigations in elimination areas:** The test performance of hsRDTs in the setting of active case detection will be evaluated in comparison to conventional RDTs with PCR as the gold standard.(\$500,000)
- **Feasibility of scale-up of radical cure treatment for *P.vivax* using new point-of-care G6PD tests:** Pending the availability of a sensitive point-of-care test for G6PD deficiency, the feasibility of its use in peripheral health center and VMW settings will be evaluated prior to wide-scale implementation. (\$400,000)
- **Technical assistance for OR studies:** Two CDC TDYs are planned to provide technical assistance for monitoring and evaluation. (\$20,000)

9. Staffing and administration

One health professional serves as Resident Advisor (RA) to oversee PMI in Cambodia, representing USAID. In addition, one full-time Foreign Service National (FSN) works as part of the PMI team and another 50% of another FSN's time will be allocated to support 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 Deputy Director and thus the PMI RA reports to the USAID Health Office Deputy Director for day-to-day leadership, and work together as a part of a single interagency team. Technical expertise housed in Atlanta, Washington and the USAID/Regional Development Mission for Asia located in Bangkok complements PMI programmatic efforts.

The PMI RA is physically based within the USAID health office but is expected to spend approximately half of his/her time with and providing TA to the NMCP 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 2018 funding: (\$848,000)

- **Support for USAID/PMI Resident Advisor, including 1.5 FSNs, and in-country programmatic support and administrative costs. (\$838,000)**
- **Travel costs for Regional Development Mission Asia (RDMA)-based USAID/PMI Resident Advisor and FSN. (\$10,000)**

Table 1. Budget Breakdown by Mechanism

**President's Malaria Initiative – CAMBODIA
Planned Malaria Obligations for FY 2018**

Mechanism	Geographic Area	Activity	Budget (\$)	%
CMEP (new bilateral)	8 Operational Districts	Case management at the community level; ITN distribution; capacity building for in-country coordination and support to CNM and PHDs; SBCC community level implementation; national level SM&E strengthening; enhanced surveillance and monitoring and evaluation in elimination settings in target ODs	5,000,000	56%
CDC IAA	National	TDYs for entomology (2), monitoring and evaluation (2), and OR studies (2).	69,000	1%
TBD (Vector control)	Sentinel sites and residual foci	Entomological monitoring in selected sites	363,000	4%
TBD (LLIN durability)	Sentinel sites	LLIN durability monitoring	100,000	1%
GHSC-PSM TO2	National	Procurement of LLINs/LLIHNs, RDTs, ACTs to fill gaps in PMI supported areas and supply chain strengthening	1,250,000	14%
GHSC-PSM TO1	National	Support LMIS strengthening	200,000	2%
WHO umbrella grant	Sentinel sites	TES in sentinel sites	270,000	3%
TBD (OR studies)	National	Operational research studies	900,000	10%
USAID	National	Staffing, administration, and travel costs.	848,000	9%
Total			9,000,000	100%

Table 2. Budget Breakdown by Activity

**President’s Malaria Initiative – CAMBODIA
Planned Malaria Obligations for FY 2018**

Proposed Activity	Mechanism	Budget		Geographic Area	Description
		Total \$	Commodity \$		
PREVENTIVE ACTIVITIES					
VECTOR MONITORING AND CONTROL					
Entomologic monitoring and insecticide resistance management					
Entomologic monitoring	TBD	363,000	-	Sentinel Sites and Residual Foci	Focus on increasing capacity and range of surveillance for insecticide resistance; ad hoc entomological surveys to improve information on malaria transmission risk in particular residual foci and ecosystems.
Entomological technical assistance	CDC IAA	29,000	-	National	2 TDYs for entomologic support
Subtotal Ento monitoring		392,000	-		
Insecticide-treated Nets					

Procurement of LLINs/LLIHNs	GHSC-PSM (TO2)	500,000	500,000	National	Support for approximately 150,000 LLINs and LLIHNs (hammocks) for focus areas, filling potential gaps, and targeting migrant and mobile populations
Distribution of LLINs/LLIHNs	CMEP	200,000	-	8 Operational Districts	Support for distribution of LLINs (approximately \$1/LLIN & \$2/ LLIHN).
LLIN durability monitoring	TBD	100,000	-	Sentinel Sites	Continue support durability monitoring of LLINs (incl. physical durability and insecticide content) to inform timing of future LLIN procurements
Subtotal ITNs		800,000	500,000		
Indoor Residual Spraying					
		-	-		
Subtotal IRS		-	-		
SUBTOTAL VECTOR MONITORING AND CONTROL		1,192,000	500,000		
Malaria in Pregnancy					
Subtotal Malaria in Pregnancy		-	-		
SUBTOTAL PREVENTIVE		1,192,000	500,000		
CASE MANAGEMENT					
Diagnosis and Treatment					

Procurement of RDTs	GHSC-PSM (TO2)	200,000	200,000	8 Operational Districts	150,000 RDTs and microscopy supplies procured for focus areas for use by community level health volunteers with expansion to new operational districts. If G6PD RDTs are adopted, PMI will procure 30,000 to 40,000 G6PD RDTs for initial scale up.
Procurement of ACTs	GHSC-PSM (TO2)	50,000	50,000	8 Operational Districts	Procure ~17,000 ACTs or other first line treatment for use by community level health volunteers or workers; targeting migrant and mobile populations and to fill commodity gaps in public and private sector.
Case management at the community level, including implementation, training and supervision	CMEP	2,400,000	-	8 Operational Districts	Training and supervision of community based malaria case management activities both broadly and in relation to malaria elimination; includes specific case management practices for malaria in pregnancy
Quality assurance of case management in the private sector	CMEP	600,000	-	8 Operational Districts	Improve quality of private sector case management through medical detailing, monitoring and supervision; provision of malaria data to national surveillance system
TES Monitoring	WHO	270,000	-	Sentinel sites	For TES implementation costs and PfMDR and Kelch 13 propeller (K13) or other genetic marker backup testing to support drug policy decisions
Subtotal Diagnosis and Treatment		3,520,000	250,000		
Pharmaceutical Management					

Supply chain strengthening TA	GHSC-PSM (TO2)	500,000	-	National	Strengthening the pharmaceutical management systems, forecasting, quantification, management and distribution of pharmaceuticals and RDTs through National Quantification. Commodities distribution to PMI's target areas under CMEP
Strengthening the LMIS	GHSC-PSM (TO1)	200,000	-	National	Leveraging the investments of other U.S. Government programs and contribute to this broader effort to support strengthening and updating of Cambodia's LMIS system
Subtotal Pharmaceutical Management		700,000	-		
SUBTOTAL CASE MANAGEMENT		4,220,000	250,000		
HEALTH SYSTEM STRENGTHENING / CAPACITY BUILDING					
Capacity building for in-country coordination and support by CNM and PHDs	CMEP	300,000	-	National	Capacity building for CNM and PHDs/ODs to support oversight and management of control and elimination activities
SUBTOTAL HSS & CAPACITY BUILDING		300,000	-		
SOCIAL AND BEHAVIOR CHANGE COMMUNICATION					

SBCC community level implementation	CMEP	500,000	-	8 Operational Districts	Support for implementing effective SBCC approaches for both malaria control and elimination at community level (e.g., early detection and treatment of individual cases, conducting case notification, investigations, timely responses to cases, strategies to educate malaria patients on the importance of case follow-up and regimen adherence, etc. and ITN use) including piloting of innovative approaches to reach mobile and migrant populations, based on the findings of FY 2017 OR on mobile and migrant populations.
SUBTOTAL SBCC		500,000	-		
SURVEILLANCE, MONITORING, AND EVALUATION					
M&E strengthening	CMEP	200,000	-	National	Build capacity at PHD/OD level to collect, analyze and use data; transition to MIS2 platform, including software development and training.
Enhanced surveillance and M&E in elimination settings	CMEP	800,000	-	6 Operational Districts including Sampov Loun	Support for implementing case-based, real-time reporting system in elimination ODs, including training and use of electronic reporting. Includes costing of elimination-specific S, M&E activities
CDC technical assistance for M&E	CDC IAA	20,000	-	National	2 TDYs for M&E support
SUBTOTAL SM&E			-		

		1,020,000			
OPERATIONAL RESEARCH					
Evaluate use of hsRDTs in the context of foci identification/investigation.	TBD	500,000	-	National	Support evaluating the use of high-sensitive RDTs for foci identification/investigation in malaria elimination setting
Feasibility of scale up of radical cure treatment for <i>P.vivax</i>	TBD	400,000	-	National	Support conducting a study to understand the feasibility of scale up of radical cure treatment for <i>P.vivax</i>
CDC technical assistance for OR studies	CDC IAA	20,000	-	National	2 TDYs for OR studies
SUBTOTAL OR		920,000	-		
PRE-ELIMINATION					
SUBTOTAL PRE-ELIMINATION		-	-		
IN-COUNTRY STAFFING AND ADMINISTRATION					
USAID	USAID	838,000	-		USAID Resident Advisor, 150% Malaria FSN, in-country and regional travel, administrative costs.
RDMA FSN and RA travel	USAID	10,000	-		TA travel from RDMA

SUBTOTAL IN-COUNTRY STAFFING		848,000	-		
GRAND TOTAL		9,000,000	750,000		