

This Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. The final funding available to support the plan outlined here is pending final FY 2013 appropriation. If any further changes are made to this plan it will be reflected in a revised posting.



PRESIDENT'S MALARIA INITIATIVE



PRESIDENT'S MALARIA INITIATIVE

Greater Mekong Sub-Region

Malaria Operational Plan FY 2013

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ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AusAID	Australia's Aid Programme
BCC	Behavior change communication
BMGF	Bill and Melinda Gates Foundation
BVBD	Bureau of Vector-Borne Diseases, Thailand
CAP-Malaria	Control and Prevention of Malaria project
CDC	U.S. Centers for Disease Control and Prevention
CNM	National Centre for Parasitology, Entomology, and Malaria, Cambodia
DHA-Pip	Dihydroartemisinin and piperazine
FETP	Field Epidemiology Training Program
G6PD	Glucose-6-phosphate dehydrogenase
GHI	Global Health Initiative
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GMS	Greater Mekong Subregion
IEC	Information, education, communication
IRS	Indoor residual spraying
ITN	Insecticide-treated net
Lao PDR	Lao People's Democratic Republic
LLIHN	Long-lasting insecticide-treated hammock net
LLIN	Long-lasting insecticide-treated net
MARC	Myanmar Artemisinin Resistance Containment Project
M&E	Monitoring and evaluation
MMP	Mekong Malaria Programme
MOH	Ministry of Health
MOP	Malaria Operational Plan
MOPH	Ministry of Public Health (of Thailand)
NGO	Nongovernmental organization
NMCP	National Malaria Control Program
OR	Operations research
PMI	President's Malaria Initiative
PSI	Population Services International
RDT	Rapid diagnostic test
RMIF	Regional Malaria Indicator Framework
USAID	United States Agency for International Development
USG	United States Government
USP	United States Pharmacopeia
VBDC	Vector-borne Disease Control Program, Burma
WPRO	Western Pacific Regional Office
WHO	World Health Organization

EXECUTIVE SUMMARY

Malaria prevention and control is a major foreign assistance objective of the U.S. Government. In May 2009, President Barack Obama announced the Global Health Initiative, a six-year, comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through the Global Health Initiative, the United States will invest \$63 billion over six years to help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns, and children.

The President's Malaria Initiative (PMI) is a core component of the Global Health Initiative, along with HIV/AIDS, and tuberculosis. PMI was launched in June 2005 as a 5-year, \$1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2008 Lantos-Hyde Act, funding for PMI has now been extended through fiscal year (FY) 2014. Programming of PMI activities follows the core principles of the Global Health Initiative: encouraging country ownership and investing in country-led plans and health systems; increasing impact and efficiency through strategic coordination and programmatic integration; strengthening and leveraging key partnerships, multilateral organizations, and private contributions; implementing a woman- and girl-centered approach; improving monitoring and evaluation; and promoting research and innovation.

In line with the 2009 Lantos-Hyde Malaria Strategy, PMI support extends to the Greater Mekong Sub-Region (GMS), which is made up of six countries: Burma, Cambodia, China (Yunnan Province), Lao People's Democratic Republic, Thailand, and Vietnam. Although considerable progress has been made in malaria control in the GMS during the past 10 years, malaria remains a major concern for the international community, ministries of health, and the people of the region. This is due primarily to the development and possible 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 has now been confirmed in western Cambodia; failures in artemisinin-based combination therapy (ACT) 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 from the Thailand-Burma and Burma-China borders and in southern Vietnam.

The U.S. Government has supported malaria control efforts in the GMS since 2000. These regional efforts have focused on antimalarial drug resistance monitoring and drug quality surveillance. All countries in the GMS have Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) support. Burma and Cambodia received Round 9 Global Fund malaria grants, and Thailand's Round 10 malaria grant has been approved. The other major source of funding for artemisinin resistance containment in Burma is the multidonor initiative, Three Millennium Development Goal Fund, formerly known as the Three Diseases Fund.

The FY 2013 PMI Malaria Operational Plan for the GMS was developed with the Regional Development Mission for Asia during a planning visit in April 2012 by representatives from U.S. Agency for International Development, the U.S. Centers for Disease Control and Prevention, and the national malaria control programs of Burma, Thailand, and Cambodia, with the participation of other major partners working on malaria in the area.

The PMI GMS program differs in two important ways from PMI Africa country programs. First, it primarily focuses control efforts in areas of known or emerging artemisinin resistance. In addition, it is a regional program covering to a lesser or greater extent all the countries in the GMS. The distinctive nature of this program is highlighted in the FY 2013 Malaria Operational Plan, which includes support for regional/cross-cutting activities, such as surveillance for antimalarial drug resistance and antimalarial drug quality monitoring, but also focuses on activities to reduce malaria transmission in geographically-focused cross-border areas with emerging artemisinin resistance, as a means of reducing the burden of malaria and eliminating the resistant parasite from these high-risk areas. These cross-border focus areas will be centered on the Tanintharyi-Ranong border areas of Burma and Thailand and the Trat-Pailin border areas of Thailand and Cambodia. PMI will also consider supporting malaria control implementation activities in other target areas within the three focus countries where there is evidence of confirmed or emerging artemisinin resistance including Kayin, Kachin, Bago, Mon, and Shan States in Burma; Tak, Chiang Rai, and Kanchanaburi Provinces in Thailand; and the western and eastern districts of Cambodia bordering Thailand and Vietnam, including Mondulkiri and Snoul. The proposed FY 2013 PMI activities are in line with the national malaria control strategies of the six countries and are intended to complement ongoing Global Fund malaria grants, containment specific projects, and contributions from other donors.

Vector control: Malaria transmission in the GMS is closely associated with two malaria vectors that inhabit the forest and forest fringe, *Anopheles dirus* and *An. minimus*. Insecticide resistance is not a major problem for these two vectors, and most studies suggest that insecticide-treated nets (ITNs) can provide at least some protection. Bed net ownership appears to be quite high, especially in Burma and Cambodia compared to Thailand, but most of those nets are untreated. Considerable numbers of long-lasting ITNs targeted for townships along the borders between Burma and Thailand and Thailand and Cambodia are included in their respective Global Fund Round 9 and Round 10 grants.

With FY 2013 funding, PMI will procure approximately 300,000 long-lasting insecticide-treated nets (LLINs)/ hammock nets/ retreatment kits to fill gaps in Global Fund grants in the cross-border focus areas identified above and develop innovative behavior change communication approaches to improve use. PMI will also provide support to entomological services in the region, in response to the changing vector ecology and the challenge of outdoor transmission. Indoor residual spraying is mostly limited to outbreak response and is not a key activity in national malaria control strategies for any of the GMS countries. Therefore, no PMI funds will be targeted for indoor residual spraying in the sub-region.

Malaria in Pregnancy: While intermittent preventive treatment for pregnant women is not part of national policies for any country in the sub-region, 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. PMI will support a review of country malaria in pregnancy practices and develop policies and tools to strengthen malaria case management and prevention activities through antenatal clinics.

Case management: In all countries making up the GMS, diagnosis of malaria is based on laboratory tests with microscopy (which is preferred at health facilities), or rapid diagnostic tests (RDTs), particularly at community level. Although all countries in the sub-region recommend ACTs as the first-line treatment of *P. falciparum* infections, artemisinin resistance has been

confirmed on the Thai-Cambodian border and early evidence of developing resistance has been reported from several other sites in the subregion. Case management of malaria in the GMS is further complicated by the fact that *P. vivax* and *P. falciparum* are both relatively common. Chloroquine is the drug of choice for the treatment of *P. vivax* infections except for Cambodia, although reports of *P. vivax* resistance to chloroquine are emerging from the sub-region. Another problem in the sub-region is the widespread availability of counterfeit and substandard antimalarial drugs, especially artemisinin drugs, and artemisinin monotherapy. With U.S. Government support, considerable progress has been made in recent years in establishing effective drug quality monitoring in the sub-region, but engagement with Burma and China has been limited to date.

RDT and ACT needs in Burma, Cambodia, and Thailand are anticipated to be met by those countries' Global Fund grants; however, stockouts have been happening more frequently due to bottlenecks in Global Fund procurement. With FY 2013 funding, PMI will procure small quantities of RDTs, microscopes, and microscopy supplies to fill gaps and strengthen laboratory capacity in the cross-border focus areas. PMI will also procure ACT treatments to fill any gaps in Burma and Cambodia. Because of concerns about the quality of malaria diagnosis and treatment in these border areas, PMI will support in-service training and quality assurance of the parasitological diagnosis of malaria. In addition, PMI will continue support to national pharmaceutical reference laboratories to ensure they have the capacity to carry out pre- and post-marketing surveillance of drug quality.

Strategic Information: Monitoring and evaluation (M&E), Surveillance, and Operational Research: The quality of malaria case detection and reporting systems varies widely within the GMS. In the context of malaria elimination, timely reporting can inform policy decisions and focus resources towards outbreak areas or in geographical regions harboring resistant malaria strains. Development of optimal case detection and reporting capabilities would include determining meaningful surveillance metrics that include discernment of resistant cases and capturing timeframes for analysis and responses to surveillance indicators. U.S. Government funding for M&E during the past several years has focused on building a regional malaria M&E framework, updating national M&E plans, and capacity development.

In FY 2013, PMI will focus efforts within the cross-border focus areas to implement systems and practices to foster timely collection of quality surveillance and periodic survey data, and continue to collect data on day 3–malaria-positive case reports at the community level to better target intensified control efforts in the cross-border focus areas. At the national level, PMI will help all national malaria control programs develop one national M&E plan, support national/ sub-national malaria surveys, and build M&E capacity within their national programs. PMI will continue to support drug resistance and therapeutic efficacy monitoring in all six GMS countries. Entomologic surveillance will focus geographically on cross-border areas and functionally at further identifying critical opportunities to interdict transmission risks specific to the Mekong region. Other operational research activities to be supported with FY 2013 funding will include exploring the efficacy of spatial protection measures e.g. dichlorvos or C8910, a short-chain fatty acid-based spatial/area repellent, to protect from outdoor and early biting vector mosquitoes.

The PMI team proposes that the FY 2013 GMS budget of \$12 million be allocated across countries as follows: 45% to Burma, 23% to Cambodia, 5% to border areas in Thailand, and

27% for regional support activities that includes targeted support to the other three countries. These proportional allocations may change during the course of program implementation due to unanticipated requirements or the need to rapidly respond to changing epidemiology.

INTRODUCTION

Global Health Initiative

Malaria prevention and control is a major foreign assistance objective of the U.S. Government (USG). In May 2009, President Barack Obama announced the Global Health Initiative (GHI), a six-year, comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through the GHI, the United States will help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns and children. The GHI is a global commitment to invest in healthy and productive lives, building upon and expanding the USG's successes in addressing specific diseases and issues.

The GHI aims to maximize the impact the United States achieves for every health dollar it invests, in a sustainable way. The GHI's business model is based on: implementing a woman- and girl-centered approach; increasing impact and efficiency through strategic coordination and programmatic integration; strengthening and leveraging key partnerships, multilateral organizations, and private contributions; encouraging country ownership and investing in country-led plans and health systems; improving metrics, monitoring and evaluation; and promoting research and innovation. The GHI will build on the USG's' accomplishments in global health, accelerating progress in health delivery and investing in a more lasting and shared approach through the strengthening of health systems.

President's Malaria Initiative

The President's Malaria Initiative (PMI) is a core component of the GHI, along with HIV/AIDS, and tuberculosis. PMI was launched in June 2005 as a 5-year, \$1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2009 Lantos-Hyde Act, funding for PMI has now been extended through FY 2014 and an updated USG Lantos-Hyde Malaria Strategy has been developed for the period 2009-2014. As part of the GHI, the goal of PMI in sub-Saharan Africa has been adjusted to halve the burden in 70% of the at-risk population in the original 15 countries by the end of 2015. This will be achieved by continuing to scale up coverage of the most vulnerable groups — children under five years of age and pregnant women — with proven preventive and therapeutic interventions, including artemisinin-based combination therapies (ACTs), insecticide-treated nets (ITNs), intermittent preventive treatment of pregnant women, and indoor residual spraying (IRS). In addition, PMI will work to limit the spread of antimalarial drug resistance in two USAID-supported regional programs, the Mekong Regional Initiative in six Southeast Asian countries and the Amazon Malaria Initiative in seven South American countries.

Malaria Operational Plan

This FY 2013 Malaria Operational Plan (MOP) presents a detailed implementation plan for the Greater Mekong Sub-Region (GMS), comprising six countries: Burma, Cambodia, China (Yunnan Province), Lao People's Democratic Republic (PDR), Thailand, and Vietnam. It was developed in consultation with the Burma, Thailand, and Cambodia National Malaria Control Programs (NMCPs) and with the input of multiple national and international partners involved with malaria prevention and control in the sub-region. The activities that PMI is proposing to

support with FY 2013 funding contribute to the countries' national malaria control strategies and plans, and build on malaria investments made by the USG in the sub-region since 2000.

PMI's GMS program differs from PMI's Africa malaria programs both in its regional focus and its primary goal: respond to artemisinin resistance. PMI GMS recognizes that this goal stems from evidence of artemisinin resistance in the sub-region; as a response to this problem, PMI's strategy is to implement malaria control and prevention interventions in selected geographic areas with emerging artemisinin resistance along the Thai-Cambodia and Thai-Burmese borders.

Therefore, the FY 2013 MOP for the GMS includes support to both cross-cutting regional activities, such as surveillance for antimalarial drug resistance, antimalarial drug quality monitoring, and regional capacity building, as well as targeted malaria prevention and control activities with a country-specific focus. (See Goals and Targets of PMI in the GMS for detailed discussion on PMI strategy and objectives.) Support for prevention and control activities in the GMS includes distribution of long-lasting ITNs (LLINs) to protect against indoor-biting mosquitoes; testing interventions for those at risk of outdoor transmission; behavior change communication (BCC) to reinforce personal protection efforts as well as appropriate case management in private and public sectors; entomological monitoring to identify when and where infective bites occur; and surveillance for drug quality and therapeutic efficacy, especially in areas with emerging artemisinin resistance.

The cross-cutting regional activities will benefit all six countries making up the GMS, depending on access and other sources of funding. Country-level work plans will be developed for Burma, Thailand, and Cambodia to ensure that activities are coordinated to achieve maximum impact. Given the burden of malaria and the threat of artemisinin resistance in the GMS, the focus of the country-specific, community intervention activities will be centered on the Tanintharyi-Ranong border areas of Burma and Thailand and the Trat-Pailin border areas of Thailand and Cambodia. Although these selected cross-border focus areas are the geographic areas in the GMS of greatest concern for artemisinin resistance, there are emerging sites along the Burma-Thailand and Cambodia-Thailand borders with resistance. Therefore, PMI will also consider supporting other target areas within the three focus countries where there is evidence of confirmed or emerging artemisinin resistance including Kayin, Kachin, Bago, Mon, and Shan States in Burma; Tak, Chiang Rai, and Kanchanaburi Provinces in Thailand; and the western and eastern provinces/districts of Cambodia bordering Thailand and Vietnam, including Mondulkiri and Snoul. In coordination with NMCP strategies and other donor efforts, PMI will concentrate its commodity investments as well as additional monitoring and evaluation (M&E) resources in the cross-border focus areas to ensure access to quality malaria prevention and curative services. Commodity support will aim to fill gaps in all cross-border focus areas, but the need is likely to be greatest in Burma.

This document briefly reviews the current status of malaria control policies and interventions in the GMS, describes progress to date, identifies challenges and unmet needs if the targets of the NMCPs and PMI are to be achieved, and provides a description of planned FY 2013 activities.

NATIONAL MALARIA CONTROL PROGRAMS¹ AND THE MALARIA SITUATION

GMS

Malaria control in the GMS faces many challenges different from those in the African context. The sub-region is the epicenter of the world's most severe drug resistance. Chloroquine resistance developed in the sub-region in the late 1950s, followed by resistance to sulfadoxine-pyrimethamine, mefloquine, and decreased sensitivity to quinine. The emergence of artemisinin resistance on the Thai-Cambodia border, the same area where chloroquine resistance emerged 50 years ago, is of great concern as this is the last remaining efficacious antimalarial drug for *Plasmodium falciparum* worldwide. Beyond drug resistance, NMCPs in the sub-region face several related challenges including a vibrant private sector with an abundance of substandard and counterfeit medicines; migrant and mobile populations; vulnerable and remotely settled ethnic minorities; poor public health infrastructure; weak surveillance, monitoring and evaluation systems; civil strife; and occasional cross-border conflicts.

While it is imperative that countries in the GMS work together on cross-border issues and sharing of information, bringing the countries of the GMS together through the traditional mode of a World Health Organization (WHO) regional office is problematic as the sub-region is split into two separate WHO regions (Southeast Asia Regional Office and Western Pacific Regional Office [WPRO]). Through the development of Roll Back Malaria (RBM)-Mekong and later, the Mekong Malaria Programme (MMP), the U.S. Agency for International Development has supported an innovative biregional approach to the sub-region. The MMP is coordinated by WHO staff based in Bangkok reporting to both regional offices in New Delhi, India, and Manila, Philippines. The MMP “aims to facilitate the implementation and monitoring of a comprehensive *MMP Malaria Strategy* endorsed by national authorities and stakeholders to address common Mekong challenges in order to further impact malaria morbidity and mortality.”²

The key malaria control strategies and policies of the countries comprising the GMS are listed in Table 1.³ All countries in the GMS now recommend ACTs for first-line treatment of *P. falciparum*.

¹ Malaria in the Greater Mekong Subregion: Regional and Country Profiles. WHO 2010

² Strategic Plan to Strengthen Malaria Control and Elimination in the Greater Mekong Subregion: 2010–2014. A Mekong Malaria Programme Partnership Initiative Working Document, Dec 2009. WHO

³ Malaria in the Greater Mekong Subregion: Regional and Country Profiles. WHO 2010

Table 1. Key national strategies and policies in malaria control

	Burma	Cambodia	China	Lao PDR	Thailand	Vietnam
Year treatment and diagnosis guidelines were most recently updated	2008	2012	2009	2011	2011	2009
First-line treatments for <i>P. falciparum</i>	AL; AS+M; DHA-Pip	DHA-Pip; AS+M; AP in Pailin	DHA-Pip; AS+AQ; ART+ naphthoquine; ART+PIP (Pip mono as chemoprophylaxis)	AL	AS+M; AP (Zone 1)	DHA- Pip
Antigametocytocidal treatment	45 mg PQ	45 mg PQ with testing or when safety data available			30 mg PQ	30 mg PQ
First-line treatments for <i>P. vivax</i>	CQ+PQ	DHA-Pip + PQ 45mg Qwk x 8 weeks	CQ+PQ	AL	CQ+PQ	CQ+PQ
Number of antimalarial drug resistance monitoring sites	10	5	3 (currently inactive)	3	9	5
Number of insecticide resistance monitoring sites	1	4	N/A	10	2	>10
AL- artemether-lumefantrine; AS- artesunate; M- mefloquine; DHA- dihydroartemisinin; Pip- piperazine; CQ- chloroquine; PQ- primaquine; AQ- amodiaquine; AP- Atovaquone- proguanil; SP- sulfadoxine-pyrimethamine						

The malaria situation across the GMS is very complex and ranges from countries on track for malaria elimination to countries that are just beginning to scale up malaria control activities. Unlike most sub-Saharan African countries, the GMS must contend with multiple parasite species, with *P. vivax* more prevalent in some countries, numerous vector species that are not traditionally endophilic (biting inside structures), and most importantly, multidrug resistance. Much of the malaria burden in the sub-region is concentrated along border areas and in forest or forest-fringe areas where the region's most efficient vector, *Anopheles dirus*, exists. Approximately three-quarters of the reported cases in the GMS occur in Burma. The annual figures shown in the table below reported by the NMCPs to WHO for the sub-region probably underestimate the true burden of malaria as it captures data only from the public sector.

Table 2. Malaria burden in the GMS (public sector data)

	Estimated population residing in malaria-endemic areas (millions)	Probable and confirmed malaria cases	Confirmed cases	Percent (%) <i>falciparum</i>	Inpatient malaria deaths	Artemisinin resistance (suspected and confirmed)
Burma	40.7	649,522	420,808	69	788	Suspected
Cambodia*	3.2	103,439	93,323	63	151	Confirmed (western border)
China (Yunnan)	35.5	2277	631	28	3	Suspected
Laos	2.6	23,047	20,800	97	24	None detected
Thailand	2.8	22,969	22,969	41	80	Confirmed (west and east borders)
Viet Nam	15.5	54,297	17,515	73	21	Confirmed in Binh Phuoc and suspected in Giai Lai
Source: WMR 2011; *2010 NMCP data						

Over the past decade, GMS countries have made tremendous progress in reducing the number of malaria cases and deaths. From 1998 to 2010, the six countries have collectively reported an 81% reduction in the annual number of deaths attributed to malaria. Multiple factors have contributed to this reduction. Governments and partners have made malaria control a priority by increasing investments, successfully garnering international funding, strengthening political will, integrating malaria control efforts into national health systems, and intensifying cross-border collaboration. It is also likely that environmental changes such as deforestation, economic development, demographic stabilization, greater political stability, and improved coverage of basic health services have had an impact on malaria morbidity and mortality in the GMS.⁷

Burma

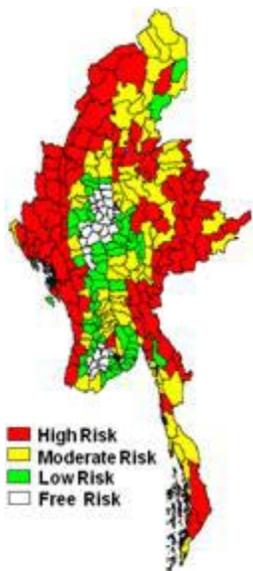
Among the six Mekong countries, the malaria burden is highest in Burma, where it remains a leading cause of morbidity and mortality. Burma has a National Strategic Plan⁴ for 2010 – 2015 that sets malaria control goals to achieve the Millennium Development Goals. Approximately 68% of the population is thought to be at risk for malaria, with the highest risk areas concentrated near international borders. Malaria occurs mostly in and near forested areas and disproportionately affects men aged 15–54 years. Migrant workers involved in logging, mining in the mountains and forests, and agriculture, plantations, and construction in the forest-fringe areas are at especially high risk. While the number of malaria deaths has decreased in the past decade, the number of reported cases has not. These data need to be interpreted with caution, however, as the number of cases confirmed by microscopy and especially rapid diagnostic tests (RDTs) has increased tremendously. Furthermore, reported data represent only the public sector and are thought to reflect only 25 -40% of the total burden. In 2010, with 649,522 reported outpatient and inpatient cases, the true burden may have been over 2 million cases, since only approximately 25% of sick persons seek care in the public sector. Areas of concern for artemisinin resistance have been identified within Burma through ongoing drug resistance monitoring. Kawthoung, which is located in Tanintharyi Division neighboring Ranong Province in Thailand, has noted both increased failure rates to ACTs and increased proportion of patients with delayed parasite clearance (increased day 3–positive blood smears).

National malaria control efforts in Burma are implemented by the Vector-Borne Disease Control (VBDC) Program within the Department of Health located in the Ministry of Health (MOH). The VBDC is aided by a Malaria Technical Advisory Group which has evolved into the Malaria Technical and Strategy Group. The core group of the Technical and Strategy Group consists of VBDC, WHO, United Nations Children’s Fund, and the Japan International Cooperation Agency.

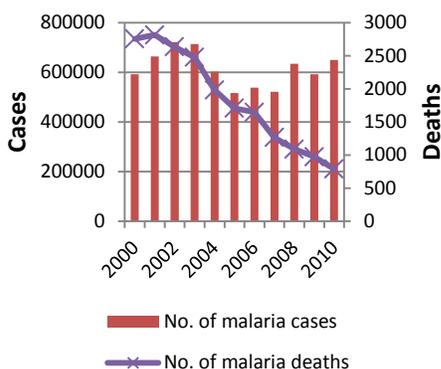
A key challenge faced by the VBDC in Burma has been a lack of resources. Burma ranks among the lowest in the world in per capita health expenditures, and, while the program promotes sound, comprehensive approaches to malaria control, it lacks sufficient resources to implement those plans. Following termination of the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) Round 3 support, the Three Diseases Fund — multi-donor trust fund consisting of European Commission, UK Department for International Development, Australia’s Aid Programme (AusAID), Norway, Netherlands, and Sweden — was established in August 2006. The Three Diseases Fund has contributed approximately \$4 million per year over the past several years to malaria control, allowing the program to successfully implement case management and preventive programs in limited areas. Although the Three Diseases Fund is coming to an end, the seven-donor consortium will contribute to a new Three Millennium Development Goal (3MDG) Fund that will include some investments in malaria. With the Global Fund Round 9 grant, Burma’s National Malaria Control Program will expand access to parasitological diagnosis and treatment with ACTs. The program works at the community level through a network of village health volunteers who carry out either preventive measures only (e.g., BCC, mass treatment of mosquito nets, and distribution of LLINs) or prevention measures and case management in villages where access to health facilities is very difficult.

⁴ National Strategic Plan for Malaria Prevention and Control, Union of Myanmar, 2010–2015

These additional resources will allow the program to continue to protect at-risk populations with ITNs/LLINs. The program’s objective is to ensure that 80% of the population in moderate- to high-risk areas is protected with ITNs/LLINs. The use of IRS was halted in the early 1990s; however, the program continues to promote its selected use in situations such as outbreaks or new development projects.



**Burma Malaria Cases and Deaths
2000–2010**

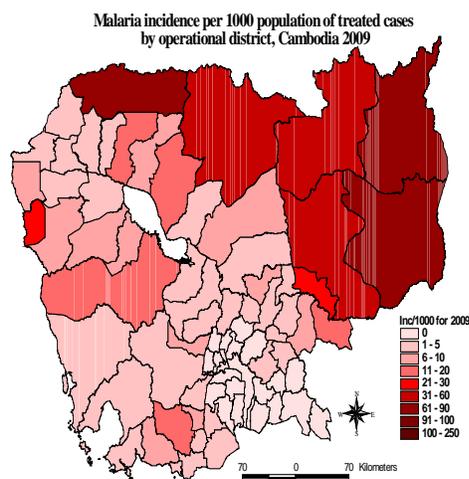


Cambodia

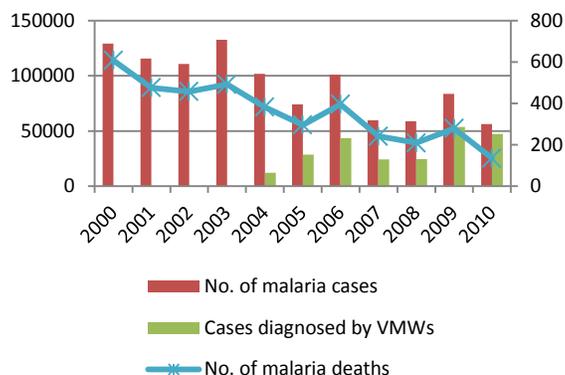
Decades of civil war, including the brutal genocide and systematic destruction of infrastructure under the Khmer Rouge regime left Cambodia with a limited health infrastructure, particularly in rural areas; however, over the last decade, many of Cambodia’s key health indicators have improved as the country’s economy has developed. Malaria nevertheless remains a major contributor to the public health and economic burden in Cambodia, with a reported incidence in the public sector of 4.3 cases per 1,000 persons in 2011. Various surveys have reported 67-80% of sick persons (68% in the 2010 Cambodia Malaria Indicator Survey) seeking treatment in the private sector; thus at least 300,000 to 400,000 new cases of malaria could be treated in the private and informal sector annually. Eighty percent of the population lives in areas without malaria transmission, but around 20% (approximately 2.89 million people) either live permanently in the forested endemic areas or are “forest dependent” for additional income. The 2010 national survey estimated a malaria prevalence of 0.9% in high-risk areas (<2km from the forest), a significant reduction from the 2.9% reported in 2007. Transmission is seasonal in the forest and forest-fringe areas of the north, west and northeast, and also in the rubber plantations of the east and northeast. Development of cassava, corn, and fruit orchards, where migrant workers are common, have contributed to favorable conditions for local malaria vectors. In the rice-growing areas of the south and central regions, transmission is low or nonexistent. There is no transmission in urban areas. Low intensity transmission is found locally in coastal areas. According to the health management information system (HMIS), confirmed malaria is predominantly observed in males aged 15-49 years (51%). Both malaria morbidity and mortality rates have declined over the last decade due to increased government commitment together with substantial additional financial and technical support from the international community.

The National Centre for Parasitology, Entomology, and Malaria, formally referred to as the National Malaria Centre (CNM), sits within the MOH of the Royal Government of Cambodia. The leadership of the malaria control activities within Cambodia rests at the central level; however, with the decentralization of the MOH, provincial health department and operational district malaria supervisors are involved with planning and implementing activities. Participation of village malaria workers (VMWs), village health volunteers, and local authorities helps improve the availability and accessibility of malaria services, including early diagnosis and treatment, LLIN distribution, and malaria health education.

The national case management policy in Cambodia is to ensure access to quality diagnosis and treatment of positive cases with the ACT dihydroartemisinin-piperaquine (DHA-Pip), which has been made available countrywide in public health facilities and through trained VMWs. ACTs are used to treat both falciparum and vivax malaria. In response to the reduced efficacy of DHA-Pip, newly revised national treatment guidelines authorize the use of Malarone in Pailin (Zone 1). The use of single-dose primaquine to block transmission of primaquine has been temporarily put on hold in the absence of safety data or a point-of-care glucose-6-phosphate dehydrogenase (G6PD) test. Malarone is provided as directly observed therapy. The burden of malaria among mobile, migrant, and cross-border populations remains high and presents a huge challenge for prevention and control. Monotherapies are still found in the unregulated private sector in Cambodia, despite efforts to ensure availability of high-quality antimalarials. With the increased resources associated with successful Global Fund grants, overall ITN ownership improved from 43% in high-risk areas in 2007⁵ to 75% in 2010.⁶ Cambodia has drafted a new strategic plan following the Prime Minister’s announcement that Cambodia will seek to eliminate malaria by 2025.



Cambodia Malaria Cases and Deaths 2000–2010



⁵ Cambodia National Malaria Survey, 2007

⁶ Cambodia National Malaria Survey, 2010

Thailand

Malaria cases occur mainly in the border provinces, especially near the Burmese border. The groups at risk for malaria in Thailand consist of migrants, mobile populations, refugees in camps, those spending nights in the forest. Ethnic minority groups are particularly affected. In 2009, Thailand reported a higher number of cases amongst foreigners than Thai nationals. Between 2001 and 2010, Thailand noted a drop in the number of cases from 63,528 to 32,480 and deaths from 848 to 80.

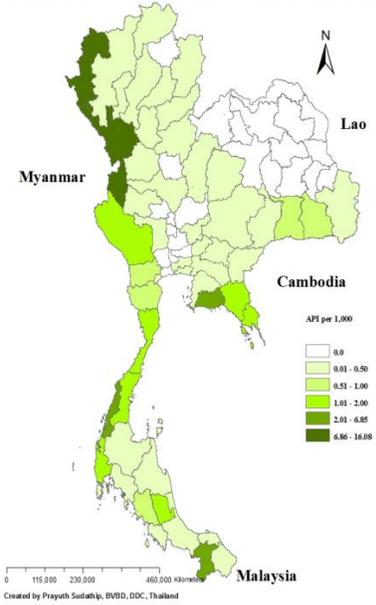
The Thai NMCP is located within the Bureau of Vector-Borne Diseases (BVBD), Department of Disease Control, within the Ministry of Public Health (MOPH). The program operates vertically in areas where malaria transmission still occurs. In areas where indigenous transmission has been eliminated it provides only technical assistance, and programmatic responsibilities have been transferred to provincial public health offices. The National Strategic Plan for Malaria Control and Elimination 2011–2020 seeks to free 80 percent of the country from malaria transmission by the year 2020.

The country has done an excellent job of extending diagnostic services to endemic areas through malaria clinics and posts. The staff in these facilities use either microscopy or RDTs. Patients testing positive for falciparum malaria are treated with mefloquine and artesunate per national policy and with Malarone in select zones of the artemisinin-resistance containment project. In both these settings, a single dose of primaquine is provided for gametocytocidal effect without prior G6PD testing.

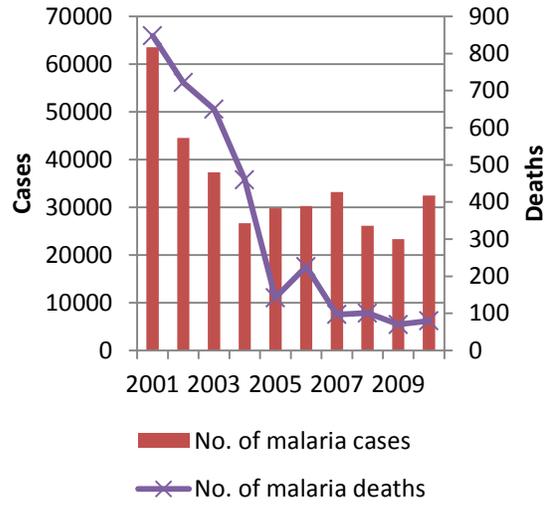
With Global Fund Round 10 support, the BVBD will continue containment activities and expand their focus beyond the Thai-Cambodian border to include the Thai-Burma border. Round 10 support will increase LLIN coverage to 100% (approximately two persons per LLIN) among Thai citizens and long-term non-Thai residents. In addition, LLINs for short-term non-Thai residents will be provided when the person presents at a clinic with fever. Long-lasting insecticide-treated hammock nets (LLIHNS) and repellents will also be provided to special at-risk populations. In the event of a documented local focus of infection, the NMCP plans to conduct limited IRS in the areas near the index cases.

Other important components of the Thai national strategy include a comprehensive approach to migrant and mobile populations; enhanced information, education, communication (IEC)/BCC activities; operations research (OR); and intensified surveillance and M&E. *In vivo* antimalarial drug efficacy studies have identified additional sites in Thailand with an increased proportion of day-three-positive blood smears and increased ACT failure rates at day 28. These sites include Ranong, Kanchanaburi, Tak, and Mae Hong Son, all located along the border with Burma.

Annual Parasite Incidence (per 1,000), 2009, Thailand

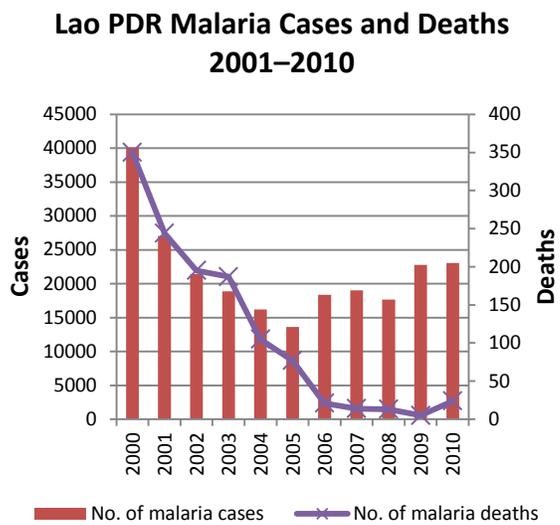
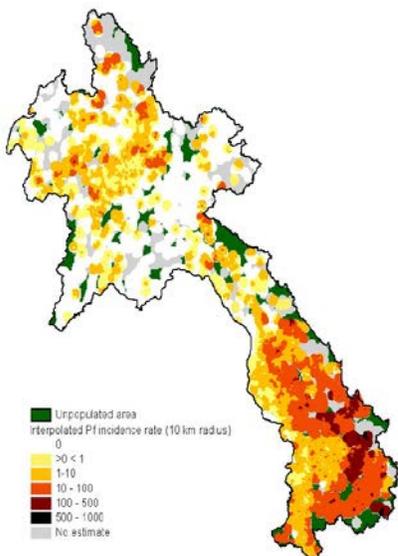


Thailand Malaria Cases and Deaths 2001-2010



transmission in remote, hilly and forested areas. *P. falciparum* is the predominant species, accounting for 95% of all recorded malaria cases, although recent surveys suggest a *P. vivax* prevalence rate of around 25%. Transmission is perennial but with large seasonal and regional variations. Groups at greatest risk include ethnic minorities, forest and agricultural workers, miners, and children below the age of five years. Significant reductions in malaria transmission have been reported since the large-scale introduction of ACTs and ITNs, in conjunction with socioeconomic and environmental changes. The annual number of uncomplicated malaria cases (probable and confirmed) fell from 40,106 in 2000 to 20,800 cases in 2010 and the number of malaria deaths in hospitals dropped from 350 in 2000 to 24 in 2010. However, the influx of seasonal workers of mainly Vietnamese origin has led to alarming increases of reported malaria cases in southern and eastern provinces bordering Vietnam.

Although the public health system in Laos predominates, a private system is growing, especially in peripheral areas. The Lao National Strategic Plan for malaria control and pre-elimination 2011–2015⁸ aims to intensify malaria control efforts, targeting remaining endemic communities and key risk groups and progressively rolling out malaria elimination in selected provinces. Malaria control activities in Laos are managed by the Ministry of Health’s Centre for Malaria, Parasitology, and Entomology. Much of the support has focused on distribution of ITNs/LLINs, reaching vulnerable ethnic minority groups, and implementing diagnosis and treatment with artemether-lumefantrine (AL). Recent data show that 89% of patients with malaria received a parasitological diagnosis and were treated with an ACT. The center, with current Global Fund grant support, is in process of scaling up LLIN coverage with a projected target of reaching 3.6 million persons at risk for malaria.

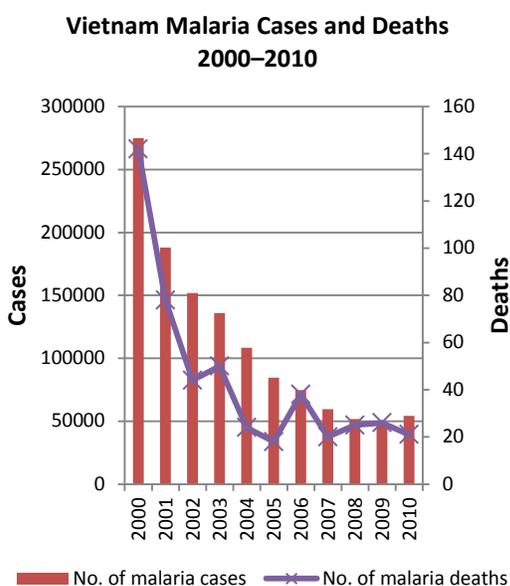


⁸ National Strategy for Malaria Control and Pre-elimination 2011–2015. Lao People’s Democratic Republic, Ministry of Health.

Vietnam

Malaria occurs in remote forest and forest fringe communities, which are often inhabited by marginalized groups, including ethnic minorities and migrant settlers. ITNs have been distributed in all endemic villages with a coverage estimated by the NMCP to be 70%. The program retreats approximately four to five million bed nets each year. In addition to this, the NMCP uses IRS to cover an additional two million people residing in hyper-endemic areas, where the culture of using ITNs is weak. The burden is concentrated at the border areas of Cambodia and Lao PDR. Vietnam has reduced malaria cases and deaths from 274,910 to 54,297 and from 142 to 21, respectively, between 2000 and 2010.

The National Institute for Malariology, Parasitology, and Entomology rests within the Ministry of Health. Since the government changed strategies from eradication to control in the early 1990s, it began to prioritize interventions toward case management, prevention (ITNs and IRS), and health education. The institute recently drafted a National Strategy for Malaria Control, Prevention, and Elimination in Vietnam through 2020 with the goals of continuing to roll back malaria in meso- and hyper-endemic areas and implementing a step-by-step malaria elimination strategy in the low transmission areas. The strategy has been endorsed by the prime minister.



CURRENT STATUS OF MALARIA INDICATORS

Although some of the standard indicators adopted in the GMS differ from those in Africa, several indicators, mostly measuring net ownership and use, remain applicable to this sub-region. The following table shows the most recent figures for the standard indicators being used by PMI, where survey data are available:

Table 3. National and subnational survey data for GMS countries

Indicator	Burma (Chin, Kachin, Sagaing 2008)	Cambodia (CMS 2010)	Cambodia (MCC 2011)	Lao PDR (Bednet 2009)	Thailand (R7 household 2009)	Vietnam (MICS 2006)
Malaria prevalence (%)	-	0.9	-	-	-	-
Households with at least one net (%)	91	99.4	98	-	-	99
Households with at least one ITN (%)	-	74.7	45	90	-	19
Persons who slept under an ITN the previous night (%)	-	52.6	-	-	36	-
Children under five years old who slept under an ITN the previous night (%)	-	56.3	36	81	-	5
Pregnant women who slept under an ITN the previous night (%)	-	59.1	-	-	-	-
CMS: Cambodia Malaria Survey; ITN: insecticide-treated net; MCC: Malaria Control in Cambodia; MICS: Multi-Indicator Cluster Survey; R7: Global Fund to Fight AIDS, Tuberculosis and Malaria Round 7						

Most GMS countries have relied primarily on routine health management information system data for planning and monitoring their malaria activities and less so on national, cross-sectional survey data. The exception has been Cambodia, which has conducted national malaria surveys in 2004, 2007, and in 2010, as well as a Demographic and Health Survey (DHS) in 2010. Other countries with national intervention coverage, but not prevalence data, include Lao PDR, where a national bed net survey was conducted in 2009, and Vietnam, with a Multiple Indicator Cluster Survey in 2006. Subnational data on bed net ownership is also available from three states/divisions in Burma and household surveys in Thailand in Global Fund Round 7–supported areas. Overall, these surveys from the sub-region show high levels of conventional bed net ownership with low levels of ITN ownership and use with the notable exception of Lao PDR. No national level malaria prevalence or intervention coverage estimates are currently available from Burma, Thailand, and China. However, Burma has conducted a survey which includes households, health facilities, and drug outlets in areas of zones one and two as part of the Myanmar Artemisinin Resistance Containment (MARC) Project; data analysis is currently under way. Thailand is planning a national household survey with Global Fund Round 10 support in October of 2012, and Lao PDR is currently undertaking a DHS with a malaria module. Lastly, Cambodia plans to conduct a follow-up national survey in 2012.

Data quality and completeness varies across the indicators and the countries. Current reporting is limited to the public sector in Burma and Cambodia, while a significant percentage of those with fever seek care in the private sector. For the cross-border focus areas, routine surveillance data and survey data, where available, are reported for the relevant PMI indicators. Currently, the Control and Prevention of Malaria Project (CAP-Malaria) is in the process of gathering baseline

data for Burma and Thailand. Their baseline for the project in Cambodia will be the final results from their previous Malaria Control in Cambodia project.

Table 4. Cross-border focus areas

Indicator	Tanintharyi Burma	Ranong, Thailand	Trat, Thailand	Containment areas, Cambodia	Cambodia (CAP-malaria project areas) ^δ
Population*	1,658,903	177,079	221,860	1,671,900	330,716
Malaria cases*	36,107	993	120	45,627	3,221
<i>P. falciparum</i> cases*	4,219	404	26	-	-
In-patient malaria deaths*	62	3	1	23	1
Percentage of cases with parasites detected on day 3 after treatment with an ACT [‡]	5-10% (AL); 13-20% (DHA- Pip) 27% (AS)	0-14% (A+M)	[BVBD routine follow-up data 31% (A+M)]	5-45% (DHA- Pip) 0-55% (A+M) 55% (AS)	16% [VMW pilot surveillance]
Malaria prevalence (%)	pending analysis	To be collected in 2012	To be collected in 2012	1.0 (by slide) [†]	-
Households with at least one ITN (%)	pending analysis	To be collected in 2012	To be collected in 2012	67.8 (LLINs) [†]	45
ACT- artemisinin-based combination therapy; AL- artemether-lumefantrine; A+M- artesunate + mefloquine; AS: artesunate; BVBD- Bureau of Vector-Borne Diseases; DHA- dihydroartemisinin; PIP- piperazine; ITN- insecticide-treated nets; LLIN- long-lasting insecticide-treated nets; VMWs- village malaria workers					

*2010 NMCP data except containment areas in Cambodia is from 2011 Cambodia Malaria Bulletin

[†] Cambodia National Malaria Survey 2010

[‡] Therapeutic Efficacy Study data 2010

^δ Project data from Malaria Control in Cambodia (which will serve as baseline for CAP-Malaria)

Current Funding Situation

The tremendous progress made in the region to date has paralleled the unprecedented increase in malaria funding from external sources. As a whole, the region has been very successful in obtaining funds from the Global Fund. All six countries have had at least one successful Global Fund grant totaling over \$500 million for the GMS. The table below details the Global Fund grants from the six countries. It also includes domestic funding, where the data were available, and additional major funding sources in the sub-region, e.g. Three Diseases Fund and the Bill and Melinda Gates Foundation (BMGF). This table does not include potential future funding. Both Lao PDR and Vietnam submitted proposals in 2012 to the Global Fund Transitional Funding Mechanism.

Table 5: Current funding, GMS countries

Country	Funding	Total Budget in US\$ (Funds Disbursed)	Activities
Burma	Domestic*	2,250,000	
	Three Diseases Fund-MARC	10,800,000	2011 support for implementation of the Myanmar Strategic Framework for Artemisinin Containment in 26 priority high-risk townships in Kayin and Mon states, Bago (East), and Tanintharyi regions
	BMGF	7,500,000	Three-year grant to PSI to develop a framework for addressing the issue of malaria parasite resistance to artemisinins
	GF SSF	72,935,088 (24,127,706)	LLINs and early diagnosis and treatment in 14 out of 17 states/ divisions
Cambodia	Domestic*	1,355,728	
	WHO*	1,446,616	
	GF R6	22,908,144 (21,284,961)	Procurement of LLINs, RDTs and drugs; Coordination at the periphery
	GF SSF	56,137,912 (36,632,924)	Containment of artemisinin-resistant <i>Plasmodium falciparum</i> and moving towards pre-elimination
China	Domestic*		None reported in WMR 2011
	GF R6	12,312,206 (11,582,682)	Focus on Chinese migrant workers and local residents on the Myanmar border and cross-border collaboration
	SSF	176,046,908 (61,483,848)	Elimination
	GF R10	5,100,000 (1,690,632)	Intensified malaria control along the Myanmar-China border. Implementing only the 2-year Phase 1 (January 2012-December 2013).
Lao PDR	Domestic*	97,690	
	GF R6	3,633,039 (3,633,039)	Antimalarial quality assurance, especially with private sector
	GF R7	23,268,177 (15,973,540)	Scaling up prevention and treatment; IEC for ethnic minority communities
Thailand	Domestic*	439,376	Treatment services for Thai citizens (2009 funding)
	GF R7	21,222,080 (15,526,805)	Focus on migrants and communities in conflict zones
	GF SSF	78,700,727 (12,846,645)	Containment of artemisinin resistance and moving towards the elimination of <i>Plasmodium falciparum</i>
Vietnam	Domestic*	4,476,190	
	GF R7	24,780,695 (16,431,113)	Community-based targeting the remaining endemic areas and mobile populations

Source: WMR 2011, www.theglobalfund.org, www.gatesfoundation.org, www.ThreeDiseasesFund.org; Figures in parentheses are disbursed amounts; *Funding per year

GOAL AND TARGETS OF THE PRESIDENT’S MALARIA INITIATIVE IN THE GMS

In line with the Lantos-Hyde Malaria Strategy,⁹ PMI will work with NMCPs and partners to strengthen the response to multidrug-resistant *P. falciparum* malaria in the GMS. The USG strategy states that this will be accomplished by

- Supporting well-functioning antimalarial drug resistance surveillance networks in each country in the region
- Establishing national systems to monitor the quality of antimalarial drugs as a means of preventing the introduction and dissemination of substandard or counterfeit drugs, which contribute to increased drug resistance
- Contributing to a further reduction in the level of transmission of *P. falciparum* malaria and the number of reported cases in the Greater Mekong Region

For PMI GMS, the goal of limiting the spread of multidrug-resistant malaria will be accomplished through three programmatic subobjectives guiding the FY 2013 MOP activities and their implementation at regional and country levels. The three sub-objectives:

1. Strengthen malaria prevention and control interventions in focus areas with existing or emerging artemisinin resistant malaria
2. Ensure effective drug efficacy surveillance networks to monitor artemisinin-resistant malaria throughout the GMS
3. Monitor the quality of antimalarial drugs throughout the GMS and build country capacity to prevent the availability of substandard or counterfeit drugs

At a regional level, PMI GMS activities will support efforts to conduct therapeutic efficacy studies to monitor artemisinin resistance in all six countries, with particular intensity in areas with evidence of confirmed or potential emergence of artemisinin resistance. PMI will lead the effort to ensure technical capacity and timely reporting; engage national governments taking ownership of these efforts; encourage cost-sharing as other interested donors provide resources for expansion; support efforts to monitor drug quality; ensure that critical bottlenecks in the antimalarial supply chain system are removed; address impediments to the availability of other effective commodities; and discourage use of substandard and counterfeit drugs that contribute to increased drug resistance.

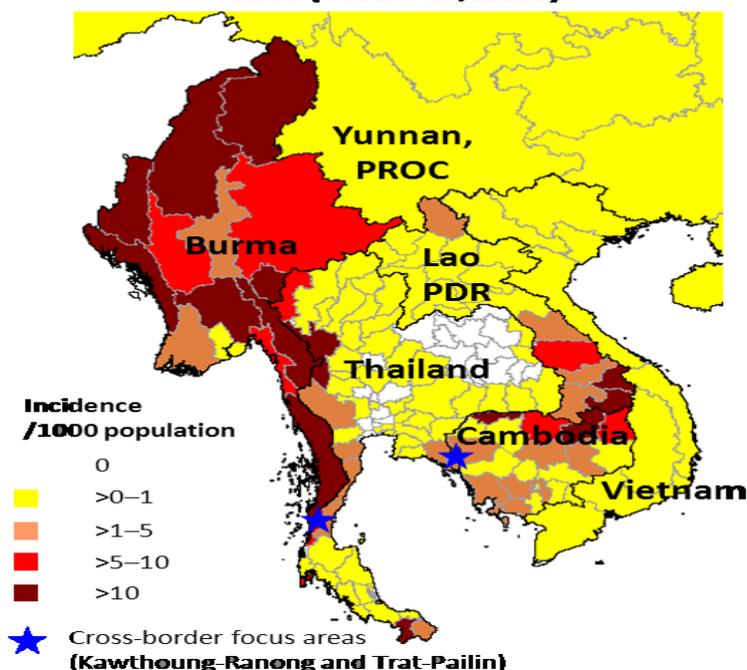
These cross-border focus areas will be centered on the Tanintharyi-Ranong border areas of Burma and Thailand and the Trat-Pailin border areas of Thailand and Cambodia. At the country level, PMI GMS activities will target intensified malaria prevention and control interventions in key cross-border areas in the region suspected of artemisinin resistance: (1) on the Thai-Burmese border, especially Tanintharyi-Ranong area; and (2) on the Thai-Cambodian border, especially Trat-Pailin area (see map below¹⁰). Depending on donors’ and partners’ access and resources, PMI will also consider supporting other target areas within the three focus countries where there is evidence of confirmed or emerging artemisinin resistance, including Kayin, Kachin, Bago, Mon, and Shan States in Burma; Tak, Chiang Rai and Kanchanaburi Provinces in Thailand; and the western and eastern areas of Cambodia that border on Thailand and Vietnam, including Mondulkiri and Snoul. The focus will be on intensified case management at the community

⁹ Lantos-Hyde USG Malaria Strategy 2009–2014

¹⁰ Cui et. al., Malaria in the Greater Mekong Subregion: Heterogeneity and complexity. [Acta Trop.](#) 2011 Mar 5.

level and active follow-up of patients, increased collaboration with the private sector, and effective cross-border collaboration between NMCPs and localized district offices. Modest preventive activities among forest workers and seasonal migrants will be supported in Cambodia near Snoul in an effort to prevent spread of resistant malaria.

**Malaria incidence in the Greater Mekong Subregion
2008 (Cui et. al., 2011)**



To support the goals and objectives of the PMI GMS, the following indicators are proposed:

- 1) To strengthen malaria prevention and control measures in focus areas with existing or threatened artemisinin-resistant malaria:
 - Confirmed malaria cases (number and rate) (target: 50% decrease by 2015 compared to 2010)
 - In-patient deaths due to malaria (number and rate) (target: 50% decrease by 2015 compared to 2010)
 - Percentage of households at risk of malaria that own at least one ITN (target: 100% by 2015)
 - Percentage of individuals in areas at risk of malaria who slept under LLINs/ITNs the previous night (target: 90% by 2015)
- 2) To ensure effective drug efficacy surveillance networks to monitor artemisinin-resistant malaria throughout the GMS:
 - Number of PMI-supported sites completing drug efficacy studies (target: 35 sites over 2 years)
- 3) To monitor the quality of antimalarial drugs throughout the GMS and build country capacity to prevent the availability of sub-standard or counterfeit drugs:
 - Percentage of drugs identified during postmarket surveillance to be substandard or counterfeit (target: <5% by 2015)

EXPECTED RESULTS — YEAR THREE

By the end of Year 3 of PMI in the GMS, the following targets under the three programmatic objectives will have been met:

1. To strengthen malaria prevention and control measures in focus areas with existing or threatened artemisinin-resistant malaria.

Cross-border focus areas

Prevention:

- In Year 3, approximately 300,000 LLINs will be procured and distributed free of charge in the PMI cross-border focus areas to protect targeted vulnerable and high-risk mobile and migrant populations through various community-based distribution mechanisms.

Treatment:

- RDTs (approximately 800,000) and ACTs (approximately 450,000) will be procured to fill any gaps in the cross-border focus areas.
- Approximately 440 community malaria volunteers (140 in Cambodia and 300 in Burma) in the cross-border focus areas will provide malaria prevention and control services to targeted populations including migrant and mobile groups.

M&E:

- Surveillance systems strengthened and baseline routine surveillance and survey data collected for the cross-border focus areas.

2. To ensure effective drug efficacy surveillance networks to monitor artemisinin-resistant malaria throughout the GMS.

Regional— GMS (6 countries)

Drug Efficacy Surveillance:

- Over 17 of 35 PMI-supported sites across six countries in the regional network will have conducted therapeutic efficacy studies (testing conducted at each site every two years).

3. To monitor the quality of antimalarial drugs throughout the GMS and build country capacity to prevent the availability of sub-standard or counterfeit drugs:

Regional— GMS (6 countries)

Drug Quality:

- Antimalarial drugs sampled for quality in Thailand, Burma, and Cambodia and host countries' systems strengthened in drug monitoring, policy, and enforcement.

PREVENTION ACTIVITIES

Insecticide-Treated Mosquito Nets and Indoor Residual Spraying

National malaria control programs in GMS all support the free mass distribution of LLINs to targeted areas, especially where there is suspected artemisinin resistance. In addition to LLINs, there is provision – sometimes free and sometimes through social marketing – of nets specially

designed for use with hammocks, intended for forest workers. These hammocks are made from long-lasting insecticide-treated materials. Traditionally, there has been a very large and active private sector sale of untreated nets of varying quality throughout the GMS. Household ownership of untreated nets is high, especially in rural Burma and Cambodia; thus, both of these NMCPs include net retreatment with a long-lasting insecticide as part of their strategies.

Much of the malaria transmission in the region occurs in forested and forest fringe areas, plantations, and farms, where workers sleep in the open or under temporary shelters. Some reports indicate that up to 60% of infective bites occur either outdoors or during the evening or early morning hours when people are not sleeping. Thus, due to vector and human behavior patterns, LLINs may not be the ideal malaria prevention method. There have been many small efforts in Burma, Thailand, Cambodia, and Vietnam to reinforce personal protection through use of repellents and treated materials; however, the use and effectiveness of these interventions in different settings has not been assessed, and widespread deployment has not occurred. There is an urgent need to identify and test new, efficacious personal protection measures for these vulnerable groups.

ITNs are still used and efficacious in a variety of settings in the region. The one unpublished study showing ITNs were not effective was conducted in Rakine State in Western Burma, where the vectors did not include *An. dirus* and *An. minimus* and about half of the biting among secondary suspected vectors occurred early evening. All major species in this coastal area showed a strong preference for outdoor biting.¹¹ In contrast, a number of studies were conducted in Burmese refugee camps along the Thai-Burma border, showing an impact in school children with a 38% reduction in parasite prevalence and a 42% reduction in clinical episodes.¹² Likewise a study among pregnant women showed a two-fold decrease in women requiring treatment for anemia who used treated bed nets compared to women who did not use any nets and a 1.6-fold decrease among women using untreated nets.¹³ There is an urgent need to identify supplemental forms of personal protection for forest and plantation workers but this does not negate the need to continue to rely on ITNs to protect the households and bring down transmission. The private sector market, consumer preferences, availability and estimated high coverage and use of conventional untreated nets, limited availability of retreatment kits, and need for coordination of net retreatment strategies pose some additional challenges for GMS countries focused on increasing ITN coverage and use.

While IRS appears in strategy documents for the GMS countries, it is now rarely used, being difficult to efficiently target and implement. The implementation of IRS in Thailand, as in Burma and Cambodia, is limited. All three countries state that they will implement IRS in “outbreak” areas or where there is active transmission. For example, the Thai Global Fund Round 10 documents state: “Indoor residual spraying will be supported and strengthened in documented active transmission foci (two or more confirmed secondary cases per investigation

¹¹ Smithuis F, et al. The effect of insecticide-treated bed nets on the incidence and prevalence of malaria in an area of unstable transmission in western Myanmar. 2006 Unpublished thesis.

¹² Luxemburger C et al. Permethrin-impregnated bed nets for prevention of malaria in schoolchildren on the Thai-Burmese border *Trans R Soc Trop Med Hyg* Mar-Apr 1994;88(2):155-159

¹³ Dolan G et al Bed nets for the prevention of malaria and anemia in pregnancy *T Roy Soc Trop Med* Nov-Dec 1993;87(6):620-626

site) detected through active case investigation.” At the present time, PMI will not fund IRS implementation in any GMS country.

Burma

According to the 2010–2015 National Strategic Plan for Malaria Control, Burma’s VBDC Program aims for 80% of the population in moderate- and high-risk areas to be using ITNs or LLINs by 2015. The NMCP strategy classifies a total of 284 townships as endemic, of which 180 are targeted for scaling up coverage of LLINs/ITNs and retreatment of nets. The strategy supports two LLINs per household, provided free through mass distribution campaigns to the population of 15.5 million residing in high- and moderate-risk areas within the 180 townships and then replacement of the LLIN after three or five years depending on the type of net. Mass retreatment campaigns for ITNs, using a long-lasting insecticide, are scheduled every two years in 115 townships, where approximately 8 million untreated nets are thought to exist at household level.

Like other countries in the region, Burma has a traditionally high rate of mosquito net use among much of its population. According to the 2010–2015 National Strategic Plan for Malaria Control, many families in Burma already use mosquito nets, but rates are highly variable and many are untreated. A 2008 survey by the Myanmar Council of Churches conducted in 160 malaria endemic and hard-to-reach villages in Chin State, Kachin State, and Sagaing Division showed that 91% of households own any type of mosquito net (treated and untreated) with an average of two nets per household. However, there is very low coverage of nets treated with insecticide (ITNs and LLINs)—only an estimated 5.6% of the total population protected in malaria risk areas.

Burma’s VBDC also recognizes the importance of the private sector and the need for a clear policy articulating its role. According to a recent LLIN assessment report¹⁴ (May 2012) there is a vibrant retail market with several untreated cotton net brands available in a variety of colors. Consumers prefer longer, softer opaque fabric nets that are used for privacy. In addition to imported nets from China, Thailand, and Vietnam, the Burmese government produces and supplies nets through special government supply shops known as “Win Thuza.” This product is priced more expensively than other nets, at K12,000 (US \$15) for a family size net; it is available in different colors and made from good quality heavy cotton material. A consumer study¹⁵ found that some communities purchase lighter netting for summer use and heavier fabric for rainy season use, when winds are stronger. The LLIN retail market is in its very early stages, with only PermaNet® available for sale in Burma; the majority of WHOPEs-approved LLIN brands must be registered before entering the market but have not been. The market for retail long-lasting insecticide treatment kits is also very limited. Population Services International (PSI) plans to socially market 100,000 *SupaNets* in 2012 and sell them through their social franchise clinics. PSI also distributes long-lasting insecticide retreatment kits, branded as *SupaTab3*, and priced at K1500 (US \$2) per kit in retail outlets. PSI provides these through their franchises and interpersonal communicators at a significantly subsidized rate of K100 per kit.

¹⁴ Networks Project: Vector Control Assessment in Greater Mekong Sub-region and Review of Malaria Prevention Strategies (Draft May 2012)

¹⁵ Kyi Kyi Win Oo, ‘Malaria in the Aftermath of Nargis’, Graduate Institute of Geneva, Master’s Thesis, March 2012

Burma's LLIN needs are met primarily through the Global Fund Round 9 grant, which covers 14 of the 17 states and divisions and an estimated population of 40.9 million (2008). Most of the target townships are in the eastern and southern part of the country where treatment failures and prolonged parasite clearance time for ACTs have been reported. The Global Fund grant supports retreatment of existing nets in 170 townships and LLINs distributed free of charge in 55 priority townships. In 2012 and 2013, 900,000 LLINs are expected to be distributed and 2.2 million conventional nets will be retreated using Global Fund support. The Three Millennium Development Goal (3MDG) Fund is also expected to contribute LLINs but specific quantities are unknown at this time. Due to the inaccessibility of certain areas in Burma, there will most likely be LLIN gaps in parts of the country. With the cancellation of the Global Fund Round 11, transition of the Three Diseases Fund to the multi-donor Three Millennium Development Goal Fund and funds for the MARC framework committed only until June 2012 (with a possible no-cost extension through Dec 2012), major funding gaps for LLINs and malaria commodities are expected in Burma. PMI will focus its efforts on filling gaps in LLIN procurement and distribution in the cross-border focus area of Tanintharyi Division. Depending on resources, additional border areas, e.g. Kayin, Kachin, Bago, Mon, and Shan States, will also be assessed for gaps.

Thailand

The Thai BVBD National Strategic Plan for Malaria Control and Elimination calls for one LLIN per each resident, long-term economic migrant, and member of the military based in endemic villages in the 22 targeted provinces. LLINs are to be replaced every three years and long-lasting insecticide hammock nets are distributed in endemic areas of targeted provinces in order to provide protection from malaria where LLINs cannot (e.g., migrants and soldiers spending nights in the forest and on the Thai-Cambodia border).

Good estimates of untreated net coverage in Thailand are not available. Usage is thought to be lower than in neighboring areas of Burma and Cambodia – but this may also be due to the better construction of housing in Thailand. According to data presented during the Thailand Malaria Program Review in August 2011, of the 2.1 million persons at risk in Thailand, 780,858 were protected by IRS and 1.8 million were protected by ITNs/LLINs in 2010. The 2007 WHO Mekong Malaria Programme Profiles report also states that approximately 8 million people in Thailand were covered by mosquito nets in 2007, including low-risk populations. Of the population at moderate- and high-risk of malaria, it is estimated that approximately 40% were covered by mosquito nets, but the proportion of those that are treated is not clear. Higher coverage levels with ITNs are reported from the artemisinin-resistance containment project areas.

Under Thailand's Global Fund Round 10 grant, 1.9 million LLINs will be distributed over the project period in 22 endemic target districts. Funding from Round 10 will also support provision of LLINs to protect against outdoor transmission.

According to a May 2012 PMI-supported LLIN assessment, the net distribution system appears well-designed, based on village stratification, predistribution census, and postdistribution assessments. Further efforts are needed to increase access to LLINs by hard-to-reach populations, especially mobile and migrant populations. PMI will fill any commodity gaps and

provide targeted support for migrants in the targeted cross-border areas of Trat, Ranong, and possibly other areas along the border with concerning artemisinin resistance data, e.g. Tak, Chiang Rai, and Kanchanaburi Provinces.

Cambodia

Cambodia has a strong “net culture.” The 2010 national malaria survey from indicated that almost all households owned at least one mosquito net (99%); however, just 75% of households had an ITN, and 53% of all respondents reported sleeping under an ITN the previous night. The proportion who slept under an ITN the previous night was 56% for children under five years and 59% for pregnant women.

Cambodia’s 2011–2025 National Strategic Plan for Elimination of Malaria calls for universal access to preventive measures among target populations by mosquito control, personal protection, and environmental manipulation and ensuring community awareness and behavior change among the population at risk through comprehensive BCC, community mobilization, and advocacy. The strategy calls for one LLIN per person and one LLIHN per family provided for free to those living in villages at risk as well as the retreatment of existing conventional nets with long-lasting insecticide. Mobile and migrant populations will receive one ITN distributed either free or on loan from large-scale employers. Under the Global Fund Rounds 6 and 9 grants, the CNM will procure 800,000 LLINs for distribution between 2012 and 2013.

ITNs have been distributed free of charge since the mid-1990s. The Global Fund Round 9 grant continued LLIN distribution starting with Rounds 4 and 6 targeting all affected villages located less than 2km from the forest; however, the current stratification of malaria risk (distance from forest less than 2km) is based on outdated maps of forest cover. Furthermore, there are increasing numbers of new settlements that have not been mapped. The CNM is in the process of updating their malaria risk stratification map based on the incidence and risk of transmission. Nearly 3 million people living less than 2 km from the forest edge will receive LLINs and hammock nets. According to a May 2012 LLIN assessment, the CNM has struggled to reach vulnerable populations in remote areas. Village malaria workers are trained to assist with increasing coverage of malaria services; however, not all villages in targeted malaria-endemic areas currently have VMWs.

Cambodia has a large number of privately purchased untreated nets. It is estimated that 900,000 untreated nets are imported every year. Unlike programs in Africa, support has been provided for a net treatment scheme for untreated nets in Cambodia. Supported by Global Fund Round 9, PSI is implementing a ‘bundling strategy’ to ensure that a long-lasting insecticide retreatment kit (ICON MAXX) is bundled along with 70% of all commercially available family-size and hammock nets *before* the nets are released onto the market. Most of the estimated 900,000 nets imported and sold in Cambodia each year are untreated. The nets are moderately priced, affordable, and attractive, coming in an array of colors and styles, which make these nets extremely appealing to the Cambodian consumer. In 2011 and 2012, an estimated 700,000 retreatment kits are targeted for distribution in the private sector. The average price of a bundled net to a consumer ranges from \$2.50 to \$5.00.

Progress to date:

With FY 2011 funds, PMI is supporting an assessment to review policies, strategies, and gaps in funding and distribution of ITNs in targeted GMS countries (particularly focused on Burma, Cambodia, and Thailand). Once the assessment is finalized, PMI will use the findings to further assist countries in refining their programmatic and operational strategies. PMI has been unable to obtain specific information about the quantities of LLINs needed and is requesting implementing partners to work closely over the next year with NMCPs in the region to develop national forecasts and estimates. Donor funding has changed since the Global Fund applications were submitted for Cambodia and Burma. In addition, the funding situation and projected needs for 2013-2014 are uncertain. Due to poor performance, Cambodia and Burma are anticipating cuts in their Phase 2 funding levels. PMI will work with NMCPs and implementing partners over the next year to gather information on LLIN gaps and needs.

To help address urgent needs and protect vulnerable populations, with FY 2011 funding, PMI expects to procure and distribute approximately 100,000 LLINs in Tanintharyi Division in Burma. With FY 2012 funds, PMI will procure 145,000 LLINs for Burma, Lao PDR, and Cambodia to fill gaps.

Planned activities with FY 2013 funding are as follows: (\$2,400,000)

- **Procurement and distribution of LLINs, LLIHNs, and retreatment kits:** PMI will procure approximately 300,000 LLINs, hammock nets, and retreatment kits for the GMS region in FY 2013. Although the GMS countries have funding from the Global Fund to cover most needs, additional quantities of LLINs and other hammock nets may be needed in Burma and Cambodia, exacerbated in part by weak MOH supply chain distribution systems. PMI funding will fill LLIN gaps at the household level in villages and townships in the cross-border focus areas and in those that are not supported under the current Global Fund agreement. PMI is targeting LLINs in its focus areas where implementing partners will conduct household assessments and distribute LLINs to residents at the household level. Once information is collected from the Burma household survey, PMI will have better quantitative information to inform the LLIN gap analysis. In Cambodia, PMI provides LLINs to employers of seasonal migrant workers and to residents at the household level in specific targeted eastern districts. A smaller amount of funding may also be used to cover gaps in other GMS countries in coordination with the NMCP's analysis of needs and gaps and to cover delays in Global Fund funding. (\$1,750,000)
- **Community-level support for distribution, promotion, and use of ITNs:** PMI will support delivery of LLINs through mass distribution to reach households and promote use of LLINs and treated material/hammock nets in the focus areas. PMI will primarily target the cross-border focus areas in Burma (Tanintharyi) and Cambodia (Pailin) with possible geographic extension along the border areas, depending on the existing gaps and PMI resources. Some support will also be provided to ensure cross-border reach in Thailand, particularly focused in the border areas of Ranong, Trat, and possibly Tak. In Cambodia and Thailand, special efforts will be made to reach cross-border migrant populations and other vulnerable groups (forest, plantation, and farm workers). PMI will focus primarily on community-level strategies, since private sector strategies are covered through Global Fund grants. (\$550,000)

- **Community mobilization:** PMI will support efforts in Cambodia to build capacity among local NGOs to prevent and control malaria in high-risk and hard-to-reach vulnerable populations living in eastern Cambodia along the forest and forest fringe areas and on rubber and timber plantations. Local nongovernmental organizations (NGOs) will implement targeted BCC/IEC and prevention interventions for vulnerable populations to increase coverage and use of ITNs and carry out “hang-up/keep-up” strategies to ensure nets distributed in mass distribution campaigns are properly hung and maintained. (\$100,000)

Malaria in Pregnancy

While intermittent preventive treatment in pregnancy is not part of any of the national strategies in the GMS, PMI will promote universal LLIN coverage and prompt diagnosis and treatment of clinical cases in pregnant women especially amongst migrant workers, refugees, and other hard-to-reach populations as they remain a vulnerable group in the region. Control of malaria in pregnancy and implementation of strategies in the Mekong region are complicated by heterogeneous transmission settings, coexistence of multidrug-resistant *P. falciparum* and *P. vivax* parasites and different vectors. A recent review of malaria in pregnancy in the Asia-Pacific region (2012) reported that treatment regimens for malaria in pregnancy are absent in many settings, and in practice, health workers may not be prescribing antimalarials correctly or are reluctant to give drugs to pregnant women because of potential harmful effects. The report identified a disconnect between routine antenatal practices and the recommended prevention and treatment strategies for malaria in pregnancy.

The NMCP strategic plan for Burma mentions a 2002 review of 17 studies on malaria in pregnancy reporting a low prevalence of clinically suspected malaria among pregnant women (1-2% of total outpatient and inpatient burden). A separate 2005 study found that 11% of pregnant women attending antenatal care and 12% of all women delivering in Eastern Shan State and Mon State were infected with malaria. The states and divisions identified with the highest incidence are Rakhine, Kachin, and Kayah. Wide variations in prevalence of malaria parasitemia in women attending antenatal care services were reported, ranging from 3% in Tanintharyi Division to 37% along the Thai-Burma border, where the majority of women were asymptomatic and infected with *P. falciparum*.

Cambodia undertook a study in Ratanakiri Province, which has the highest malaria burden, in order to assess malaria in pregnancy. With USAID funding, WHO supported the Ratanakiri Provincial Health Department to implement a malaria screening strategy for pregnant women using RDTs as part of antenatal care in three selected health centers. Antenatal staff and VMWs were trained to conduct an RDT and to treat the pregnant women according to national guidelines. Preliminary results indicate a malaria prevalence of 5% at health centers and 6% at the village level.

Progress to Date:

With FY 2011 funds, PMI will support a regional assessment of malaria in pregnancy to identify programmatic areas that can be strengthened including updating and/or consolidating malaria prevention and treatment guidelines for pregnant women, ensuring accurate diagnosis and prompt treatment of pregnant women at health facilities, and coordinating with ANC services.

Planned activities with FY 2013 funding are as follows: (\$100,000)

- **Strengthen malaria in pregnancy and ANC practices:** Based on the FY 2011 malaria in pregnancy assessment, PMI will provide support to develop and update national policies and treatment guidelines on malaria in pregnancy to ensure consistency and alignment of recommendations, update training and supervision materials, and ensure joint collaboration between NMCP and Maternal, Newborn and Child Health programs. (\$100,000)

CASE MANAGEMENT

Malaria Diagnosis

Diagnostic testing with microscopy or an RDT is required before treatment in all GMS countries. While microscopy is the preferred diagnostic method at health facilities, RDTs are now widely available in many parts of the GMS through VMWs, mobile malaria workers, VHWs, and some private sector providers (particularly in Cambodia). Because both *P. falciparum* and *P. vivax* are present throughout the GMS, national programs promote RDTs that can detect both species.

Burma

The status of the Government of Burma's 700 reported malaria microscopy centers remains unclear, although only about 60% are reported to be functioning adequately. A quality assurance system was initiated in 2005, with training and technical support provided by WHO and ACTMalaria, but the quality of diagnostic testing is unknown.

Microscopy is the preferred diagnostic method, but its availability is limited primarily to townships. In addition, the majority of persons with malaria seek treatment from private sector providers, where diagnostic testing may not be available or may be of poor quality. Even in health facilities that do have malaria microscopy, some health providers continue to treat patients for malaria based on clinical signs and symptoms alone.

VHWs have been trained to diagnose malaria using RDTs and provide treatment with ACTs, but only in a limited number of townships. Plans are in place to increase the scale and geographic coverage of VHWs, but are awaiting clearance by the Government of Burma.

Efforts also have been made to train and supervise private sector providers in the diagnosis and treatment of malaria, through the Sun Quality Network implemented by PSI, with support from the Global Fund and other donors. Approximately 870 Sun Quality Health Clinics have the capacity to diagnose malaria with RDTs and treat confirmed cases with ACTs, but most of these providers are in townships, not in rural areas where malaria transmission occurs. Since 2008, a limited number of VHWs have also been trained and are functioning as Sun Quality Primary Care Providers. Expansion of this VHW network has the potential to bring diagnostic and case management services closer to communities with high-risk of malaria transmission.

Cambodia

Malaria microscopy for diagnosis of all suspected malaria cases is standard practice in the majority of Cambodian public sector facilities. In addition, VMWs and mobile malaria workers, focused primarily in the Zone 1 containment zones of Western Cambodia, use RDTs to diagnose malaria and treat with ACTs. A recent end-of-project assessment of USAID's Malaria Control in Cambodia (MCC) Project found that none of the 971 patients diagnosed at health facility or community level in the project target area with suspected malaria were treated without first getting a diagnostic test. The success of this program has been attributed to a number of interventions, including consistent routine supervision, quality assurance, and refresher training activities at both facility and community levels; implementation of a community supply system linked to the existing health facility system, close monitoring of diagnostic stock levels at operational district warehouses; and reinforcing and strengthening logistic management at the peripheral level. In addition, MCC maintained a buffer stock of RDTs and microscope materials to mobilize in case of national shortage.

Outside of these targeted areas, the quality of malaria microscopy is less than optimal, particularly in remote health facilities. When RDTs are available, health staff prefer using RDTs over microscopy, because of the ease of use. Most Cambodians seek treatment for malaria in the private sector. For more than a decade, the NMCP and partners have provided training and supervision to a network of private sector outlets and provided them with subsidized, high-quality ACTs.¹⁶ More recently RDTs also have been introduced at these outlets. Use of RDTs in these outlets has increased significantly since their introduction, except for a few occasions when there were national stockouts of the test kits. There have been improvements in adherence to the RDT results, with approximately two-thirds of those with negative tests not being prescribed ACTs. There remains room for improvement, as many private providers are not in this network and nonadherence to test results among network providers continues to be a challenge.

Thailand

In high transmission areas, a network of 315 malaria clinics with malaria microscopy and 460 malaria posts using RDTs has been established. The BVBD conducts quality assurance monitoring for microscopy. Active case detection using microscopy and/or RDTs is carried out in high-risk villages and towns and in the artemisinin resistance containment zones. BVBD, in collaboration with provincial health offices, also is targeting hard-to-reach populations in high-risk border areas through the development of special service facilities where RDTs are available. Some NGOs provide primary health care services, including malaria case management, to 140,000 refugees along the Thai-Burma border.

¹⁶ Yeung S, et al. Socially-marketed rapid diagnostic tests and ACT in the private sector: ten years of experience in Cambodia. *Malar J.* 2011 Aug 18;10:243.

Progress to Date:

Burma

With FY 2011 funding, PMI is procuring 238,500 RDTs. Plans to train and equip additional VMWs and primary care practitioners in malaria case management, including diagnostic testing, in three townships in Containment Zone 1, have been developed and are currently awaiting approval by the MOH. Furthermore, a survey of public and private sector providers is planned to assess the scale and quality of case management services in these three townships.

Cambodia

Procurement of 10,000 RDTs and 25 microscopes with FY 2011 funding is underway, with delivery anticipated later this year. Following the handover this year of support for 35 VMWs in Pailin to the Global Fund, PMI has continued supervision and supportive activities to an additional 481 VMWs. Standard operating procedures for quality assurance of laboratory diagnosis of malaria also were finalized with the support of PMI. Quality assurance activities were carried out in targeted laboratories in Containment Zone 1 areas of Western Cambodia. Cross-checking of blood slides demonstrated a sensitivity of 97% and specificity of 99%.

Thailand

A rapid assessment has identified the need for refresher training for laboratory technicians in Ranong, three border malaria posts, and 15 village malaria posts. In addition, the assessment identified a need for a mobile malaria clinic, targeting military and border police, in Trat.

Planned activities with FY 2013 funding (\$910,000):

PMI will continue support for diagnostic testing at facility and community levels in Cambodia and Thailand and scale up diagnostic testing at community level and primary care level in Burma through the provision of commodities, refresher training of laboratory staff and health workers in performance and use malaria microscopy and RDTs, and strengthening quality assurance systems. Specifically, PMI will:

- **Procure RDTs and microscopy supplies for cross-border focus areas.** PMI will procure approximately 800,000 multispecies RDTs (including 0.5 million for Burma and 300,000 for Cambodia) to scale up diagnostic testing at community level in PMI focus areas and to fill gaps in RDT needs in other parts of the region. PMI also will procure a small quantity of additional microscopes and microscopy kits (reagents, slides, lancets, etc.) to fill gaps at laboratories in the cross-border focus areas. The Global Fund Round 10 grant and country resources cover nearly all commodity requirements in Thailand. (\$830,000)
- **Training, supervision, and quality assurance of RDTs and microscopy.** Support will be provided by PMI for training of new VMWs and VHWs, and refresher training of existing VMWs and VHWs, clinicians, and laboratory staff (including targeted private sector providers) in malaria diagnosis and case management in PMI focus areas of Burma and

Cambodia. All village volunteers will be trained in a combined curriculum that includes appropriate clinical management of malaria and performance of RDTs. (Costs included in treatment section)

- **Training and accreditation for microscopy.** PMI will continue support for the training and accreditation of supervisors of malaria microscopy in the GMS. This training is essential for maintenance of a cadre of expert laboratory technicians who will in turn supervise and train front-line health workers. (\$80,000)

Malaria Treatment

Malaria treatment policies in all GMS countries promote early diagnosis and prompt effective treatment with ACTs for confirmed cases of falciparum malaria. Countries that have *P. vivax* transmission continue to use chloroquine for treatment except Cambodia, while policies for the use of primaquine for *P. vivax* radical cure vary. All the GMS countries have scaled up implementation at health facilities and continue to improve community-level case management.

Evidence of artemisinin-resistant *P. falciparum* in areas of the Thai-Cambodian and Thai-Burmese border regions and chloroquine-resistant *P. vivax* in other parts of the GMS has caused NMCPs to intensify their case management activities. Government policies for most GMS countries encourage laboratory-based diagnosis prior to treatment. National treatment guidelines in Thailand have “prohibited” presumptive treatment since 2001 while Cambodian national treatment guidelines recommend “parasite-based diagnosis.” Despite the development of drug-resistant foci, ACTs remain generally efficacious throughout the region and constitute the first-line treatment in all GMS countries.

Injectable artemisinin drugs remain the mainstay for severe malaria treatment throughout the GMS, with the exception of Pailin, Cambodia, where a pilot program utilizing IV quinine was implemented in 2012. Cambodia treatment guidelines recommend use of artesunate suppositories at the village and health center levels as a bridge to higher levels of care where treatment with injectable artemether is available.

In the border areas and in suspected foci of resistance, patients now undergo more rigorous follow-up to monitor the response to therapy, including routine collection of a blood smear on the third day after initiation of treatment. This is particularly important for PMI GMS, since the goal of limiting the spread of multidrug-resistant malaria will be accomplished through drug efficacy surveillance networks to monitor artemisinin-resistant clones. Although this has traditionally been accomplished via standard *in vivo* therapeutic efficacy monitoring, the logistics required allow conducting efficacy trials in only a few sites within each GMS country. In areas at risk for prolonged parasite clearance, a possible harbinger of artemisinin resistance, the documentation of persistently positive parasitemia after three days of treatment will help identify areas for formal therapeutic efficacy studies and more intensified interventions. The PMI team will work together with the NMCPs in sites where day 3 surveillance is employed to develop appropriately enhanced surveillance and control efforts in response measures.

Countries continue to employ VMWs for diagnosis and treatment services in less accessible areas. With implementation of day 3 surveillance, the role of VMWs expands in the realm of surveillance and in continued follow-up to document that slow-clearing parasites are eventually cured.

Drug stockouts are generally the result of supply chain issues rather than funding shortfalls. In Burma, the extent and cause of stockouts are not completely clear, but it is likely that ACT stockouts will occur as community-based treatments are accelerated as expected in FY 2013.

In Thailand and Cambodia, health workers at health facilities generally receive regular supervision and refresher training under the technical leadership of their NMCPs. In Cambodia, USAID has supported health worker supervision in the western border region for several years. The quality of case management activities and supervision in Burma has not yet been assessed, but will likely require strengthening.

The private sector continues to be an area where drug quality, access, and case management are likely to vary widely. PMI will look for ways to support private sector approaches. This may include strengthening case management and diagnostics and BCC messages to address the issues of substandard, counterfeit drugs as well as other areas in which public sector approaches might be similarly applied. Although not funded by PMI, PSI has been active in both Cambodia and Burma in improving access to quality ACTs in the private sector. In Cambodia, PSI provides subsidized, quality ACTs through social marketing and in Burma through a network of social franchises (Sun Quality Health and Sun Primary Health). In Burma, PSI will soon launch a new subsidized ACT treatment project in the informal private sector that aims to replace artemisinin monotherapy.

Planned activities with FY 2013 funding (\$3,550,000)

With the exception of Burma, 2012 requirements for ACTs largely have been met by the Global Fund, government resources, and other donors. Support for supervision of case management activities must be sustained in the target areas of Cambodia and scaled up in Burma. Limited technical support for supervision of case management also is required in Thailand. PMI will support the following activities:

- **Procure ACTs:** PMI will procure approximately 200,000 ACT treatments for Burma and 100,000 second-line treatments for Cambodia. The ACTs may be deployed in the public or private sector. (\$350,000)
- **Training and supervision of case management at facility and community levels for the cross-border focus areas:** Support will be provided to train and supervise 140 VMWs in Cambodia and approximately 300 VMWs in Burma.¹⁷ Support also will be provided to train and supervise private sector providers in target areas of Burma and Cambodia. (\$3,010,000)

¹⁷ Government staff may attend training but will not receive per-diem or travel expenses.

- **Training and supervision of case management at malaria posts and clinics:** Direct support will be provided to continue supervision of malaria posts/clinics and volunteers in Thailand, particularly in the areas around Ranong and Trat. (\$190,000)

Pharmaceutical management

Effective malaria case management requires that efficacious, high quality antimalarials are available and used by both providers and patients according to national guidelines. Incomplete or inappropriate treatment can lead to drug failures requiring additional treatment, as well as contributing to selection of resistant parasite strains. The availability and use of antimalarial medicines, diagnostics, and preventive commodities is a top priority for PMI. Support for pharmaceutical management will ensure that Global Fund support for commodities and pharmaceutical management is operational and that there are no gaps in availability of key commodities in Burma, Cambodia, and Thailand.

Burma

Health commodities are procured and distributed in Burma in two ways: through the VBDC and through the Central Medical Store Depot. The VBDC distributes laboratory supplies and antimalarial drugs to township hospitals and health departments throughout Burma. Additionally, it supplies subnational VBDC teams located in states and divisions. Township health departments then are responsible for the distribution to the station hospitals, rural health centers, and subrural health centers. The second system managed by the Central Medical Store Depot is within the Medical Care Services of the Department of Health. The depot purchases antimalarial drugs using government funds in consultation with the VBDC. The depot distributes to all township hospitals and health departments. Since 2002, the United Nations Children's Fund has supported supply system management officers whose duty it is to strengthen the supply and logistics systems within the Ministry of Health.

The private sector is a key source of care in Burma. The PSI Sun Quality Health project operates a private sector franchise of clinics and shops. The procurement of commodities and logistics for this network of private sector clinics is operated by PSI through Global Fund Round 9 support.

Global Fund Round 9 funding covers ACTs, RDTs, and other malaria medicines for 240 of the 284 malaria endemic townships. VBDC will provide the services in all 240 townships with support from other partners. Procurement for ACTs and other malaria medicines is handled by United Nations Office for Project Services. The Global Fund proposal assumes that 879,000 cases of malaria will be treated with ACTs in 2012 and 754,000 in 2013. The proposal also estimates that approximately 1.1 million fevers will be tested with RDTs in 2012.

PMI support for pharmaceutical management and commodities to Burma primarily consists of monitoring availability of commodities (medicines, diagnostics, and nets) supplied through the Global Fund; facilitating procurement and distribution of PMI-funded commodities to fill gaps not addressed by the Global Fund grant; and providing targeted technical assistance, micro-planning, and/or logistics support as needed to support full coverage of malaria interventions in the focus areas of Tanitharyi Division and possibly Kayin, Kachin, Bago, Mon, and Shan States. Special attention will be paid to support community-level logistics to target cross-border migrants through the development of simple inventory tools, storage and transport boxes, etc.

Cambodia

In Cambodia, approximately 67% to 80% of fever patients are estimated to seek care in the private sector, in part because the public health system is weak and not easily accessible and commodity stockouts have been a major problem. Cambodia is now experiencing difficulty with procuring and maintaining adequate stock of RDTs and ACTs with Global Fund resources. Cambodia is in the process of transitioning its first-line treatment for malaria from artesunate-mefloquine to DHA-Pip for both *P. falciparum* and *P. vivax*.

The Central Medical Stores is responsible for the procurement and logistics of essential medicines to the public sector. It operates an integrated logistics system that procures and distributes medicines to the operational district stores and national hospitals every quarter. The operational district stores are supposed to make requests for essential medicines including antimalarial drugs to the Central Medical Stores. Medicines are provided free of charge to the districts, but user fees at service delivery sites vary by facility and often are a barrier for the poor to seek diagnostic and treatment services. The Central Medical Stores operates an integrated logistics management information system. The NMCP has received assistance to develop a web portal into this system to better monitor the movement and availability of malaria pharmaceutical products in the system.

In an effort to improve the quality of antimalarials in the private sector, PSI/Cambodia embarked upon a pilot project in 2002 exploring the possibilities of a socially marketed ACT named Malarine (artesunate plus mefloquine). The pilot was successful, and PSI scaled up the program, which distributes Malarine and Malacheck (a combination RDT), to private clinics, pharmacies, and shops throughout rural Cambodia. PSI manages all aspects of the in-country supply chain; thus, stockouts are limited to procurement delays at the national level.

Supplies of ACTs and RDTs for both the public and private sector in Cambodia are through the Global Fund Round 9 funds. Although Cambodia is also a recipient of Affordable Medicine Facility – malaria funding, the program is not yet operational.

As in Burma, PMI is supporting the strengthening of the supply chain management to facilitate procurement and distribution of PMI-funded commodities; and provide targeted technical assistance, microplanning, and/or logistics support as needed to ensure full coverage of malaria interventions, particularly in the focus area of Pailin and other containment zone areas. Special attention will be paid to community-level logistics to target cross-border migrants through the development of simple inventory tools, storage and transport boxes, etc.

Thailand

In order to achieve the goal of early diagnosis and treatment of malaria cases in Thailand, the NMCP manages the delivery of commodities to facilities, particularly to the public sector malaria clinics and posts. Although a recent USAID-supported assessment in Thailand revealed that there are some challenges in the pharmaceutical management and supply system, overall capacity and performance is strong. When there are problems with stock availability, drugs are exchanged between facilities and districts.

The recent Thai Malaria Program Review found that logistics and pharmaceutical management systems in the border provinces, particularly in migrant and mobile population areas, need

improvement. The review also recommended consideration of a stockpile for medicines and diagnostics for potential epidemics. PMI support for pharmaceutical management in Thailand will primarily focus on these priorities and micrologistics for migrant and mobile populations in the targeted focus areas of Ranong, Trat, and possibly Tak, Chiang Rai, and Kanchanaburi.

Regional

The PMI GMS will provide limited pharmaceutical management support to the other countries in the region, as requested. The challenges and limitations are common to most pharmaceutical management logistic systems including delays in reporting, lack of completeness, and the weak collection of data. PMI plans to initiate support for, and implementation of, a procurement planning and monitoring report for malaria in targeted GMS countries that will report product availability at central levels to serve as an early warning system to avoid stockouts. This reporting will provide another means for on-going monitoring of commodity availability and system performance.

Progress to Date:

PMI is providing support to strengthen pharmaceutical management and supply chain systems in the region. PMI has provided a consultant who traveled to Burma to address issues related to commodity bottlenecks, which decrease the efficiency of the implementation of Global Fund-supported activities. In addition, PMI is supporting recruitment of a technical expert who will be located in the region to provide ongoing assistance to focus countries in the GMS.

Planned activities with FY 2013 funding (\$250,000)

- **Support for pharmaceutical management and logistics:** PMI will address potential bottlenecks in procurement and distribution of malaria commodities (including Global Fund-financed commodities) to ensure the availability of key commodities in the cross-border focus areas in Burma, Cambodia, and Thailand through monitoring, training, and support to distribution when needed. Key priorities for each country are listed above. Support will be provided to all GMS countries, as needed, particularly to assist on commodity issues with respect to Global Fund grant implementation. (\$250,000)

Drug Quality

A key component of case management is ensuring that the antimalarial drugs provided to patients with confirmed malaria are of high quality. The USG has a strong commitment in the GMS to improve the quality of antimalarial drugs. Over the past decade, USAID has supported the establishment of a regional approach to monitoring drug quality by training key staff within national programs and medicine regulatory agencies to travel into the field and periodically test randomly collected antimalarials for quality. The presence of counterfeit drugs with no active ingredient can result in the patient going untreated and possibly dying. Substandard drugs, including those with less than an appropriate amount of active ingredients, lead to sub-therapeutic blood levels and may contribute to the development of drug resistance. Other key challenges include inadequate quality assurance/quality control of medicines, weak regulatory enforcement, manufacturers not compliant with good manufacturing practices, availability of artemisinin monotherapy, and the presence of multiple brands of antimalarial drugs on the market that are hard to regulate.

The United States Pharmacopeia (USP) has established a regional program of >30 sentinel sites throughout the GMS that periodically monitor antimalarial drugs. These sites are not fixed, but rather collect samples from geographic areas around the sites to prevent counterfeiters from making sales to specific vendors or even villages. This program reports that it has reduced the number of substandard and counterfeits over the past five years, in close collaboration with NMCPs, medicine regulatory agencies, and other local and national bodies. This has been accomplished through a comprehensive approach including not only field monitoring, but also training of national quality control laboratory personnel and manufacturers in good manufacturing practices with assistance from regional centers of excellence. Public education campaigns have occurred, including public service announcements, newspaper and radio campaigns, posters, etc. In addition, USP provides data to WHO and INTERPOL for use in international investigations. (USP has a waiver to permit this cooperation.)

Burma

Given the large quantities and varieties of antimalarials available in the private sector, the high number of malaria cases in the country, and the country's relative poverty, Burma is felt to be vulnerable to the introduction and sale of counterfeit and substandard antimalarial drugs and artemisinin monotherapies. There have even been anecdotal reports of counterfeits in Burma resulting in patients dying. The work of the PMI-supported antimalarial drug quality program in Burma is only beginning. In 2009, WHO found that most of the staff trained to conduct drug quality testing were no longer present, nor were there adequate equipment and reagents. In addition, the national reference laboratory at the Food and Drug Administration (FDA) has only one high performance liquid chromatography machine and one refurbished dissolution machine; and it has no standards for registration of malaria medicines. The WHO assessment found that there was a severe need for equipment, supplies, and training at the national reference laboratory.

Cambodia, Lao PDR, Thailand, Vietnam

These four countries have very active programs aimed at addressing the problems of substandard and counterfeit medications. Through the support of USAID and other donors, these countries have developed extensive networks of sentinel sites using portable drug quality testing kits. In addition, USP has worked with FDAs, medicine regulatory agencies, and other authorities to develop appropriate enforcement approaches to regulate the drug industry. The countries also benefit from training obtained through the Asian Network of Excellence in Quality Assurance of Medicines, a network of university pharmaceutical programs providing technical assistance within the region to develop national capacities for quality assurance/quality control, good manufacturing practices, and bioavailability testing.

China

Drug quality activities within China have been coordinated by Government of China officials and WHO. Some of the counterfeit antimalarials coming into the GMS have originated from China; and WHO working with INTERPOL (with non-USG funding) and with national enforcement authorities has been successful in cracking down on some of the producers. The MMP has been interested in having China join other GMS countries in accessing sub-regional drug quality resources so that the data collected by sub-regional programs can be better shared

among national authorities. The PMI team will explore opportunities to engage China diplomatically on this issue.

Progress to Date:

PMI has made tremendous strides towards establishing a drug quality network in the GMS, periodically collecting field specimens for monitoring of drug quality and working with national and international authorities to enforce drug manufacturing policies. USP has conducted site visits to Cambodia, Lao PDR, Thailand, and Vietnam to provide needed reagents, reference standards, USP-national formularies, and other essential supplies. USP is also providing technical guidance to the countries as appropriate and following up on actions taken by countries, e.g., in Cambodia, closing down outlets and in Laos, issuing regulatory notices, and fining and educating violators. They continue to strengthen medicine quality assurance systems through in-country capacity building. Technical assistance is provided to the National Health Products Quality Control Centers laboratories through advanced analytical trainings, provision of equipment and supplies, and ongoing good laboratory practices assistance to attain accreditation by the International Organization for Standardization.

In the areas where sampling of drugs is ongoing a notable decrease in the presence of counterfeit or substandard malaria medications has been observed. According to data provided by USP, in 2003 the overall failure rate was 21.8%. The figures were 4.7% and 3.8% in 2005 and 2007 respectively, and dropped to 1.4% in 2010. These data however were collected from a sample of sentinel sites only and may not represent the entire region.

USP collaborated with INTERPOL and the WHO in a mission to thwart counterfeit medicines production in Southeast Asia. “Operation Storm” targeted manufacturers and distributors of antimalarial, anti-tuberculosis, anti-HIV/AIDS medicines, and antibiotics for pneumonia and other child-related illnesses. In addition to international actions, the general awareness of medicine quality has been raised through mass media and outreach to professional organizations.

USP has begun work in Burma with training staff to use the portable drug quality testing kits to prepare for a national survey of antimalarial drug quality. Additionally, USP trained staff from the national and regional drug quality laboratories in the methods related to confirmatory testing.

There continues to be limited engagement with the sub-regional antimalarial drug quality program in China. The goal of PMI is to make these resources available to all the countries in the GMS and work in a concerted regional fashion to address the problem of poor drug quality. Unfortunately, while there is support within certain sectors, introducing routine drug quality monitoring in the Yunnan Province of China continues to be problematic and USP has not received approval from the State FDA in Beijing.

Planned activities with FY 2013 funding (\$350,000)

- **Support drug quality surveillance, regional and in-country enforcement, and regional coordination:** Maintain the sub-regional network of drug quality surveillance with increasing attention paid to engaging Burma on this issue (no efforts will be directed towards China until there is a clear indication that activities will be supported by the State FDA). Valid sampling strategies established with FY 2012 funds will be utilized. PMI

will continue to work with FDAs, medicine regulatory agencies, and other pertinent partners to ensure that national pharmaceutical reference laboratories are qualified to conduct the necessary analyses for pre- and post-marketing surveillance of drug quality. This will be done, in part, through support to a network of university pharmaceutical programs, and will include a longer-term effort that entails building and supporting greater in-country capacity and perhaps extend beyond laboratories to regulatory officials. PMI will ensure that available drug quality data are shared with international and national officials to ensure enforcement of national policies on quality and substandard medications. PMI will also explore how high-level diplomatic interventions to foster bilateral and multilateral cooperation on drug quality, counterfeits, and substandard medicines among the GMS host governments can be facilitated through the Association of Southeast Asian Nations and initiatives such as the Lower Mekong Initiative. As the largest producers of medicines used in GMS, engagement with China and India is essential. Additionally, PMI will support a regional meeting on antimalarial drug quality efforts to share data, lessons learned, and develop a shared strategic vision for the sub-region.(\$350,000)

BEHAVIOR CHANGE COMMUNICATION

Behavior change is a key objective for every malaria program in GMS, with a focus on drug sellers and consumers, forest dwellers and workers, mobile populations, and health workers. Key behaviors to influence include use of treated nets, prompt diagnosis and treatment of fever, adherence to treatments, and avoidance of monotherapies and counterfeit drugs. The linguistic diversity of GMS, coupled with mobility of key target groups, presents unusual challenges for BCC. Burmese crossing into Thailand need materials written in the appropriate language encouraging prompt diagnosis and full, effective treatment. Inside Burma itself and in Thailand, special materials are needed for Karen and speakers of other minority languages. Seasonal workers from low transmission zones, as in Cambodia, need suitable warnings before transferring into high transmission or artemisinin-resistant areas.

Burma

WHO, United Nations Children's Fund, and Japan International Cooperation Agency have supported VBDC in producing various BCC materials, e.g. posters, pamphlets, and television spots in multiple languages, including Shan and Karen. In 2007, WHO in collaboration with VBDC and other agencies working in malaria control developed a framework for BCC activities entitled "*Communication and Social Mobilization for Malaria Prevention and Control in Myanmar.*" The possible expansion of the village health worker model for malaria diagnosis and treatment will play an important role in providing BCC messages through interpersonal and peer communications. There is also a need to more effectively engage the private sector because of the role it plays in treating cases and issues related to drug quality.

The WHO *Strategic Framework for Artemisinin Resistance Containment in Myanmar 2011-2015*, identifies BCC as an integral part of all malaria interventions, serving to improve the utilization of available health services offering quality diagnostics and ACTs, reducing the demand for artemisinin monotherapies in the private sector, and improving adherence to the three-day ACT regimen. The framework recommends collaboration on BCC with various sectors, especially private sector health providers, as well as transportation companies (malaria

messages through loudspeakers at bus stations and in buses). It also recommends gathering information on BCC efforts targeting migrants in neighboring countries and ensuring consistent messaging. With the launch of the Global Fund Round 9 grant, Burma plans to develop BCC activities to maximize utilization of ITNs/LLINs and early diagnostic and treatment services and to strengthen community-based malaria control activities by training and empowering village health volunteers.

Thailand

The MOPH and malaria partners have been developing BCC materials for migrants and mobile populations as well as for schools. The MOPH has implemented mass health promotion and community mobilization activities in the transmission areas as well as more focused personal counseling and education through village health volunteers, migrant health volunteers, and migrant health workers. Efforts are underway to explore nontraditional collaborations with hard-to-access workplaces such as factories, plantations, and faith-based organizations. Thailand and Cambodia have supported extensive efforts to develop bilingual Thai and Khmer language BCC materials for use in targeted areas. The lifestyle of the migrant and mobile population often precludes the effective use of conventional preventive measures. The national behavior change communication strategy focuses on promoting appropriate behaviors and raising awareness, teaching about symptoms of malaria, promoting the new directly observed therapy approach to malaria treatment, and strengthening referral mechanisms for malaria diagnosis and treatment.

Thailand's Global Fund Round 10 grant builds on current containment and elimination models, providing support for comprehensive BCC, community mobilization, and advocacy for migrant access to health services. Round 10 activities include:

- development of BCC materials, tools, and methodologies;
- implementation of mass health promotion and community mobilization activities; and
- implementation of containment-specific operational research on issues of antimalarial drug adherence, social mobilization, and communication strategies for migrant populations along the border.

A BCC technical working group will be established and include representatives from BVBD, health communications specialists from Thai academia, WHO, ODPCs, Malaria Consortium, other NGO partners, and community members. Other BCC activities include a community mapping exercise to identify migrant communities and households and a formative assessment done by NGOs to identify migrants at high-risk of *P. falciparum* malaria and modes of reaching these populations with information about prevention and treatment of malaria.

Cambodia

The current CNM strategy targets messages on LLINs and LLIHNs to people living within 2km of forested areas. With the threat of artemisinin resistance along the Thai-Cambodian border, one of the main challenges is to reach mobile and migrant populations. Those at risk include people working in the forest for extended periods, such as gem miners, loggers, sandal wood collectors, and soldiers. Radio and TV spots encourage use of appropriate preventive measures, stressing the importance of treating conventional bed nets with insecticide and seeking early diagnosis and treatment, as well as rational drug use. BCC activities are also carried out by VHWs who are members of the village health support groups, the officially recognized

community health promotion organization that serves a variety of functions including case-finding, case management, home-based care, health education, surveillance, and as a conduit for community problems. In western Cambodia, University Research Corporation (URC) has been visiting health facilities and communities to identify BCC needs for patients, community members, health-care providers, managers, and mobile and migrant population. The University Research Corporation also conducted a baseline BCC survey in four provinces and drafted a BCC strategy. The Malaria Consortium piloted an innovative BCC method applying the positive deviance approach among mobile and migrant workers. They looked for successful positive deviant behaviors by a few individuals that enabled them to prevent and control malaria in their community.

The Global Fund Round 9 grant supports comprehensive BCC, community mobilization, advocacy, and strengthening community outreach to contain artemisinin resistance. PSI will work on promotion of appropriate products in the private sector. Malaria Consortium and others will engage in monitoring and evaluation of the BCC strategy. Several ministries including Interior, Defense and Education, will also participate in the development and dissemination of materials for specific target groups (e.g., police and soldiers, students, and teachers with school malaria activities).

Progress to Date:

A recent qualitative study among Burmese migrants in Tak province was conducted with pre-PMI funds to assess their access to malaria prevention and curative services. Poor knowledge about malaria transmission and limited availability of malaria diagnostics and treatments at the facilities were highlighted in the preliminary report findings with specific recommendations to target BCC messages to recent migrants by incorporating them into the health education component of BVBD mobile outreach activities and broadening LLIN distribution campaigns to reach recent migrants that are missed in the current mechanism. Any relevant findings as this report is finalized will be used to inform PMI activities.

With FY 2011 funding, PMI is supporting malaria health education in focus areas within Burma and Cambodia through mass media, development and dissemination of BCC materials, interpersonal communications by community health volunteers, and school health programs, etc., to reach targeted high-risk populations. Mass media and BCC messages promote general awareness and knowledge about malaria and preventive measures and provide information about malaria treatment to strengthen treatment-seeking behaviors at the community level. PMI is supporting partners in Cambodia to provide BCC messages to mobile and migrant populations through trained VMWs who provide malaria diagnosis and treatment at their homes and by educating local pharmacies and drug sellers in rationale drug use. In Burma, using FY 2011 funds, PMI will support VHWs and village health volunteers to provide BCC on net use and malaria management and explore ways to more effectively engage the private sector. Mobile malaria clinics have also proven to be useful in some remote areas of Burma, and PMI will look for ways to integrate BCC materials into their services. PMI is supporting BCC assessments in the target areas to identify knowledge and practices of high-risk groups and gather programmatic data on net coverage and use, diagnostic and treatment coverage, and other indicators. The recent 2012 PMI LLIN assessment of national prevention strategies in Burma, Cambodia, and Thailand will help guide PMI and partner BCC activities in cross-border focus areas. Some of the report's recommendations include a need for more formative behavioral research to better

understand target high risk populations, preferences and use of ITNs, and use of multipronged approaches to reinforce messages.

Planned activities with FY 2013 funding (\$200,000)

PMI will focus on strengthening BCC strategies for malaria prevention and control at the community level in selected cross-border focus areas of the GMS. Support will include training and disseminating of already developed BCC materials on malaria prevention, accurate diagnosis, and prompt and effective treatment. Depending on the target groups, suitable approaches for each area may be different and may vary from increased participation of village health workers, engagement with the private sector, including employers and workplace interventions, mass media campaigns, and school-based health programs.

- **Community-level prevention activities including distribution and promotion of LLINs:** PMI will support the distribution and promotion of LLIN use among targeted populations in focus areas in Burma and Cambodia which border Thailand. The costs of the distribution and LLIN promotion include BCC activities to augment malaria prevention efforts implemented by community health/malaria volunteers in the focus areas and engage community members and networks, possibly including employers of migrant and forest workers, to raise awareness about malaria and use of preventive measures. (BCC costs are included under the LLIN section.)
- **Case management at the community level, including implementation, training, and supervision:** PMI will support training and supervision of village malaria workers and private sector providers in Cambodia and Burma and provide technical support for malaria posts and malaria volunteers in Thailand. As part of their training and supervision, PMI will support BCC activities to strengthen their interpersonal counseling and communication skills, adapt and disseminate culturally appropriate BCC materials through the network of health volunteers, educate private providers about correct treatment and diagnosis and the harmfulness of using monotherapy and substandard drugs, and develop mass media messages to reach specific target populations including migrants and mobile populations. (BCC costs are included under the case management section.)
- **BCC technical assistance for community-level implementation:** To ensure harmonization and dissemination of BCC materials and messages in the three focus countries (Burma, Cambodia, and Thailand), PMI will support development and implementation of effective BCC/IEC approaches. Careful consideration will be given to special and high-risk target groups with BCC approaches focused on improving coverage and use of malaria prevention measures (LLINs, hammocks, retreatment kits) and increasing awareness of malaria in pregnancy, as well as diagnostics and prompt and effective treatment. (\$200,000)

EPIDEMIC SURVEILLANCE AND RESPONSE

Despite progress in reducing malaria in most Mekong countries, malaria infections in mobile populations and unpredictable malaria epidemiology in low transmission areas illustrate the need for surveillance system strengthening. The sensitivity of surveillance systems in the context of elimination programs is of critical importance when even relatively small case numbers could

jeopardize progress. Although no large outbreaks have been reported in the region recently, a disastrous epidemic occurred in Burma in 2001 with an estimated 1,000 deaths; large *P. vivax* outbreaks occurred in central China in the mid-2000s; and a recent outbreak occurred in Attapeu, Lao PDR. Through Global Fund support, most countries in the region have been strengthening their surveillance systems to be able to identify outbreaks in a timely fashion and to mount a rapid response, although capacity at the periphery is still limited. Vietnam is expected by 2012 to have 95% of commune-level health centers participating in their outbreak early detection system. China has moved to real-time, web-based monitoring of malaria cases; and Thailand has piloted a web-based, GIS-based electronic surveillance system in the containment project provinces on the Cambodian border.

Progress to Date:

With FY 2011 and 2012 funding, the focus of PMI's activities was on strengthening surveillance and the rapid response efforts as well as maintaining quality diagnosis especially in Burma, Cambodia, and Thailand. Both RDT and microscopy testing capacity is being strengthened in the cross-border focus areas through direct supervision and at the national level through refresher trainings and strengthening quality assurance/quality control systems. Technical assistance is being provided to develop or scale up timely collection of community-level data through automated platforms using either SMS or smart phone technology in Cambodia and Thailand, respectively, and cases are detected through a combination of active and passive case detection.

An increase in the number of malaria cases in Attapeu, Lao PDR, was noted in late 2011. From October to December 2011, a total of 7,904 persons were tested of whom 932 had confirmed malaria, an increase from previous years. Investigations led by the MOH's Centre for Malaria, Parasitology, and Entomology revealed an increase in cases and deaths, probably due to a decrease in LLIN coverage and local development projects requiring forest clearings, which put the workers at risk. PMI was able to meet LLIN/LLIHN commodity gaps with FY 2011 funding and is supporting an assessment of the local surveillance capacity through pre-PMI funds.

Planned activities with FY 2013 funding are as follows: (These costs are covered under the Diagnosis and M&E sections)

- **Maintaining surveillance and response in low transmission and elimination settings:** The focus of PMI's epidemic surveillance and response activities will be on strengthening surveillance systems and maintaining quality diagnosis. Although no regional stockpiles of commodities will be maintained for outbreak purposes, there is flexibility in the commodities procured for the region to respond promptly to potential outbreaks or bottlenecks. (see Diagnosis and M&E sections)

MONITORING AND EVALUATION

PMI will continue to work with NMCPs and partners to strengthen efforts to limit the burden of multidrug-resistant *P. falciparum* malaria in the GMS. Although there is some overlap between the M&E needs of the regional and PMI-supported focus areas, PMI support to these areas will be outlined separately. PMI will focus on the following areas: 1) ensuring collection of quality, standardized routine and survey data from the cross-border focus areas that feeds into national surveillance systems; 2) development of one national M&E plan for each country; 3) provision

of technical support for national/subnational surveys; and 4) strengthening national M&E capacity.

Activities in cross-border focus areas

Efforts to strengthen malaria control in areas with evidence of artemisinin resistance will be targeted to cross-border focus areas, where PMI will contribute to achieving the sub-regional targets set by WHO-MMP and WHO-WPRO of reducing malaria morbidity and mortality by 50% by 2015 compared to 2010. Depending on partners' access and resources, PMI will explore extending its control efforts to Kayin, Kachin, Bago, Mon, and Shan States in Burma; Tak, Chiang Rai, and Kanchanaburi Provinces in Thailand; and in Cambodia in other areas near the Vietnamese borders (especially Mondulkiri/Snoul). Support will be provided to strengthen M&E activities in the cross-border focus areas, to strengthen routine data collection at the community level, and track several outcome indicators through periodic surveys. The coverage targets will be set higher (100% ITN ownership and 90% use) than previous PMI targets as the areas with documented artemisinin resistance require intensive scale-up (See Goals and Targets). The PMI targets are consistent with the targets set by the program for their containment zones. Reaching and maintaining these ambitious targets will require sustained commitment and financing.

Regional activities

Previously, USAID funded development of an updated GMS-specific M&E framework, the Regional Malaria Indicator Framework (RMIF). The RMIF was developed through the joint efforts of the NMCPs of the six GMS countries, WHO, USAID, Centers for Disease Control and Prevention (CDC), and the Malaria Consortium, with leadership from MEASURE Evaluation. The framework has been harmonized with the WPRO Regional Action Plan to Control and Eliminate Malaria as endorsed by the Regional Committee Meeting in 2009 and was presented to the 16th RBM Monitoring and Evaluation Reference Group Meeting (RBM-MERG) in Cambodia. With the near finalization of the RMIF, technical partners in the region will continue to assist NMCPs in adopting this framework and streamlining their reporting requirements. The updated M&E framework is being used to guide the multiple existing donor-driven M&E needs and in assisting countries in developing national M&E plans.

The RMIF includes indicators that require data generated through both the routine health management information system and from surveys. Malaria has been integrated into the health management information system in all six countries. This and its capacity in the GMS vary widely from paper to web-based surveillance and from passive case detection (sometimes of cases that may or may not be parasitologically confirmed) to active case detection in some places e.g. China and containment zones of Thailand. Limitations include delays and incompleteness of reporting and the collection of data only from the public sector. Most programs struggle to collect data from peripheral settings, such as from village health volunteers, from the private sector, the military, and migrants. The collection of data from the private sector poses particular challenges in Cambodia and Burma. Other challenges in the region are providing feedback and supervision, poor information technology structures limiting timely reporting of data, and weak capacity for data management and analysis, especially at the periphery. Often the data is not disaggregated by factors that are epidemiologically pertinent (e.g. age, gender, ethnicity, migrant status, or occupation).

Progress to Date:

Activities in cross-border focus areas

Monitoring of PMI's activities in the cross-border focus areas will require strengthening the collection of routine data and survey data in the project areas. The majority of the indicators to be monitored by PMI will come from routine surveillance data except for key ITN ownership and use numbers. The NMCP data from both Burma and Cambodia underestimate the true burden which is thought to be 3 to 4 times higher since the majority of malaria treatment occurs in the private sector. For Thailand, reported cases are confirmed, and there is very little use of the private sector. For Cambodia and Burma, PMI will begin to engage with the formal private sector in the cross-border focus areas to improve case management and malaria reporting. In Burma, this is in its nascent phase of mapping the registered private providers, whereas in Cambodia engagement of the private sector has begun with training and monthly supervision with collection of referral rates.

Malaria data from migrants and mobile populations have been difficult to ascertain as traditional survey methods may miss this population and routine surveillance data varies as to the collection of this demographic information. Thailand has made efforts to record and report malaria data specifically for migrants stratifying by those with residence < 6 or >6 months. In Cambodia, a cadre of mobile malaria workers specifically targeting mobile/migrant populations has been deployed, and their malaria data are now incorporated into the malaria surveillance system. PMI is also supporting a respondent-driven sampling survey, a methodology used often with hidden populations, in Ranong, Thailand, among Burmese migrants to ascertain malaria prevention and treatment coverage and prevalence estimates. Data collection will be completed in July, 2012.

With FY 2011 funding, PMI M&E technical partners will provide assistance to the CAP-Malaria project to strengthen surveillance systems and collect high-quality, timely data for RMIF and PMI indicators at the community level. This will also include day 3-positive surveillance broadly in Thailand and Cambodia and at sentinel sites in Burma. Additional baseline survey data for the cross-border focus areas will be collected by PMI implementing partners in Burma in their focus areas. Baseline data in Cambodia is represented by the USAID's Malaria Control in Cambodia end-of-project survey data (see Table 5 in Current Status of Malaria Indicators section). In Thailand, PMI will rely on the national survey planned for late 2012.

Regional activities

To assist NMCPs to adopt the RMIF and to build M&E capacity, a regional M&E course was conducted in October 2011. The curriculum developed by the M&E technical partners led by Malaria Consortium/CDC aims to train a cadre of M&E experts and trainers within each country who would be able to adapt the curriculum to their country context and conduct national and subnational trainings. Following the training, Lao PDR adapted the curriculum to their national context and has conducted provincial level trainings.

With the finalization of the RMIF and development of revised national strategic plans for malaria control, countries are in the process of developing updated national M&E plans. Vietnam and Laos have recently updated their M&E plans incorporating the RMIF. The PMI-supported technical partners will provide technical assistance to Thailand, Cambodia, and Burma as they undertake this activity. Efforts to harmonize the performance framework of Global Fund grants

with the RMIF are being supported by Thailand's Global Fund Round 10 and Cambodia's single-stream Global Fund grant.

The incorporation of the RMIF into the national M&E plans is the first step in standardizing the indicators collected throughout the sub-region. As countries strengthen their data collection activities, PMI technical partners are supporting NMCPs to conduct national/subnational surveys and develop malaria bulletins. Burma recently concluded a subnational survey that includes malaria intervention coverage and prevalence estimates in the MARC areas, which overlaps with PMI project areas. These data are currently being analyzed. The Cambodian 2010 National Malaria Survey has been finalized and they are planning for the next survey to take place at the end of 2012. Thailand is also planning a national malaria survey to take place in October and November of 2012, which is primarily being funded by the Global Fund. These national surveys will supplement intervention coverage data being collected by CAP-Malaria. In Cambodia, Malaria Consortium is assisting the CNM to develop an electronic malaria information system that incorporates data on malaria from health facility- and community-level village malaria workers. 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 general health information system for comparison. CNM has recently posted this pilot on-line (<http://www.cnm.gov.kh/index.php?action=ID80>). Malaria Consortium is supporting Thailand as they seek to streamline their surveillance system and transition to a smartphone-based reporting and alert system. PMI will also undertake an assessment of the surveillance system in Burma.

WHO has completed an M&E capacity assessment of the four WPRO countries (Cambodia, China, Lao PDR, and Vietnam). A similar assessment is planned for Thailand and Burma. WHO continues to update the regional strategic document, Mekong Malaria III, which includes both epidemiological and entomological data and analyses of relationships with health systems, program costs and financing, community involvement, private sector engagement, and cross-border collaboration. This analytical review also projects regional trends in socio-economic development, migration, and other factors likely to affect malaria transmission. A first draft should be available in June, 2012.

Planned activities with FY 2013 funding (\$387,000)

- **Support for M&E activities and surveillance strengthening:** Technical assistance will be provided to ensure that quality routine surveillance and survey data collection at the community level has been harmonized with other regional efforts. Development of data collection tools and streamlined reporting platforms will be designed (Burma) or adapted (Thailand and Cambodia) to improve community-level reporting of cases.

At the regional level, PMI will continue to support national programs as they update their national M&E plans, although most countries should have updated plans by late 2013. For countries such as Thailand and Cambodia that are moving towards electronic data management systems, malaria bulletins will be produced and maintained. Following an assessment of the surveillance system in Burma, PMI will support NMCP's plans to strengthen their system and coordinate multipartner M&E needs. In Burma, PMI will provide capacity building support and technical assistance to strengthen routine collection and reporting of RMIF indicators, as well as data analysis, and use of data for decision making.

Limited technical assistance will be provided for countries as they adapt the regional M&E curriculum and conduct in-country cascade training. (\$200,000)

- **Coordination of regional surveillance and M&E activities:** PMI will continue to support the M&E network convened by WHO WPRO and composed of technical partners and NMCP M&E focal points to identify and address M&E needs in the sub-region. PMI will contribute to planned National Malaria Program Reviews. (\$75,000)
- **Burma subnational malaria survey 2014:** A follow-up household, health facility, and drug outlet survey data will be collected in Burma in 2014. PMI will provide technical assistance and funding support to ensure coordination and additional analyses of the PMI project areas. (\$100,000)
- **Technical assistance on M&E:** A CDC medical epidemiologist will provide technical assistance with on-going M&E activities in the GMS region, provide input on planned surveys, and support NMCPs' with their M&E plans. (\$12,000)

Surveillance: Drug resistance and therapeutic efficacy studies

Since 1991, drug efficacy monitoring has been carried out in several sentinel sites. This has led to the recognition of emerging artemisinin resistance at the Thai-Cambodian border.¹⁸ Historically, a significant contributing factor to drug resistance in this region has been the extensive population movement among gem-miners, soldiers, refugees, and plantation workers in and around forested areas of these countries. Another related issue is the widespread availability of substandard antimalarial drugs.

Since 2000, USAID has supported a regional network and several regional meetings to address this important issue, beginning with *Monitoring resistance to antimalarial drugs* in Phnom Penh, Cambodia, in 2000 to the most recent *Workshop to review and plan therapeutic efficacy studies to monitor P. falciparum and P. vivax resistance to antimalarial drugs in the Greater Mekong Sub-region* held in Mandalay, Burma in 2009.

Progress to Date:

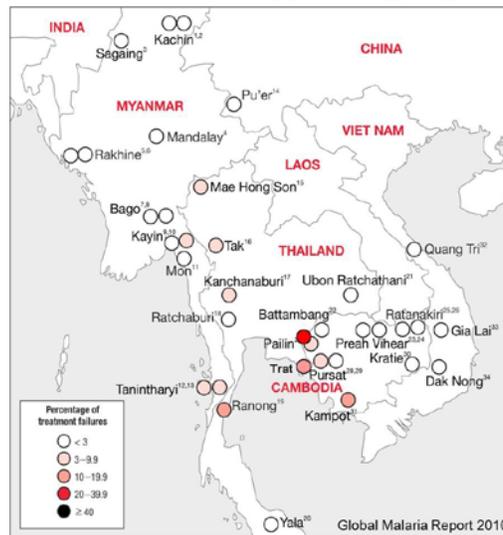
The therapeutic efficacy study (TES) network in the GMS supported by PMI is one of the strongest regional TES networks and serves as a model for other regions. Currently, 35 sentinel sites are active in the six countries on a rotating basis (Cambodia-5 sites; China-3 sites in Yunnan; Lao PDR 3 sites; Burma-10 sites; Thailand-9 sites; and Vietnam-5 sites). This network has been strengthened in the past few years to include chloroquine-resistant *P. vivax* monitoring and to extend its geographic coverage. WHO, which coordinates this network with financial support from PMI, continually updates the database on drug resistance, convenes regular network meetings to share data and publish periodic reviews. The recent WHO report *Malaria in the Greater Mekong Subregion* reviews the therapeutic efficacy data from 2001 to 2007 for the six GMS countries. The next regional network meeting will be held in Yunnan, China in June 2012. The network has focused on improving the quality of TES data by standardizing the

¹⁸ World Health Organization. *Containment of malaria multidrug resistance on the Cambodia-Thailand border, Report of an informal consultation, Phnom Penh, 29-30 January 2007*. SEA-MAL-246.

protocol and operating procedures around microscopy quality assurance and data management and monitoring throughout the region. The early routine surveillance data from these sentinel sites heralded the potential emergence of artemisinin resistance and triggered further research to characterize and confirm the resistance and to mount a containment response.

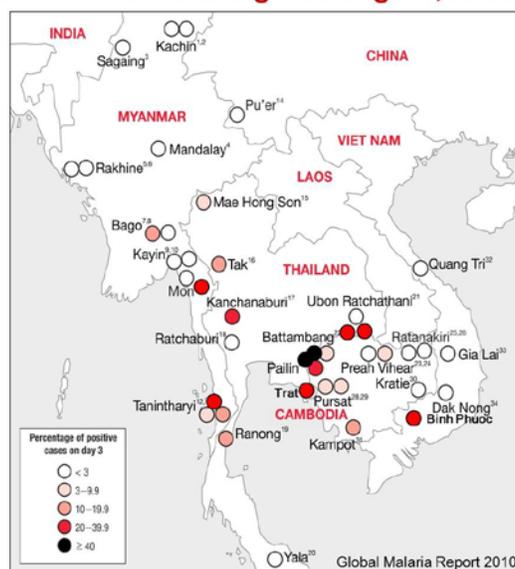
The TES provided early warning information on the emergence of artemisinin resistance from its initial foci on the Thai-Cambodia border; it is now spreading or emerging *de novo* in other parts of the Mekong region. Artemisinin resistance is confirmed in Pailin; DHA-Pip showed delayed parasite clearance times and high failure rate in Pailin; and artesunate + mefloquine showed delayed parasite clearance times but good adequate clinical and parasitological response.

Percentage of treatment failure of different ACTs in Greater Mekong Sub-region, 2006-2011



Analysis of current and historical USAID/PMI-funded TES data has shown that the percentage of positive slides on day 3 of follow-up above 10% is a predictor of decreased clearance of the parasite to artemisinins. Delayed parasite clearance times to DHA-Pip has been observed in Binh Phuoc, Viet Nam, in two sites in Myanmar (Mon and Kawthaung), and in two provinces in Thailand (Surin and Sisaket) along the Cambodian border. In addition, of great concern is that high day 3 parasitemia rates have been noted at key migrant border crossing points for Thailand and Burma: Ranong-Tanintharyi, Kanchanaburi-Mon State, and Tak-Kayin State.

Percentage of positive cases on Day 3 after ACT in the Greater Mekong Sub-region, 2006-2011



Although these sentinel sites have now been maintained for several years and remain a priority of the NMCPs, the network faces several challenges. Due to the tremendous progress made in the region and thus a decline in malaria incidence, timely recruitment of patients has been an issue at most sites. They have also faced some technical challenges around clinical trial registration, timely data entry and data validation, and report writing/publication. Although the AusAID-funded joint assessment recommended to maintain and expand the TES network, PMI will explore other donor support for expanding the network or conducting more in-depth *in vitro* or pharmacokinetic studies.

Planned activities with FY 2013 funding are as follows: (\$950,000)

- **Regional TES network:** PMI will continue to support the NMCPs to conduct therapeutic efficacy studies at 35 sites across the six countries. Along with testing the current first-line regimens, testing replacement first-line therapies is imperative, especially as countries prepare to update their treatment guidelines. WHO will continue to provide regional coordination and technical assistance to the NMCPs in protocol adaptation, data analysis, and dissemination of results, as well as updating national treatment guidelines. (\$825,000)
- **Thailand TES sites:** PMI will support the Royal Thai Government directly to maintain nine TES sentinel sites in Thailand. (\$125,000)

Surveillance: Entomology

As rapid ecologic changes occur with economic development, deforestation, and scale-up of LLINs in this sub-region, there is an urgent need to collect and synthesize the entomologic data that already exists and to collect new, standardized data. The forested areas and possibly some plantations in the GMS are home to the region's most efficient malaria vector, *An. dirus* s.l., with a second major vector, *An. minimus* s.l., found in the forest and forest-fringe areas and possibly in the new orchard and rubber plantation ecologies. Beyond these two major vectors, there are a

plethora of “secondary” vectors, whose importance in the rapidly changing ecology of the region is still largely unknown. Unlike the TES network, the entomological surveillance undertaken by NMCPs and some foundations, universities, and research institutions within each of the GMS countries is often uncoordinated and the results are not widely disseminated.

Given the high donor investments in LLINs, studies assessing the physical and insecticidal durability of LLINs are important. Such studies are currently on-going in Africa with PMI funds, but none have been conducted nor are currently planned in the GMS. With the recent launch of PMI and the community-level interventions in the region, PMI may consider starting to develop appropriate methodologies for how durability studies might be done in the GMS. If feasible, entomologic surveillance and/ or the proposed personal protection OR study funds can be reprogrammed to explore this issue.

Progress to Date:

With PMI support and in collaboration with WHO-WPRO-Southeast Asia Regional Office, a biregional workshop was convened to monitor insecticide resistance and mapping of malaria vectors in the Greater Mekong Subregion in March 2012. The workshop was attended by 40 representatives from participating GMS countries as well as observers-instructors from ten institutions. Outcomes included the development of country work plans for insecticide resistance monitoring and vector mapping, and an inventory of resources for entomologic monitoring in the GMS. PMI will continue to support regional strengthening of entomologic surveillance for mapping and insecticide resistance monitoring. Working through the WHO-MMP network, and in collaboration with ACTMalaria, PMI is assisting with coordination of personnel and resources to strengthen entomologic monitoring in the region. PMI will continue to engage with JICA and Armed Forces Research Institute of Medical Services to strengthen entomologic capacity in the region.

In the cross-border focus areas, where PMI and other donors are supporting efforts to scale up LLINs, NMCPs need to monitor and evaluate a few basic entomological parameters. In light of the changing ecologies, there are four areas of entomological monitoring that need to be addressed:

1. Location of the vectors, particularly in areas that have been deforested for farming or for orchards and rubber plantations, which may mimic the original forest ecology.
2. Vector biting time and place in relation to humans, and the potential impact of treated nets on these behaviors.
3. Insecticide resistance (limited studies suggest that pyrethroid resistance does not appear widespread).
4. Role of personal protection ‘outside the house’ such as treated hammocks and hammock nets, treated clothing and temporary shelters, and topical and spatial repellents.

Proposed USG activities with FY 2013 funding: (\$307,000)

- **Determination of vector transmission ecology in relation to current LLIN deployments in cross-border focus areas:** PMI will support entomological monitoring in the cross-border focus areas in coordination with the NMCPs and implementing partners. In these focus

areas, the following primary entomological indicators will be collected: 1) species of malaria vectors in intervention areas; 2) vector distribution and seasonality; 3) vector feeding time and location; and 4) insecticide susceptibility and mechanisms of action. PMI will also support the rehabilitation of the national-level insectary in Cambodia. (\$275,000)

- **Regional insecticide resistance database:** Previous PMI funds have established a regional insecticide resistance database and PMI will continue to support the maintenance and updating of this database. (\$20,000)
- **Technical assistance on entomological monitoring:** A CDC entomologist will provide technical assistance on entomological monitoring activities to ensure quality control in the cross-border focus areas. (\$12,000)

Operations Research

Operational research needs in the GMS present unique opportunities and challenges. Several groups in the region have been at the forefront of malaria research especially in surveillance of drug resistance, testing new treatments as regimens become ineffective, and the pathogenesis and epidemiology of *P. vivax* and mixed infections. While the absolute malaria burden remains low, malaria control efforts must be intensified to eliminate malaria in areas of suspected resistance. In an elimination setting, PMI will use best available evidence to guide such efforts. In cases where such evidence may be lacking, OR activities will be undertaken where they can inform malaria control practice and policy.

The GMS faces additional challenges of exploring different surveillance strategies for lower transmission and elimination settings, outdoor transmission, high proportions of mixed infections, and the safe use of primaquine. OR will be essential in assessing innovative preventive and curative interventions and subsequent scale-up of these interventions in the Mekong context. Although numerous research partners exist in the region, OR priorities must be framed to directly inform control policies.

To identify the priority OR questions for the GMS, an OR symposium was convened for the sub-region in 2010. Prior to the symposium, country-level assessments of current OR activities, priorities, and gaps were identified and synthesized for the regional meeting. This regional symposium facilitated the development of an OR framework for malaria control and elimination in the GMS, by identifying common regional malaria research priorities, facilitating linkages across the region, and promoting greater coordination and sharing of findings. The symposium identified several priority questions for six topic areas (vector control and prevention, case management, *P. vivax* and safe use of primaquine, vulnerable populations, M&E and surveillance, and health systems and private sector). PMI-supported OR projects will seek to answer some of the priority questions identified through this sub-regional forum.

The recent joint assessment of the response to artemisinin resistance in the GMS funded by AusAID and BMGF identified the following priority areas for OR: a strategy on the addition of primaquine to ACT for treatment of *P. falciparum*, a field-ready test for G6PD deficiency, molecular markers for resistance, personal protective measures, *in vitro* susceptibility monitoring, highly sensitive diagnostic tools for detecting low-density parasitemia, patterns of

population movement, and expanding research into new drugs. The more down-stream, programmatic needs, e.g., personal protection and G6PD testing, were already identified by PMI and pending approval by the OR steering committee..

Progress to Date:

With FY 2011 funding, PMI is supporting an evaluation of a point-of-care RDT (AccessBio) to assess for 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. An evaluation of a first generation RDT in Cambodia noted unacceptably low sensitivity and falsely diagnosed as normal a small percentage of persons with severely low levels of G6PD enzyme. In light of this disappointing data, the FY 2011 evaluation plans to test the third-generation RDT to assess the test performance and ease of use. AccessBio has agreed to donate the RDTs for this evaluation and the protocol will be submitted to the Cambodian national ethics board in August, 2012. If this RDT performs well, a hemolytic sensitivity study is proposed with FY 2012 funds using this RDT to guide the use of primaquine. This evaluation is urgently needed as Cambodia is trying to safely deploy single-dose primaquine along with Malarone in Pailin for *P. falciparum* malaria with no capacity to test for G6PD deficiency in peripheral settings.

The need to prevent the outdoor transmission of malaria continues to challenge this region. The RBM Vector Control Working Group established a network for outdoor transmission research in the Mekong countries and convened a meeting in March 2012 to discuss the strategic direction for research and development along the lines of entomological efficacy and community acceptability. With FY 2012 funds, an evaluation of insecticide-treated materials (e.g. vests/ longyis) among rubber tappers is proposed.

Proposed PMI activities with FY 2013 funding: (\$212,000)

- **Spatial protection measures:** Following the recommendations of the RBM Vector Control Working Group Outdoor Transmission Network on the strategic direction for research, PMI will support a project to assess the entomologic efficacy of one personal protection measure e.g., the efficacy of dichlorovos (Vapona Insect Strips), C8910 (a short-chain fatty acid-based spatial/area repellent), or other new spatial repellents to protect from outdoor and early biting vector mosquitoes. Once the implementing partner and test locations are identified the appropriate research design and budgetary needs will be defined. (\$200,000)
- **Technical assistance with OR:** A CDC medical epidemiologist or entomologist will provide technical assistance for the implementation and completion of PMI OR activities in the region. (\$12,000)

CAPACITY BUILDING

GMS countries face many challenges related to human resources for health care, including the shortage of skilled health workers and technical staff and a high turnover and lack of motivation among trained staff in remote and inaccessible areas. Decentralization of the health care system and integration of malaria control into general health services places an additional management burden on the provincial and district levels. While it is beyond the ability of PMI to address the

system-wide capacity and health systems issues throughout the sub-region, PMI has provided long-standing support to strengthen regional technical capacity through ACTMalaria. ACTMalaria is an intercountry training and communication network that includes the NMCPs of Bangladesh, Cambodia, China, Republic of Indonesia, Lao PDR, Malaysia, Burma, Philippines, Thailand, Timor-Leste, and Vietnam. Since 1996, ACTMalaria has been a primary mechanism for building technical and management capacity among the countries in the GMS. The ACTMalaria Secretariat is located in the Philippines, while the chair of the Executive Board rotates every two years. The Burma NMCP manager is the current chair. Although PMI supports much of ACTMalaria's management costs, many trainees receive domestic or Global Fund support to participate in the organized courses. ACTMalaria is also a key partner in capacity building within the Asian Pacific Malaria Elimination Network, which is supported by AusAID. While continuing their work with established courses, e.g. the Management of Malaria Field Operations, Quality Assurance for Diagnostics, and Integrated Vector Management, ACTMalaria will explore opportunities to develop new curricula as identified by the executive board of the 11 member NMCPs.

Thailand under the Bureau of Epidemiology, MOPH, began its Field Epidemiology Training Program (FETP) in 1980 and was the first program to be established with CDC technical assistance. The FETP is a two year, full-time, postgraduate competency-based training program consisting of about 25% class work and 75% field residency. Trainees are closely supervised and provide epidemiologic services to the MOPH. Graduates earn a Certificate of Accomplishment in International Field Epidemiology Training Program – Thailand. Since 1998, Thailand has offered the International FETP to trainees from neighboring countries. To date, the program has produced over 100 FETP graduates, the majority of whom are now working in the MOPH, both at the central and provincial levels. PMI plans to support one to two Burmese FETP residents in FY 2013 with professional support, including malaria projects that will provide professional experience with training and educational value.

Progress to Date:

With Year 1 funding, PMI is supporting regional training courses to build the capacity of NMCPs in the management of malaria field operations, diagnostics, case management, and integrated vector management.

Planned activities with FY 2013 funding: (\$425,000)

- **Regional training courses:** Coordination and facilitation of training courses to build the capacity of NMCPs and their workforces, especially related to critical health systems bottlenecks, such as supply chain management, disease surveillance and reporting, M&E, and laboratory diagnostic services. Several courses addressing these bottlenecks include the Management of Malaria Field Operations, Quality Assurance for Diagnostics, and Integrated Vector Management. A financial sustainability plan will be developed to explore options to diversify their funding portfolio and to implement potential direct funding mechanisms through USAID Forward. (\$275,000)
- **Field Epidemiology Training Program:** The International FETP in Thailand provides training to neighboring countries. PMI will support 1–2 trainees from Burma who will focus their field training on malaria prevention and control, including malaria outbreak detection and response activities, and an evaluation of malaria surveillance efforts. (\$150,000)

COORDINATION

PMI has supported the formation and management of the WHO biregional MMP for a number of years, but this office is now in transition with the imminent retirement of the current Coordinator. MMP has helped bridge the two WHO regions of the GMS: Southeast Asia Regional Office based in Delhi and WPRO based in Manila. In light of spreading evidence of resistance, WHO/Geneva is now determined to play a more proactive leadership role in GMS. At the same time, other donors have stepped up their support for regional activities, including support for on-the-ground staff in specific areas where resistance has been identified. Therefore, PMI will refocus efforts to ensure continued country-level support for technical assistance and coordination in Burma and Cambodia, the two key PMI focus countries in the sub-region.

Progress to Date:

As noted, USAID and now PMI have played a key role in first establishing the MMP and continue to maintain its role in regional coordination, therapeutic efficacy surveillance, and M&E. In FY 2012, PMI will provide continued support for country offices in Cambodia and Burma but will discontinue support for the MMP Coordinator and office. PMI continues to encourage WHO's heightened response to artemisinin resistance, but with greater leadership from WHO/Geneva and involvement of additional donors.

Planned activities with FY 2013 funding are as follows: (\$500,000)

- **Country-level coordination:** PMI will direct its FY 2013 support to WHO country programs in Cambodia and Burma. Under the leadership of PMI-supported WHO staff, country offices will facilitate national policy guidance on artemisinin resistance and support PMI-financed M&E (see M&E section) and TES activities (see TES section). Once WHO local field staff have been posted to areas of artemisinin resistance through other donor support, PMI-supported WHO staff will be integral in providing oversight and coordination. The WHO office in Rangoon will also facilitate donor coordination and relevant program reviews. (\$500,000)

INTEGRATION WITH OTHER GLOBAL HEALTH INITIATIVE PROGRAMS

The HIV/AIDS epidemic appears to have stabilized in the countries making up the GMS. Thailand is the only country with an HIV seroprevalence as high as 1%, and its epidemic appears to be stable overall with a fall in incidence between 2001 and 2009. Across the sub-region, the most-at-risk populations include those who inject drugs, sex workers and their clients, and men who have sex with men; but as the epidemics matures, HIV is spreading more widely, with women accounting for 35% of all infections in 2009, compared with just 21% in 1990. There have been limited opportunities for integration between HIV and malaria activities because the populations at risk are different.

PMI continues to support an integrated, multidisease platform, where appropriate. For example, USP not only works to strengthen antimalarial drug quality, but also tests antibiotics and drugs for influenza and tuberculosis. With FY 2011 funding, PMI will support an assessment of antenatal care (ANC) specifically around malaria in pregnancy. Following this assessment,

opportunities to integrate training for health workers at ANCs and the possibility of routine LLIN distribution through ANCs will be assessed.

Lower Mekong Initiative

PMI embraces the goals of the Lower Mekong Initiative and fully supports the health pillar activities, which include 1) focus on malaria and the need to develop and strengthen a coordinated response; 2) prevention and control of counterfeit and substandard medications; 3) regional collaboration to support implementation of the International Health Regulations and regional level emphasis on surveillance and response; and 4) sharing good practices across GHI initiatives. Furthermore, cross border and migrant issues are common concerns for both GHI and the Lower Mekong Initiative. Burma will join the Lower Mekong Initiative in 2012, ensuring a strong geographic overlap between the PMI GMS countries and the Lower Mekong Initiative. PMI supports surveillance and drug quality monitoring throughout the Lower Mekong Initiative region.

USAID Forward

The PMI team will work to further the following implementation and procurement reform objectives:

Increase Use of Partner Country Systems: Government-to-government grants are primarily feasible in Thailand, among GMS countries. PMI will allocate up to \$340,000 in FY 2012 for support of border malaria posts and management of eight to nine therapeutic efficacy study sites.

Strengthen Local Civil Society: Support to local NGOs and community-based organizations is one of the most effective means to access difficult-to-reach migrant and mobile populations. The bilateral regional malaria project is designed to make subgrants to local organizations. CBOs may be particularly effective in behavioral change communication, ensuring ITNs reach populations most at need and facilitating community-based diagnosis and treatment; thus, in FY 2012, PMI allocated \$100,000 to support building capacity of local NGOs in malaria control through an Annual Program Statement from USAID/Cambodia and plans to continue this activity in FY 2013.

Collaboration with Bilateral Donors: The GMS region is of great interest to many donors and stakeholders in the malaria community due to the threat of artemisinin resistance. PMI is actively collaborating with the WHO, the Global Fund, and the Gates Foundation in this region. In addition, PMI is engaging in discussions with the U.K. Department for International Development, AusAID, and other bilateral donors to support the region to ensure that activities and mechanisms are complementary.

PRIVATE SECTOR ACTIVITIES

Private sector activities in the GMS can be divided into three broad areas: private practitioners and the private pharmaceutical sector; the private mosquito net sector; and private workplace programs.

Collaboration with the private practitioners and the private pharmaceutical sector

Cambodia has been doing extensive work with the private pharmaceutical sector. Partners involved with the private pharmaceutical sector include ACTWatch¹⁹, USP²⁰, PSI²¹, and the CAP-Malaria Project.²² With the new malaria elimination targets, malaria case management in the private sector must be improved. With PSI, the CNM will provide training and follow-up supervision for early diagnosis and treatment to 4,200 private providers in 20 malaria-endemic areas during 2011–2012. There will also be an expansion of the medical detailer program to reach providers and different types of unregistered drug outlets in rural areas. Although Cambodia is an Affordable Medicine Facility - malaria pilot country, these activities have been delayed due to challenges in procuring DHA-Pip.

In Burma, PSI supports the “Sun Quality Health Network,” a franchise of licensed general practitioners serving low-income populations. As of December 2008, the network included 548 clinics, located in 126 townships, which were providing malaria diagnosis and treatment (the network tested 86,600 fever cases and treated 33,700 confirmed malaria cases in 2008). Similarly, the Myanmar Medical Association, with support from Global Fund, Three Diseases Fund and WHO, has a network of private general practitioners (160 as of end of 2008) under its project “Quality Diagnosis and Standard Treatment of Malaria.” The private general practitioners are being supported with training and logistics to deliver quality-assured diagnosis and treatment of malaria. This is being expanded, and by the time Global Fund Round 9 implementation starts, it is expected that 325 private providers will be part of the network. In addition, with support from WHO and in collaboration with the VBDC, the Myanmar Medical Association is conducting continuing medical education to promote rational diagnosis and treatment of malaria.

In Thailand, antimalarials are prohibited in the private sector, and there is minimal engagement of private practitioners and the private pharmaceutical market.

Collaboration with the private sector for increased access to ITNs

While there is an entrenched “net culture” and vibrant private market for untreated nets, the PSI bundling program in Cambodia is the only current active collaboration with this sector. As described in the ITN section, PSI is bundling long-lasting insecticidal treatments to the wholesale mosquito net distributors (Cambodia imports 900,000 untreated nets each year). At the same time, many of the WHOPES-approved LLIN companies manufacture their nets in the region – but for export or sale to public-sector programs and not to private institutional buyers or the retail markets. Discussions are underway through RBM and WHO to understand better the barriers to domestic retail sales of LLINs in the region. If these can be overcome, and a local market established, especially for workplace programs by institutional buyers, engagement with the commercial LLIN sector for broader, regionwide, communications and marketing related to malaria and LLINs may be possible.

Workplace programs

Cambodia, Thailand, and Burma all have experience in developing “workplace programs” for malaria. In Cambodia, CAP-Malaria works with commercial farms in Western Cambodia to test

¹⁹ http://www.actwatch.info/countries/general_information.asp?00=1&01=29

²⁰ <http://www.usp.org/worldwide/>

²¹ <http://www.psi.org/cambodia>

²² <http://www.urc-chs.com/news?newsItemID=105>

a model of loaning out LLINs to seasonal farm workers through farm owners. In Thailand, another PMI-supported partner works with rubber plantation owners to provide preventive and curative services to the largely Burmese workforce. Also in Thailand, under the BMGF-funded containment project, BVBD established a number of partnerships with plantation owners promoting malaria prevention and control amongst migrant workers (e.g. “malaria corners” in factories and workplace BCC campaigns).

In Burma, under the Global Fund Round 9 grant the Myanmar Business Coalition for AIDS will partner with the VBDC to provide malaria prevention services to workers in mostly large-scale forestry enterprises. Another partner in Burma working with the private sector is the International Organization for Migration, which signed a Memorandum of Understanding with the MOH in 2004 to implement a community-based migration health project in Mon State. The Mon State project provides tuberculosis, malaria, and HIV prevention, diagnosis, treatment, and other capacity building and health education activities in 76 villages across six townships. This project is funded by the Swiss Development Cooperation and the Three Diseases Fund.

Possibly the most important workplace programs will be related to major development projects, such as the Dawei Deep-sea Port project, an \$8 billion construction project in Tenasserim State across from Kanchanaburi Province Thailand. Development projects attract a large migrant worker population often into the heavily forested areas and thus workplace programs for malaria prevention and treatment need to be emphasized.

Planned activities with FY 2013 funding: (No additional funding is necessary):

Funding for specific activities with the private sector are found under the sections for prevention, case management, and community interventions. The activities addressed under these sections mostly target the private delivery of malaria curative and preventive services. In addition, engagement of the private business sector through workplace programs especially major development projects, e.g., Dawei Deep-sea Port Project and the rose farms in Tanintharyi, Burma should be further explored.

STAFFING AND ADMINISTRATION

Planned FY 2013 Activities: (\$1,459,000)

Two Resident Advisors will oversee PMI-supported activities in the Regional Development Mission Asia, one representing USAID and one representing CDC. They will be provided space within its offices in Bangkok, but are expected to travel widely within the sub-region. In addition, Foreign Service Nationals will shortly be hired to support the PMI team in Bangkok and Rangoon, while an FSN position has been funded in Phnom Penh. The PMI team will share responsibility for development and implementation of PMI strategies and work plans, coordination with national authorities, managing collaborating agencies, and supervising day-to-day activities.

The PMI advisors will be part of a single inter-agency team led by the Director of the Office of Public Health, USAID Regional Health Development Mission-Asia. Both resident advisors report to the USAID Mission Director or his designee. The CDC staff member is supervised by CDC, both technically and administratively. All technical activities are undertaken in close

coordination with national and international partners, including the WHO, Global Fund, U.K. Department for International Development, Three Diseases Fund, BMGF and the private sector.

Locally-hired staff to support PMI activities in the Regional Development Mission Asia will be approved by its USAID director as well as by USAID/Cambodia and Embassy Rangoon. 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 Regional Development Mission Asia Director and Controller.

ANNEX

Table 1: Year 3 (FY 2013) Budget Breakdown by Partner

Partner	Geographical Area	Activities	Budget (\$)
ACT Malaria	Southeast Asia	a) Coordinate and facilitate training courses; b) Provide microscopy/RDT QA/QC training and accreditation; c) Maintain insecticide resistance database	\$375,000
CDC IAA	Cross-border Focus Areas/ GMS (6 countries)	FETP support for 1-2 Burmese fellows	\$150,000
CAP- Malaria	Cross-border Focus Areas	a) Community level engagement to deliver malaria prevention and treatment; b) Collect entomologic data and assess efficacy and acceptance of prevention measures; c) BCC technical assistance for community-level implementation; d) Entomology monitoring package	\$4,035,000
DELIVER	Cross-border Focus Areas/ GMS (6 countries)	a) LLIN/LLIHN/retreatment kits, RDTs and ACT procurement; b) Strengthening the pharmaceutical management systems	\$3,180,000
Thai MOPH	Thailand	a) TES sites direct support; b) direct support to malaria posts/clinics/ border posts	\$315,000
USP-PQM	GMS (6 countries)	Maintain drug quality surveillance network including strengthening enforcement measures	\$350,000
WHO umbrella grant	GMS (6 countries)	a) Coordinate bi-regional offices of SEARO and WPRO; b) Support WHO country programs in Burma and Cambodia; c) Regional and national level M&E coordination ; d) Support TES studies	\$1,400,000
TBD-local NGO	Cambodia	Strengthening ITN coverage and use	\$100,000
TBD	Cross-border Focus Areas/ GMS (6 countries)	a) Malaria in pregnancy policy development and updating training and supervision tools; b) National support to develop M&E plans, national/sub-national malaria surveys, and capacity building; c) PMI focus area technical assistance and data analysis support to strengthen routine surveillance at the periphery;	\$600,000

		d) Support for MARC survey 2014; e) Assess entomologic efficacy of a spatial protection measure	
CDC	National	TDYs and staffing and administration	\$586,000
USAID	National	Staffing and administration	\$909,000
Total			\$12,000,000

Table 2: President's Malaria Initiative— Greater Mekong Subregion Planned Obligations for FY 2013 (\$)

Proposed Activity	Mechanism	Budget		Regional	Geographic Area			Description
		Total \$	Commodity \$		Burma	Cambodia	Thailand	
PREVENTIVE ACTIVITIES								
Insecticide Treated Nets								
LLIN/LLIHN/retreatment kit procurement and distribution	DELIVER	1,750,000	1,750,000	150,000	1,250,000	250,000	100,000	Support for 300,000 LLINs/LLIHNs (hammocks)/retreatment kits for focus areas and to fill potential gaps in the region
Community-level distribution and promotion of ITNs	CAP-Malaria	550,000			450,000	100,000		LLIN distribution, promotion and IEC/BCC in targeted focus areas. Distribution will target migrants in Cambodia and Thailand; In Burma will target all residents.
Community mobilization	TBD-local NGO	100,000				100,000		Hang-up, keep-up activities; strengthen ITN coverage and use
SUBTOTAL ITNs		2,400,000	1,750,000	150,000	1,700,000	450,000	100,000	
Indoor Residual Spraying								
SUBTOTAL IRS		0	0					
Malaria in Pregnancy								
Strengthening ANC practices around malaria in pregnancy	TBD	100,000		100,000				Policy development; updating training and supervision tools; in collaboration with NMCP and MNCH programs
SUBTOTAL MIP		100,000	0	100,000				
SUBTOTAL PREVENTIVE		2,500,000	1,750,000	250,000	1,700,000	450,000	100,000	
Case Management								
Diagnosis								

Procure RDTs	DELIVER	830,000	830,000	180,000	400,000	250,000		RDT procured for focus areas for use by community level health volunteers or workers
Training and supervision of RDT/microscopy	CAP-Malaria	Costs under treatment section						Support for focus areas in Burma and Cambodia - see case management
Training and accreditation for microscopy; Maintenance of slide bank	ACTMalaria	80,000		80,000				Support for microscopy training in the region and maintenance of regional and national slide banks
SUBTOTAL Diagnosis		910,000	830,000	260,000	400,000	250,000	0	
Treatment & Pharmaceutical Management								
Procure antimalarials	DELIVER	350,000	350,000	100,000	150,000	100,000		Antimalarials (e.g. artemether-lumefantrine, atovaquone-proguanil, chloroquine, primaquine, clindamycin) procured for use by community level health volunteers or workers
Case management at the facility and community level, including implementation, training and supervision	CAP-Malaria	3,010,000			1,850,000	1,100,000	60,000	Includes training and supervision of 140 VMWs in Cambodia, 300 VMWs in Burma, and technical support for malaria posts and volunteers in Thailand
Case management and supervision at malaria posts/ clinics/ border posts	Thai MOPH	190,000					190,000	Staff/site support for malaria posts and clinics
Support for supply chain, pharmaceutical systems, and forecasting	DELIVER	250,000		50,000	150,000	50,000		Technical assistance in supply chain management to the region. Strengthening the pharmaceutical management system, forecasting, quantification, management and distribution of pharmaceuticals and RDTs.

Drug quality monitoring	USP PQM	350,000		150,000	50,000	100,000	50,000	Strengthen post- marketing surveillance and response for drug quality
SUBTOTAL Treatment & Pharmaceutical Management		4,150,000	350,000	300,000	2,200,000	1,350,000	300,000	
SUBTOTAL CASE MANAGEMENT		5,060,000	1,180,000	560,000	2,600,000	1,600,000	300,000	
Behavior Change Communication								
BCC technical assistance for community-level implementation	CAP-Malaria	200,000			100,000	75,000	25,000	Support implementing partners with developing and implementing effective BCC/IEC approaches
SUBTOTAL BCC		200,000	0	0	100,000	75,000	25,000	
Strategic Information								
M&E								
Surveillance and M&E strengthening	TBD	200,000		25,000	100,000	50,000	25,000	National support to develop M&E plans, national/sub-national malaria surveys, and capacity building; PMI focus area technical assistance and data analysis support to strengthen routine surveillance at the periphery
M&E coordination at regional and country level	WHO	75,000		25,000	25,000	25,000		Regional and national level M&E coordination of NMCP staff, donors, and malaria implementing partners
Burma national/ sub-national survey	TBD	100,000			100,000			Follow-up to 2012 MARC survey to be conducted by VBDB in 2014 (household & health facility)
Technical assistance on M&E	CDC IAA	12,000						Support to on-going M&E activities in the

								region, provide input on planned surveys, and support NMCPs with M&E plans
Surveillance								
Therapeutic efficacy surveillance network	WHO	825,000		500,000	200,000	125,000		Conducting antimalarial drug efficacy studies in 6 countries (approximately 35 sites- 10 sites in Burma, 9 sites in Thailand, and 5 in Cambodia every two years), technical assistance (P4), national drug treatment policy review
Direct therapeutic efficacy surveillance support to national MOPH	Thai MOPH	125,000					125,000	Direct support to RTG for study site support
Entomologic surveillance (basic package)	CAP-Malaria	275,000			100,000	125,000	50,000	Support for entomological monitoring; insectary support for Cambodia
Regional insecticide resistance database	ACTMalaria	20,000		20,000				Maintenance of the regional insecticide resistance database
Technical assistance on entomological monitoring	CDC IAA	12,000						A CDC entomologist to support entomological monitoring in focus areas
Operations Research								
Assessment of personal measures against mosquitoes	TBD	200,000		200,000				Assess entomologic efficacy of a spatial protection measure
Technical assistance with operations research	CDC IAA	12,000						CDC staff support for the implementation and completion of PMI research activities
SUBTOTAL STRATEGIC		1,856,000	0	845,000	500,000	300,000	225,000	

INFORMATION								
Capacity building								
Regional training/ capacity building	ACT Malaria	275,000		275,000				Coordinate and facilitate training courses
Field Epidemiology Training Program	CDC IAA	150,000			150,000			Support 1-2 Burmese fellows to participate in the Field Epidemiology Training Program based in Bangkok
SUBTOTAL CAPACITY BUILDING		425,000	0	275,000	150,000	0	0	
Regional Coordination								
Country level support and coordination	WHO umbrella grant	500,000			275,000	225,000		Support to WHO country programs (50% Burma and 100% Cambodia)
SUBTOTAL REGIONAL COORDINATION		500,000	0		275,000	225,000	0	
In-country Staffing and Administration								
USAID Staffing	USAID	909,000		789,000	60,000	60,000		USAID Resident Advisor, PMI FSN Bangkok, Health FSN Burma, Malaria FSN Cambodia
CDC Staffing	CDC IAA	550,000		550,000				CDC Resident Advisor
SUBTOTAL IN- COUNTRY STAFFING		1,459,000	0	1,375,000	60,000	60,000	0	
GRAND TOTAL		12,000,000	2,930,000	3,230,000	5,410,000	2,735,000	625,000	