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PRESIDENT’S MALARIA INITIATIVE

Malaria Operational Plan — FY 2012

Greater Mekong Sub-Region

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ABBREVIATIONS

3DF	Three Diseases Fund
ACT	artemisinin-based combination therapy
AMFm	Affordable Medicine Facility for malaria
AusAID	Australia's Aid Programme
BCC	behavior change communication
BMGF	Bill and Melinda Gates Foundation
BVBD	Bureau of Vector-Borne Diseases, Thailand
CDC	U.S. Centers for Disease Control and Prevention
CMPE	Centre for Malaria, Parasitology, and Entomology, Lao People's Democratic Republic
CMS	Central Medical Store
CMSD	Central Medical Store Depot, Burma
CNM	National Centre for Parasitology, Entomology, and Malaria, Cambodia
DfID	UK Department for International Development
DHA-PIP	dihydroartemisinin and piperaquine
DOT	directly observed therapy
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 Sub-Region
HMIS	health management information system
IEC	information, education, communication
INGO	International non-governmental organization
IPTp	intermittent preventive treatment for pregnant women
IRS	indoor residual spraying
ITN	insecticide-treated net
JICA	Japan International Cooperation Agency
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
MIS	Malaria Indicator Survey
MMP	Mekong Malaria Programme
MOH	Ministry of Health
MOP	Malaria Operational Plan
MOPH	Ministry of Public Health (of Thailand)
MRA	Medicine regulatory agency
NGO	non-governmental organization
NIMPE	National Institute for Malariology, Parasitology, and Entomology, Vietnam
NMCP	National Malaria Control Program
OR	operations research
PMI	President's Malaria Initiative
PPM	public private mix
PSI	Population Services International

QA	quality assurance
QC	quality control
RBM	Roll Back Malaria
RDMA	Regional Development Mission Asia
RDT	rapid diagnostic test
RFA	request for application
RMIF	Regional Malaria Indicators Framework
SEARO	Southeast Asia Regional Office
UNICEF	United Nations Children's Fund
URC	University Research Corporation
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 (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 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 GHI, along with HIV/AIDS, and tuberculosis. The 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 FY2014. Programming of PMI activities follows the core principles of GHI: 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 and ministries of health in 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 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 Thailand-China borders and in southern Vietnam.

The USG 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 malaria control in Cambodia and Thailand is the Bill and Melinda Gates Foundation artemisinin resistance containment project.

The FY2012 PMI Malaria Operational Plan for the GMS is based on progress and experiences during the last five years and was developed with the Regional Development Mission for Asia (RDMA) during a planning visit in August 2011 by representatives from USAID, the Centers for Disease Control and Prevention, and the national malaria control programs of 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 on containment of 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 are highlighted in the FY2012 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 where there is already strong evidence of artemisinin resistance, as a means of reducing the likelihood of it spreading beyond those areas. These cross-border focus areas will be centered on Tanintharyi-Ranong border areas of Burma and Thailand and the Trat-Pailin border areas of Thailand and Cambodia. Depending on partners' access and resources, geographic extension of the cross-border focus into other areas along the Burma-Thailand and Cambodia-Thailand borders will be considered for locations where new evidence of artemisinin resistance is identified. Potential areas could include Mon and Kayin States in Burma, Tak Province in Thailand and additional artemisinin resistance containment zones at the Cambodia-Thailand border. The proposed FY2012 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 the Global Fund Round 9 and Round 10 grants.

With FY2012 funding, PMI will procure about 325,000 LLINs to fill gaps in Global Fund grants in the cross-border focus areas centered on Tanintharyi-Ranong and Trat-Pailin, as well as provide behavior change communication messages 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 (IRS) 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 IRS in the sub-region.

Intermittent preventive treatment of malaria in pregnancy (IPTp): Because of the low levels of malaria transmission in the GMS, IPTp is not national policy for any country in the sub-region. PMI will encourage a review of country malaria in pregnancy policies and approaches to better understand issues and explore options in the future.

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 ACT 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 sub-region. 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, although reports of *P. vivax* resistance to this drug 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 USG 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 have been limited to date.

RDT and ACT needs in Burma, Cambodia, and Thailand are supposed to be met by those countries' Global Fund grants, however, stock outs have been happening more frequently due to bottlenecks in GF procurement. With FY2012 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. If countries making up the GMS are to further reduce malaria transmission, contain the spread of artemisinin resistance, and move towards elimination, their malaria surveillance systems must be strengthened. USG funding for M&E during the past several years has focused on building a regional malaria M&E framework and updating national M&E plans.

With FY2012 funding, PMI will help countries in the collection of timely, quality surveillance data and build M&E capacity within their national malaria control programs. PMI will support collection of data on Day 3 positive case reports at the community level to better assess the geographic reach of potential artemisinin resistance in the region. PMI will also continue USG support to antimalarial drug resistance monitoring in all six countries making up the GMS and entomologic surveillance in the cross-border focus areas. Operational research activities to be supported with FY2012 funding will include an assessment of primaquine safety using a second generation glucose-6-phosphate dehydrogenase deficiency rapid test and exploring the efficacy of personal protection measures e.g. insecticide-treated materials or repellants.

The proposed FY2012 PMI budget for the GMS is \$12 million. The PMI team estimates that the budget will be allocated across countries as follows: 40% to Burma, 20% to Cambodia, 8% to border areas in Thailand, and 32% 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. The 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 FY2014 and an updated USG Lantos-Hyde Malaria Strategy has been developed for the period 2009-2014. As part of the GHI, the goal of the 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 (IPTp), 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 FY2012 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 Thailand and Cambodian National Malaria Control Programs 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

FY2012 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. FY2012 planning also took into account the successful Round 9 Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) malaria grants to Burma and Cambodia and the recently approved Round 10 Thailand malaria proposal.

The PMI GMS program differs in from PMI's Africa malaria programs both in its regional focus and that its primary goal is the containment of artemisinin resistance. PMI GMS recognizes the original intent of its engagement in the region is due to evidence of artemisinin resistance; as a response to this concern, 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 FY2012 Malaria Operational Plan (MOP) for the GMS includes support to both regional/cross-cutting activities, such as surveillance for antimalarial drug resistance, antimalarial drug quality monitoring, and regional capacity building as well as malaria prevention and control activities with a country-specific focus (see Goals and Targets of PMI in GMS for detailed discussion on PMI strategy and objectives). Support for prevention activities in the GMS includes distribution of long-lasting insecticide-treated nets (LLINs) to protect against indoor biting mosquitoes; testing and development of repellents, insecticide-treated clothing, and other personal protection for forest workers and others at risk of outdoor transmission; behavior change communication (BCC) to reinforce personal protection 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 regional, cross-cutting activities will attempt to cover 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 for achievement of 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 most concerning for artemisinin resistance, there are emerging sites along the Burma-Thailand and Cambodia-Thailand borders with resistance. Depending on partners' access and resources, PMI will explore extending its geographic reach along these border areas that may include Mon and Kayin States in Burma, Tak Province in Thailand and additional artemisinin resistance containment zones at the Cambodia-Thailand border. 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.

The PMI team estimates that the budget will be allocated across countries as follows: 40% to Burma, 20% to Cambodia, 8% to border areas in Thailand, and 32% 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.

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 National Malaria Control Programs (NMCP) and PMI are to be achieved, and provides a description of planned FY2012 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 with chloroquine resistance developing 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* in the GMS. Beyond drug resistance, NMCPs in the sub-region face several challenges including a vibrant private sector with an abundance of sub-standard and counterfeit medicines, migrant and mobile populations, vulnerable remote 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 (SEARO) and Western Pacific Regional Office (WPRO)]. Through the development of first Roll Back Malaria (RBM)-Mekong and later, Mekong Malaria Programme (MMP), USAID has supported an innovative bi-regional approach to the sub-region. The MMP is coordinated by WHO staff based in Bangkok but 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 2.³ All countries in the GMS now recommend ACTs for first-line treatment of *P. falciparum*.

Table 2. Key national strategies and policies in malaria control

	Burma	Cambodia	China	Lao PDR	Thailand	Vietnam
Treatment and diagnosis	✓	✓	N/A	✓	✓	✓

¹ This section of the MOP heavily borrows from: 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

guideline						
First-line treatments for <i>P. falciparum</i>	AL; AS+M; DHA-PIP	AS+M being updated to DHA-PIP + PQ	DHA-PIP; AS+AQ; AS+ naphthoquinone	AL	AS+M+PQ; Atv-Pro (Zone 1)	DHA-PIP
First-line treatments for <i>P. vivax</i>	CQ+PQ	CQ being updated to DHA-PIP + PQ	CQ+PQ	CQ	CQ+PQ	CQ+PQ
Published/updated in:	2008	2010	2009	2005	2007	2009
Number of antimalarial drug resistance monitoring sites:	10	5	3	3	9	5
Community-based case management or IEC/BCC activities exist	✓	✓	✓	✓	✓	✓
Vector control using limited IRS in targeted areas/settings	✓	✓	✓	✓	✓	✓
Vector control using ITNs/LLINs	✓	✓	✓	✓	✓	✓
Number of insecticide resistance monitoring sites:	1	4	N/A	10	2	>10
Epidemic preparedness plan in place	✓	✓	✓	✓	✓	✓
AL- artemether-lumefantrine; AS- artesunate; M- mefloquine; DHA- dihydroartemisinin; PIP- piperaquine; CQ- chloroquine; PQ- primaquine; AQ- amodiaquine; Atv- Atovaquone; Pro- proguanil; SP- sulfadoxine-pyrimethamine						

The malaria epidemiology and 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 *Plasmodium vivax* more prevalent in some countries, numerous vector species that are not traditionally endophilic (bite within structures), and most importantly, multi-drug resistance with confirmed artemisinin resistance at the Thai-Cambodian border. 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. These annual figures reported by the NMCPs to WHO for the sub-region probably under-estimate the true burden of malaria as it captures data only from the public sector.

Table 3. Malaria burden in the GMS

	Burma	Cambodia	China*	Lao PDR	Thailand	Vietnam
Probable and confirmed malaria cases	649,522	56,217	14,491	24,045	22,969	54,297
Confirmed malaria cases	420,808	46,101	9287	22,813	22,969	17,515
In-patient deaths attributed to malaria	788	151	12	24	80	21
Of the microscopy confirmed cases, % due to Pf	68.7	57.5	10.3	98.6	40.9	72.9
Cases with parasites	0–30	0–45	0–37	0	0–18	0–20

detected on day 3 after treatment with an ACT (%)†						
Source: 2010 NMCP data; *WMR 2010; †Therapeutic Efficacy Study data 2009/2010						

Over the past decade, the GMS countries have made tremendous progress in reducing the number of malaria cases and deaths. From 1998–2007, the six countries have collectively noted a 60% reduction in the annual number of deaths attributed to malaria, and a 25% reduction in the number of confirmed cases, from 418,859 cases in 1998 to 316,078 cases in 2007.⁴ Multiple factors have contributed to the region’s achievements in reducing the burden of malaria. Governments and partners made national malaria control a priority by increasing investments in malaria control, successfully garnering international funds, strengthening political will, integrating malaria control programs 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 impacted 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 Plan⁵ for 2010 – 2015 setting 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 age 15–54 years. Migrant workers involved in seeking jungle products, logging, mining in the mountains and forests, as well as 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 with 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 to 40% of the total burden. In 2009, with 591,492 reported outpatient and inpatient cases, the true burden may have been over 2 million cases, since only ~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).

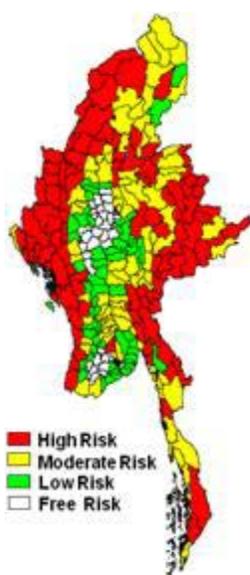
The national malaria control program is implemented by the Vector-Borne Disease Control (VBDC) Program within the Department of Health located in the Ministry of Health (MOH). The VBDC is aided by a Malaria Technical Advisory Group which has evolved into the Malaria Technical and Strategy Group. The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

⁴ Delacollette, C., et al., *Malaria trends and challenges in the Greater Mekong Subregion*. Southeast Asian J Trop Med Public Health, 2009. 40(4): p. 674-691

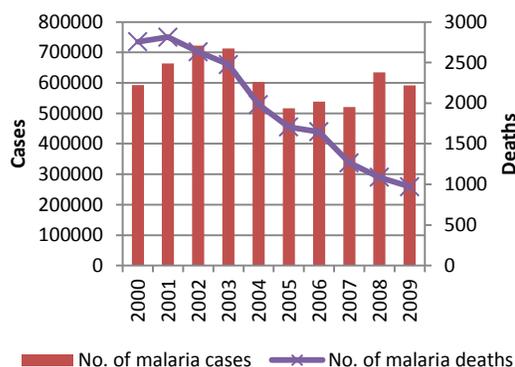
⁵ National Strategic Plan for Malaria Prevention and Control, Union of Myanmar, 2010–2015

A key challenge faced by the malaria control program in Burma has been a lack of resources. Burma ranks among the lowest in the world in per capita health expenditures; thus, while the program promotes sound, comprehensive approaches to malaria control, it lacks sufficient resources to implement those plans. Following termination of Global Fund Round 3 support, the Three Disease Fund (3DF) -- a Multi-Donor Trust Fund consisting of European Commission, UK Department for International Development (DfID), Australia's Aid Programme (AusAID), Norway, Netherlands, and Sweden -- was established in August 2006. The 3DF 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. The 3DF is coming to an end; however, it appears that the donor consortium will develop a new Millennium Development Goals fund that may include some investments in malaria. With the recent signing of the Global Fund Round 9 grant, the Burma national malaria control program will expand access to parasitological diagnosis and treatment with ACTs.

The additional resources will allow the program to continue to protect at risk populations with insecticide-treated nets/ long-lasting insecticide-treated nets (ITN/LLINs). The program's objective is to ensure that 80% of the population in moderate to high risk areas is protected with ITN/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
2000-2009**



Cambodia

Malaria remains a major contributor to the public health and economic burden in Cambodia, with a reported incidence in the public sector of 4.07 per 1,000 population in 2010. Various surveys have reported 67-80% of sick persons (67.6% 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

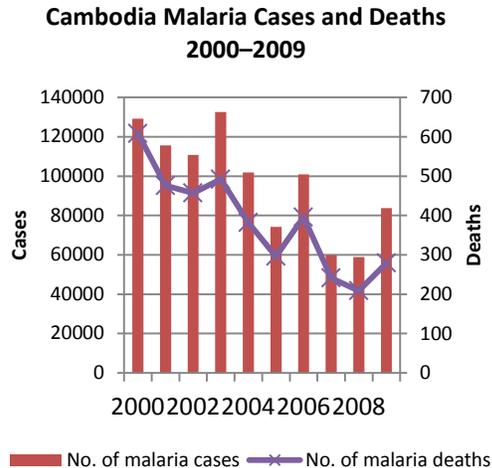
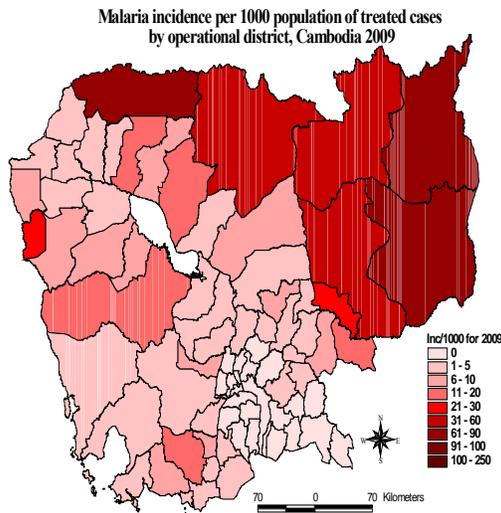
(<2km from the forest), a significant reduction from the 2.9% reported in 2007. Transmission is seasonal, in the forest and forest-fringe areas of the north, west and northeast, and also in the rubber plantations of the east and northeast. In the rice growing areas of the south and central regions, transmission is low or non-existent. 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 an increased government commitment together with substantial additional financial and technical support from the international community. This year, however, there are reports of slight increases in cases in several provinces which are currently being investigated.

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. 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.

The national case management policy in Cambodia is to ensure access to a quality diagnostic and treatment of positive cases with mefloquine and artesunate. There are special areas in the Bill and Melinda Gates Fund (BMGF)-funded containment zones where the dihydroartemisinin-piperaquine (DHA-PIP) combination is being used as the first-line therapy for uncomplicated falciparum malaria. There is widespread use of monotherapies in the unregulated private sector in Cambodia and attempts to ensure good quality antimalarials are implemented by the international non-governmental organizations. With the increased resources associated with successful Global Fund grants, Cambodia has aggressively distributed ITNs and LLINs to at-risk populations. Overall, ITN ownership improved from 43% in high risk areas in 2007⁶ to 75% in 2010⁷. A national malaria survey was conducted at the end of 2010, which will give more updated coverage figures shortly. Cambodia is currently in the process of drafting a new strategic plan following the prime minister's announcement that Cambodia will seek to eliminate malaria by 2025.

⁶ Cambodia Malaria Survey Report 2007

⁷ Draft Cambodia Malaria Survey Report 2010



Thailand

The goal of the malaria control program in Thailand is to reduce malaria morbidity and mortality, and contain and eliminate artemisinin-resistant parasites. The 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, but provides only technical assistance in areas where indigenous transmission has been eliminated and programmatic responsibilities have been transferred to Provincial Public Health Offices. BVBD is finalizing the National Strategic Plan for Malaria Control and Elimination 2011–2020 with proposed goals of 80 percent of the total country areas being free from malaria transmission by the year 2020.

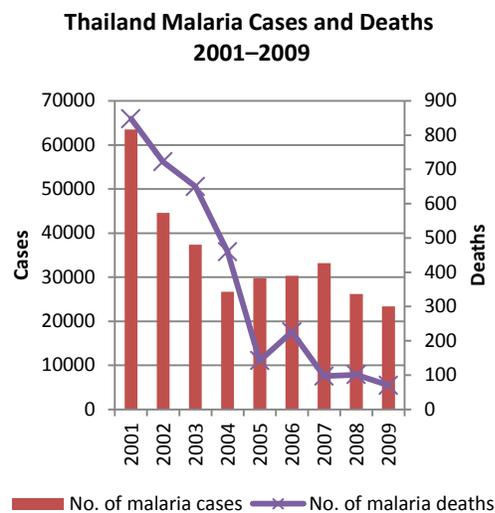
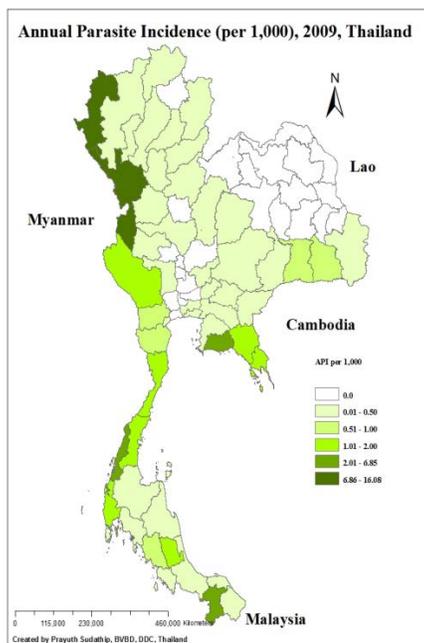
The country has done an excellent job of extending diagnostic services to endemic areas through malaria clinics and posts. The staff in these facilities use either microscopy or RDTs (although stock outs of RDTs occur occasionally). Patients testing positive for falciparum malaria are treated with mefloquine and artesunate per national policy and with atovaquone-proguanil 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 glucose-6-phosphate dehydrogenase (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) amongst Thai citizens and long-term non-Thai residents. In addition, LLINs for short-term non-Thai residents will be provided when the person presents 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 cases.

Other important components of the Thai national strategy include a comprehensive approach to migrant and mobile populations, enhanced information, education, communication/ behavior change communication (IEC/BCC) activities, operations research (OR), and intensified

surveillance, M&E. *In-vivo* efficacy studies have identified additional sites in Thailand with increased proportion of day 3 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.

Malaria cases mainly occur 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. Over the past decade, Thailand has noted a drop in the number of cases from 63,528 to 23,327 and deaths from 848 to 70 between 2001 and 2009.

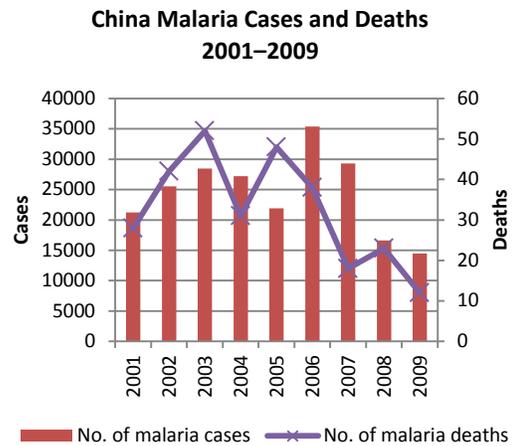
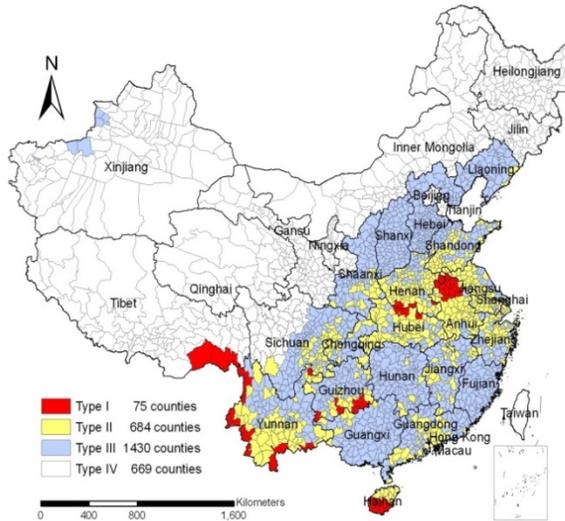


China

Yunnan Province of the People's Republic of China shares borders with Burma, Laos, and Vietnam. Malaria control activities are managed through the Bureau of Disease Control located within the MOH and, at the provincial and county levels, are managed by the Provincial Health Bureau and County Health Bureau, respectively. The Chinese treatment policy calls for use of ACTs, primarily DHA-PIP. The strategy for vector control is based on epidemiologic stratification. In the high risk areas with vector presence, the program aims to achieve 100% LLIN coverage and to use indoor residual spraying (IRS) in focal transmission areas. Additionally, the program designs specific interventions for special populations such as forest workers and migrant populations.

China is mainly affected by *P. vivax*; *P. falciparum* is endemic in only two provinces, Yunnan and Hainan. The new National Malaria Strategy 2010-2020 aims to eliminate malaria from all provinces by 2020 with an intermediate goal of elimination from all areas except the borders of

Yunnan Province by 2015.⁸ In China, counties are classified by type (e.g. Type I counties have incidence of >1/10,000, Type II counties have incidence <1/10,000, Type III counties have no local cases for three years, and Type IV are malaria free). In Yunnan, Type I counties are concentrated along the Yunnan/Burma border where malaria is particularly problematic among people crossing the border and ethnic minority groups. Although China has demonstrated a decline in malaria morbidity and mortality, control efforts are hampered by the continuous influx of migrants from Burma.



Lao PDR

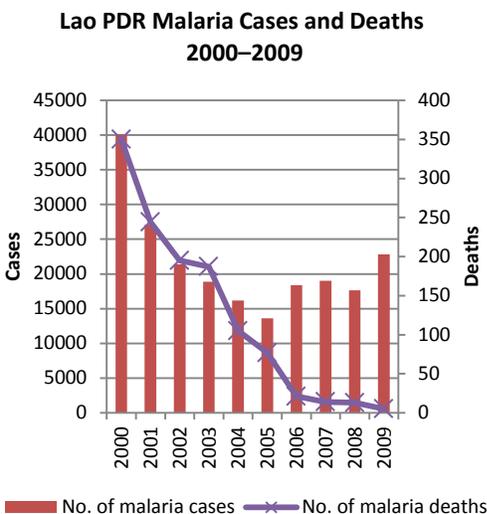
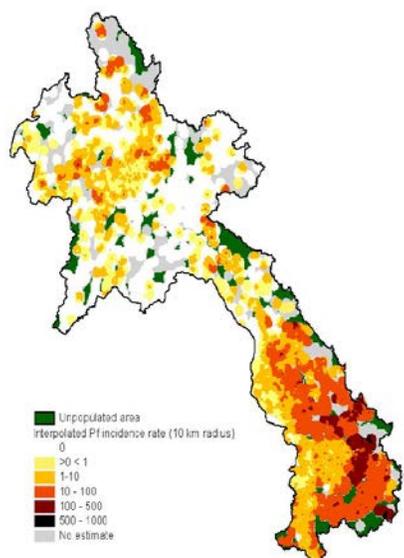
The intensity of malaria transmission varies between different ecological zones: from very low transmission in the plains along the Mekong River and in areas of high altitude, to intense transmission in remote, hilly and forested areas. *P. falciparum* is the predominant species, accounting for 95% of 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 22,800 cases in 2009 and the number of malaria deaths in hospitals dropped from 350 in 2000 to 5 in 2009.

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 2011–2015⁹ aims to intensify malaria control efforts, targeting remaining endemic communities

⁸ From Malaria Control to Elimination: A Revised National Malaria Strategy 2010-2015. The People’s Republic of China

⁹ National Strategy for Malaria Control and Pre-elimination 2011–2015. Lao People’s Democratic Republic, Ministry of Health.

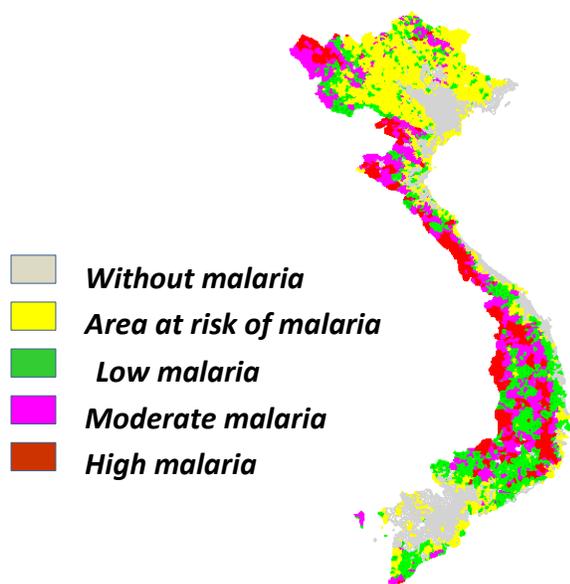
and key risk groups, and progressively rolling out malaria elimination in selected provinces. Malaria control activities in Laos are managed by the Ministry of Health's Centre for Malaria, Parasitology, and Entomology (CMPE). Much of the support has focused on distribution of ITNs/LLINs, reaching vulnerable ethnic minority groups, 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 CMPE is now in the process of scaling up LLIN coverage with a projected target of reaching 3.6 million persons at risk for malaria.



Vietnam

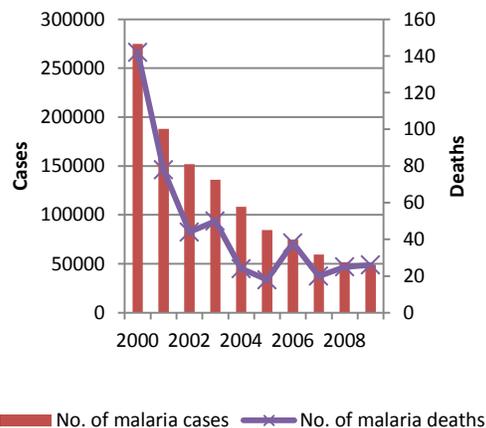
Malaria occurs in remote forest and forest fringe communities, which are often inhabited by marginalized groups, including ethnic minorities and migrant settlers. The national program uses data to stratify risks in the country and target malaria prevention services. The distribution of ITNs has occurred in all endemic villages with a coverage estimated to be 70% by the national program. The program retreats approximately 4 to 5 million bednets each year. In addition to this, the control program uses IRS to cover an additional 2 million people residing in hyper-endemic areas, where culture of using ITNs is poor. The burden is concentrated at the border areas of Cambodia and Lao PDR. Vietnam has reduced malaria cases and deaths from 2000 to 2009 from 274,910 to 49,186 and from 142 to 26, respectively.

The NMCP rests within the National Institute for Malariology, Parasitology, and Entomology (NIMPE) 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 NIMPE recently drafted the 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 endemic areas.



20

**Vietnam Malaria Cases and Deaths
2000–2009**



CURRENT STATUS OF MALARIA INDICATORS

Although some of the standard indicators adopted in the GMS differ from those in sub-Saharan 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 is available:

Table 4. National and sub-national survey data for the GMS countries

Indicator	Burma (Chin, Kachin, Sagaing 2008)	Cambodia (CMS 2010)	Lao PDR (Bednet 2009)	Thailand (R7 household 2009)	Vietnam (MICS 2006)
Malaria prevalence (%)		0.9	-		-
Households with at least one net (%)	91	99.4	-		99
Households with at least one ITN (%)		74.7	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	81		5
Pregnant women who slept under an ITN the previous night (%)		59.1	-	-	-

CMS: Cambodia Malaria Survey; ITN: insecticide-treated net; MICS: Multi-Indicator Cluster Survey; R7: Global Fund to Fight AIDS, Tuberculosis and Malaria Round 7

Most of the GMS countries have relied primarily on routine HMIS 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 bednet survey was conducted in 2009 and Vietnam with a Multiple Indicator Cluster Survey in 2006. Sub-national level data is also available from limited bednet ownership data 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 bednet ownership with lower 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 is planning to conduct a survey which will sample households, health facilities, and drug outlet in zone 1 & 2 areas as part of the Myanmar Artemisinin Resistance Containment (MARC) Project in late 2011, Thailand is planning a national survey with Global Fund R10 support in 2012, and Lao PDR will conduct a DHS in late 2011. Lastly, Cambodia plans to conduct a follow-up national survey in 2012.

For the cross-border focus areas, routine surveillance data and survey data, where available, are reported for the relevant PMI indicators. Zone designation refers to the BMGF containment project zones, where zone 1 contains areas with data suggesting a reduction in artemisinin efficacy and zone 2 are the neighboring areas. Data quality and completeness varies across the indicators and the countries. Furthermore, current reporting is limited to the public sector in Burma and Cambodia, while a significant percentage of those with fever seek care in the vibrant private sector.

Table 5. Cross-border Focus Areas

Indicator	Tanintharyi Burma	Ranong, Thailand	Trat, Thailand	Pailin, Cambodia
Population*	1,658,903	177,079	221,860	54,221
Malaria cases*	36,107	993	120	555
<i>P. falciparum</i> cases*	4,219	404	26	65
In-patient malaria deaths*	62	3	1	0
Percentage of cases with parasites detected on day 3 after treatment with an ACT‡	0% (AL); 20% (DHA-PIP)	6.8% (A+M)	[BVBD routine follow-up data 31% (A+M)]	45%-DHA-PIP [Community-based pilots in Pailin 2011 (33%)]
Malaria prevalence (%)	To be collected in 2011	To be collected in 2012	To be collected in 2012	1.0 (by slide)†
Households with at least one ITN (%)	To be collected in 2011	To be collected in 2012	To be collected in 2012	67.8 (LLINs)†
ACT- artemisinin-based combination therapy; AL- artemether-lumefantrine; A+M- artesunate + mefloquine; BVBD- Bureau of Vector-Borne Diseases; DHA- dihydroartemisinin; PIP- piperaquine; ITN- insecticide-treated nets; LLIN- long-lasting insecticide-treated nets				

*2010 NMCP data

† Cambodia National Malaria Survey 2010

‡ Therapeutic Efficacy Study data 2010

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

In line with the Lantos-Hyde Malaria Strategy¹⁰, PMI will work with NMCPs and partners to strengthen efforts to limit the spread of multidrug resistant *Plasmodium 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 sub-standard or counterfeit drugs, which contribute to increased drug resistance; and
- 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 sub-objectives guiding the FY 2012 MOP activities and their implementation at regional and country levels. The three sub-objectives are:

1. To strengthen malaria prevention and control interventions in focus areas with existing or emerging artemisinin resistant malaria.
2. To ensure effective drug efficacy surveillance networks to monitor artemisinin resistant malaria throughout the GMS.
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.

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

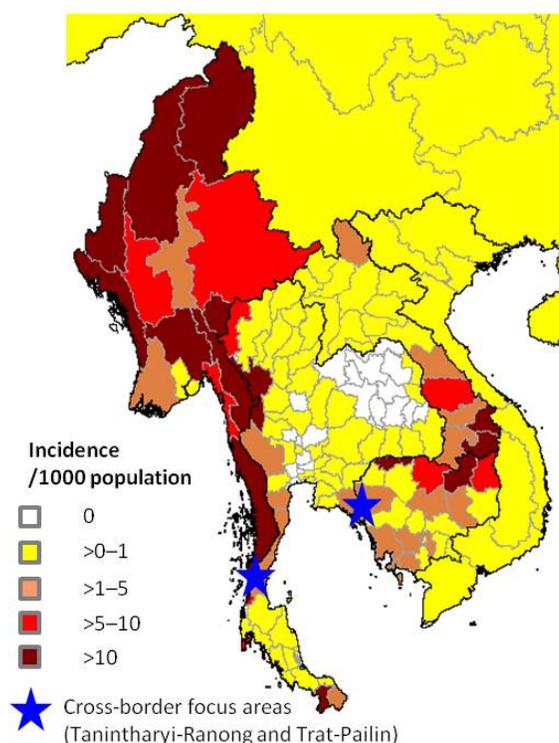
At the country level, the PMI GMS activities will target intensified malaria prevention and control interventions in key cross-border areas in the region suspected of artemisinin resistance: (1) on the Thai-Burmese border, especially Tanintharyi-Ranong area; and (2) on the Thai-Cambodian border, especially Trat-Pailin area (see map below¹¹). Depending on partners’ access and resources, PMI will explore extending its geographic reach along these border areas. Potential areas could include Mon and Kayin States in Burma, Tak Province in Thailand and additional artemisinin resistance containment zones at the Cambodia-Thailand border. The focus

¹⁰ Lantos-Hyde USG Malaria Strategy 2009–2014

¹¹ Cui et. al., Malaria in the Greater Mekong Subregion: Heterogeneity and complexity. [Acta Trop.](#) 2011 Mar 5.

will be on intensified case management and active follow-up of patients, increased collaboration with the private sector, and effective cross-border collaboration between NMCPs and localized district offices.

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%)
 - Percentage of individuals in areas at risk of malaria who slept under long-lasting insecticidal net/insecticide-treated net the previous night (target: 90%)
- 2) To ensure effective drug efficacy surveillance networks to monitor artemisinin resistant malaria throughout the GMS:
 - Percentage of cases with parasites detected on day 3 after treatment with an ACT within given therapeutic efficacy study sites (target: maintain levels at 2009/2010 baseline or below <10% (See Table 3 for ranges of baseline for the sites in the six countries and Table 5 for the sites within the cross-border focus areas));
 - 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 post-market surveillance to be substandard or counterfeit (target: <5% by 2015)

EXPECTED RESULTS — YEAR TWO

By the end of Year 2 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 2, approximately 325,000 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:

- PMI will support procurement of RDTs (approximately 700,000) and ACTs (approximately 450,000 of each commodity) to fill any gaps in the cross-border focus areas.
- PMI will support approximately 440 community malaria volunteers (140 in Cambodia and 300 in Burma) in the cross-border focus areas to provide malaria prevention and control interventions to target populations including migrant and mobile groups.

Strategic Information:

- Surveillance systems strengthened and community level surveillance of Day 3 positives to be conducted.
- Cambodian National Malaria Survey 2012 with oversampling of PMI focus areas to be conducted.
- Key operations research projects addressing bottlenecks to understanding how to safely use primaquine and assessing the efficacy and acceptability of personal protection measures will be conducted, with policy recommendations.

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 out of 35 sites across six countries in the regional network will conduct 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 strengthening of host country systems 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 mass free 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. 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 national programs include net retreatment as part of their strategies.

Much of the malaria transmission in the region occurs in forested 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 night or early morning hours when people are not sleeping. Thus, LLINs may not offer adequate protection. 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 wide-spread 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* but the secondary suspected vectors where 50% of the biting occurred before 20.00 hr. All major species in this coastal area showed a strong preference for outdoor biting.¹² 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.¹³ Likewise a study among pregnant women showed a two-fold decrease in women requiring treatment for anemia compared to no net and a 1.6 fold decrease among women using untreated nets.¹⁴ 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 population and bring down transmission. The distribution of ITNs through campaigns, private sector and routine is still an effective intervention and should be supported.

While IRS appears in strategy documents for the GMS countries, it is now rarely used, being difficult to efficiently target and implement. Implementation of IRS in Thailand, as in Burma

¹² 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.

¹³ 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

¹⁴ 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

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 (2 or more confirmed secondary cases per investigation site) detected through active case investigation.” At the present time, PMI will not fund IRS implementation in any GMS country.

The FY2012 GMS MOP allocates overall \$2.4 million for ITN and related procurement, distribution and technical assistance activities. The majority of this funding is directed to Burma and Cambodia with the flexibility to assist other countries in the region, as needed.

Burma

Like other countries in the region, there is a traditionally high rate of mosquito net use among much of the 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 (e.g. ITNs and LLINs) —with only an estimated 5.6% of the total population protected in malaria risk areas.

Funding from the 3DF has supported LLINs but ends in 2011. The Global Fund Round 9 covers 14 of the 17 States and Divisions with a population estimated to be approximately 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. In addition, mass treatment of existing ordinary mosquito nets with long lasting insecticides will be done in the remaining 115 priority townships. The Round 9 grant does not include Yangon Division, Ayeyawaddy Division, Kayah State, and some townships in the Wa Special Region and in Northern Sagaing.

Through the Round 9 grant, existing nets will be treated in 170 townships where 86% (479,942) of the total malaria cases and 84% (1,545) of malaria deaths were reported between 2003 and 2007. The total population in these townships is 27.6 million (or 52% of the total population at risk in Myanmar). In 55 priority townships, the Round 9 grant plans for 1.8 million LLINs to be distributed free of charge and the existing ordinary mosquito nets will be treated with long-lasting insecticide to ensure coverage of 94% and above from year 2 onwards. Two LLINs per household will be distributed in these 55 priority townships where 17% of the population lives and where 22% of malaria cases and 32% of malaria deaths were reported in 2003–2007 (5-year average). Overall, the coverage is expected to increase from 2.3 million residents in 2008 to 4.25 million in 2011, 7.7 million in 2012, and sustained at over 8.6 million residents thereafter.

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. However, due to the inaccessibility of certain areas in Burma, there will most likely be LLIN gaps in parts of the country. PMI will focus its efforts to filling gaps in LLIN procurement and distribution in the cross-border focus area of

Tanintharyi Division. Depending on resources, additional border areas e.g. Myawaddy township area, in Kayin state, will also be assessed for gaps.

Thailand

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, i.e. having solid walls and window screens. 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-MMP 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 these 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 long-lasting insecticide-treated hammock nets (LLIHNs) to protect against outdoor transmission.

The FY2012 GMS MOP does not envision major support for LLIN or treated material procurement for Thailand, as sufficient funding is available from other sources. Rather, the focus will be on providing 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.

Cambodia

Cambodia has a strong “net culture”. The national malaria survey from 2010 indicated that almost all households owned at least one mosquito net (99%), and most respondents reported sleeping under one the previous night (85%). However, just 75% of households had an ITN, and 53% of all respondents reported sleeping under an ITN the previous night. The majority of pregnant women and children under five in the surveyed households reported any net use the previous night (91% and 93%, respectively), while the proportion who slept under an ITN the previous night was 56% for children under five years and 59% for pregnant women. Slightly more than half (52%) of households reported LLIN ownership, and only 32% of respondents reported sleeping under a LLIN the previous night.

The CNM has been distributing free ITNs since the mid-1990s. The Global Fund Round 9 grant continued LLIN distribution started 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.

In 2011, CNM will work with Provincial Health Departments to update the list of high risk communities using village level data compiled in the malaria data base, field visits, GPS

technology and up-to-date satellite images. The target population for LLIN distribution, i.e. those persons living less than 2 km from the forest edge, is 2.9 million. In addition to the traditional LLINs, 537,000 LLIHNs will also be distributed to this population.

The CNM will procure 2.4 million family-sized LLINs (with funding from Global Fund Rounds 6 and 9 Single Stream Funding grants) for distribution during the period 2011 to 2012. Eight hundred thousand LLINs/LLIHNs are expected to be distributed in Cambodia between 2012 and 2013.

Cambodia has a large number of privately-purchased untreated nets [Population Services International (PSI) estimates 900,000 untreated nets are imported every year]. Unlike programs in Africa, where the guidance has been to supply only LLINs and not retreatment kits for the limited number of untreated nets, support has been provided to run 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 treatment kit (ICON MAXX) is sold 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 untreated 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 attractive to the Cambodian consumer. In 2010, over 795,000 bundled nets were distributed in the private sector in Cambodia. The average price of a bundled net to a consumer is reported to range from \$2.50 to \$5.00.

Progress to Date:

Using FY 11 funds, PMI is supporting an assessment to review policies, strategies, and gaps in funding and distribution of ITNs in GMS countries. The results of this assessment will be used to further assist countries in refining their programmatic and operational strategies. In addition, in early 2012, PMI is supporting an LLIN distribution campaign in Tanintharyi Division in Burma to help fill urgent gaps and protect vulnerable populations. PMI expects to distribute approximately 100,000 to 130,000 LLINs in Burma.

Planned activities with FY 2012 funding are as follows: (\$2,200,000)

- **Procurement and distribution of LLINs and treated material/hammock nets:** PMI will procure approximately 325,000 LLINs and LLIHNs for the GMS region in FY2012. Although the GMS countries have funding from the Global Fund to cover most needs, there are funding and coverage gaps for LLINs and other hammock nets in Burma and Cambodia. PMI funding will cover gaps in procurement and sub-regional distribution of LLINs in Burma, particularly in areas inaccessible through Global Fund funding. A smaller amount of funding may also be used to cover gaps in Cambodia and other GMS countries in coordination with the NMCP’s analysis of needs/gaps, to cover delays in Global Fund funding or to rapidly respond to a surge in cases. (\$1,500,000)
- **Community level support for distribution, promotion and use of LLINs and treated material:** PMI will support delivery of LLINs through mass and community-based distribution channels to reach households, promotion and use of LLINs and treated material/hammock nets, procured by PMI and other donors, in the sub-regional areas covered by PMI support. PMI’s support will primarily be targeted to 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. 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. (\$700,000)

- **Operations Research Personal Protective Vector Control Material:** One urgent need in the GMS is to identify other personal protective vector control options for groups vulnerable to malaria in forests, plantations and farms, especially those work during the night. This operations research will assess the efficacy and feasibility of personal protection measures (e.g. insecticide-treated hammock nets, insecticide-treated clothing, or repellants). (See Strategic Information- Operations Research section)

Malaria in Pregnancy

Intermittent preventive treatment in pregnancy (IPTp) is not part of any of the national strategies in the GMS and will not be supported with PMI FY2012 funds. However, PMI will support promoting universal LLIN coverage and prompt diagnosis and treatment of clinical cases in pregnant women as they remain a vulnerable group in the region. PMI recognizes that malaria in pregnancy is a concern and will explore options in the future to understand the issues better. Cambodia has undertaken a study of malaria-in-pregnancy in Ratanakiri Province, the province with the highest malaria burden, in order to assess the burden of malaria in pregnancy. With USAID support, WHO supported Ratanakiri Provincial Health Office to implement a malaria screening strategy for pregnant women using RDTs (and treatment, if the RDT is positive) as part of antenatal care in three selected health centers. Preliminary results indicate malaria prevalence of 5% (64/1277) at health centers and 6% (20/316) at villages by village malaria workers, but the final report and recommendations are pending. Although IPTp is not deployed in the region, this study will inform future development of regionally appropriate strategies to improve management of malaria in pregnancy.

CASE MANAGEMENT

Malaria Diagnosis

In all countries in the GMS, case management policies require that a suspected case of malaria undergo either malaria microscopy or an RDT to confirm the diagnosis. Those confirmed to have uncomplicated malaria should be treated promptly with an ACT, in line with national treatment guidelines. While microscopy is preferred, particularly at health facilities, RDTs are being increasingly used in situations where microscopy is not feasible, e.g., at community level and during hours when the laboratory is closed. Because both *P. falciparum* and *P. vivax* are present throughout the GMS, national programs promote RDTs that can detect both species.

Burma

The Government of Burma operates approximately 700 malaria microscopy centers throughout the country including in 325 Township hospitals; however, only about 60% are considered to be

functioning adequately. A quality assurance system was initiated in 2005, with training and technical support provided by WHO and ACTMalaria.

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 have malaria microscopy, some health providers continue to treat patients for malaria based on clinical signs and symptoms alone.

To date, only a limited number of village health volunteers have been trained to diagnose malaria using RDTs and provide treatment to confirmed cases with ACTs. These volunteers are not currently available in many areas with a heavy malaria burden. Little is known about the use and quality of diagnostic testing in the private sector.

Cambodia

Universal diagnostic testing for malaria, primarily using malaria microscopy, is common practice in the majority of Cambodian public sector facilities. In addition, with Global Fund and USAID support, village malaria workers and migrant malaria workers have been trained and equipped with RDTs and ACTs to diagnose and treat malaria, to improve access to these services in remote rural communities, particularly those in areas with suspected artemisinin resistance. In spite of this, the quality of malaria microscopy in many facilities is suboptimal, particularly in remote facilities. In facilities where both microscopy and RDTs are available, many staff prefer using RDTs because of the ease of use. In addition, the majority of persons with malaria go to private sector providers where the availability of high-quality diagnostic testing is limited and where there is a financial incentive to provide treatment to a patient with a negative test. USAID has been supporting social marketing efforts to promote use of RDTs by targeted private sector providers, but uptake by these providers has been slow.

Thailand

In areas where malaria transmission occurs or with potential for reintroduction, diagnostic testing services in the public sector are largely managed by the BVBD. In other areas, malaria diagnosis is integrated into routine health care services. In high risk areas, a network of 315 malaria clinics and 460 malaria posts has been established. Malaria microscopy is available at malaria clinics, while malaria posts test patients with multi-species RDTs. The national program conducts quality assurance monitoring for microscopy.

In addition, 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 to conduct malaria diagnosis. Some NGOs provide primary health care services, including malaria case management, to 140,000 refugees along the Thai-Burma border.

Progress to Date:

With FY2011 funding, PMI will procure RDTs and microscopy supplies and equipment to improve laboratory capacity in the cross-border focus areas. PMI will also support

improved use of diagnostics by developing and strengthening strategies to assist program with ensuring high quality microscopy. For the cross-border focus areas, additional support coordinated with the community intervention program will include in-service training and supervisory visits for malaria microscopists as part of a comprehensive program for laboratory diagnostics.

Planned activities with FY 2012 funding (\$580,000):

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

- **Procure RDTs and microscopy supplies for the cross-border focus areas.** PMI will procure approximately 700,000 multi-species RDTs to scale-up diagnostic testing at community level, either public or private sector, in focus areas in Burma and Cambodia, and to fill gaps in RDT needs in other parts of the region. The PMI also will procure a small quantity of additional microscopes and microscopy kits (reagents, slides, lancets, etc.) to further improve laboratory capacity in cross-border focus areas along the Thai-Burma and Thai-Cambodia borders. In Thailand, commodity requirements are largely covered by their Global Fund Round 10 grant and country resources. More than half of these commodities are intended for deployment in Burma, about one-third for Cambodia, and the remainder for the rest of the Mekong region. (\$500,000)
- **Training, supervision, and quality assurance of RDTs and microscopy.** Support will be provided by PMI to expand the availability and appropriate use of high-quality diagnostic testing for malaria, with a particular focus on scaling-up of RDTs at community level in the cross-border focus areas. This will include scaling-up of supervision and quality assurance systems to improve the quality of malaria microscopy and RDTs at health facilities and in the community in the cross-border focus areas. Recognizing the prominent role of the private sector in diagnosis and treatment of malaria in Cambodia, training and supervision will extend to private sector pharmacies and shops. This will include training and deployment of new village volunteers and scaling-up of supervision and quality assurance systems to improve the quality of malaria microscopy and RDTs at health facilities and in the community in the cross-border focus areas. All village volunteers will be trained in a combined curriculum that includes appropriate clinical management and performance of RDTs. (Costs included in treatment section)
- **Training and accreditation for microscopy.** PMI will support 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 then supervise and train front-line health workers in microscopy and RDT performance. (\$80,000)

Malaria Treatment

Malaria treatment policies for 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. All the GMS countries have largely scaled-up these policies at health facilities, and to a greater or lesser extent, at community level.

Evidence of artemisinin-resistant *P. falciparum* in areas of the Thai-Cambodian and Thai-Burmese border region and chloroquine-resistant *P. vivax* in other parts of the GMS has caused NMCPs to intensify their case management activities. In the border areas, patients now undergo more rigorous follow-up to monitor the response to therapy at all levels, including routine collection of a blood slide on the third day after initiation of treatment. Countries also have accelerated roll-out of Village Malaria Workers (VMWs), who provide diagnosis and treatment services at community level, although scale-up has been slower in Burma than in Thailand and Cambodia.

With the exception of Burma, requirements for first-line ACTs are largely met through Global Fund grants and government funding. Stock outs of ACTs have been reported in Cambodia, but these are largely caused by procurement and delivery delays, rather than funding shortfalls. A small gap exists for second-line treatments, particularly for the areas around Pailin, where a significant percentage of failures to first-line treatment have been identified. The situation in Burma is not completely clear, but gaps in ACT availability have been identified, which are likely to grow as community-based treatment is scaled-up.

In Thailand and Cambodia, health workers at health facilities generally receive regular supervision. In Cambodia, supervision activities in the western border region have been supported by USAID 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 is critical to malaria service delivery in the sub-region and PMI will look for ways to support private sector approaches. This would include strengthening case management and diagnostics and BCC messages to address the issues of sub-standard, counterfeit drugs and ensuring rational use of antimalarials, as well as filling in gaps in ACTs and diagnostics for the private sector in addition to the public sector.

Planned activities with FY 2012 funding (\$3,700,000)

Requirements for ACTs largely have been met by the Global Fund, government resources, and funding from other donors for 2012, with the exception of Burma. There also is a need for second-line treatments for Cambodia. 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 300,000 ACT treatments for Burma and 150,000 second-line treatments for Cambodia. The ACTs may be deployed in the public or private sector. (\$500,000)
- **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 Burma¹⁵. Supervision of health facilities and the private sector through implementation of innovative models in target areas of Burma and Cambodia also will be supported. In addition, technical support will be provided for the supervision of malaria posts/clinics and volunteers in Thailand, particularly in the areas around Ranong and Trat. (\$3,200,000)

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 for 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.

Burma

There are two ways that supplies are procured and distributed in Burma. One is through the VBDC, the other through the Central Medical Store Depot (CMSD). The VBDC program distributes laboratory supplies and antimalarial drugs to Township Hospitals and Health Departments throughout Burma. Additionally, it supplies the sub-national VBDC teams located in states and divisions. The Township Health Departments then are responsible for the distribution to the station hospitals, rural health centers, and sub-rural health centers. The second system managed by the CMSD is within the Medical Care Services of the Department of Health. The CMSD purchases antimalarial drugs using government funds in consultation with the VBDC program. CMSD distributes to all township hospitals and health departments. Since 2002, UNICEF 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 franchise operates a private sector franchise of clinics and shops. The procurement and logistics for this network of private sector clinics is operated by PSI through Global Fund Round 9 support.

The Global Fund Round 9 funding will cover 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 will be handled by United Nations Office for Project Services (UNOPS). The proposal assumes that 879,000 cases will be treated by 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 will primarily consist of monitoring availability of commodities (medicines, diagnostics, and nets) through the Global Fund; facilitating procurement and distribution of PMI-funded commodities to fill gaps not

¹⁵ Government staff may attend training but will not receive per-diem or travel expenses.

addressed by the Global Fund proposal; 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 Mon and Kayin 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, the large majority of patients with febrile illness seek care in the private or informal sectors. 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 in Cambodia and commodity stock-outs have been a major problem.

At the present time, Cambodia is 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.

The Central Medical Stores (CMS) is responsible for the procurement and logistics of essential medicines to the public sector. The CMS 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 and requisitions for essential medicines including malaria medicines to the CMS. Medicines are provided free of charge to the districts, but policy and practice of user fees at service delivery sites varies by medicine. The CMS operates an integrated logistics management information system. The CNM has received assistance to develop a web portal into this system to gain further visibility and 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) through private clinics, pharmacies, and shops throughout rural Cambodia. PSI manages all aspects of the in-country supply chain, thus, stock-outs that have occurred have results from delays in national procurement supplies.¹⁶

The current procurement and supply of ACTs and RDTs for both the public and private sector in Cambodia is through the Global Fund Round 9 funds. Although Cambodia is also a recipient of Affordable Medicine Facility for malaria (AMFm) funding, the program is not yet operational.

As in Burma, PMI will monitor Global Fund supply chains; facilitate procurement and distribution of PMI-funded commodities; and provide targeted technical assistance, micro-planning, 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.

¹⁶ Large-Scale Malaria Treatment in the Private Sector: A Case Study of the Cambodian Experience

Thailand

In order to achieve the goal of early diagnosis and prompt treatment of malaria cases in Thailand, NMCP manages the delivery of commodities to facilities, particularly at the community level through malaria clinics or posts.

Although a recent USAID-supported assessment of the Procurement Supply Management system in Thailand revealed that there are some challenges in the pharmaceutical management and supply system, overall capacity and performance is strong.¹⁷ 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 Thailand for medicines and diagnostics for epidemic preparedness. PMI support for pharmaceutical management in Thailand will primarily focus on these priorities and micro-logistics for migrant and mobile populations in the targeted focus areas of Ranong, Trat and possibly Tak.

Regional

The PMI GMS will provide limited pharmaceutical management support to the other countries in the region, as requested. Support for Vietnam, Laos and China will primarily consist of monitoring flow of key commodities through the Global Fund grants. Support could also be provided on developing procurement supply management plans for the Global Fund or short-term support on logistics or procurement gaps in the event of emergencies, outbreaks or epidemics.

Progress to Date:

The PMI is in the process of operationalizing the pharmaceutical management and supply chain support to the region. Key activities and strategies are in the process of being defined.

Planned activities with FY 2012 funding (\$250,000)

- **Support for Pharmaceutical Management and Logistics:** PMI will support operations in the cross-border focus areas and 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, trainings, 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

¹⁷ MSH/SPS: Assessment of the Supply Systems for Malaria in Thailand, July 2008: Final Report

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 (MRA) 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, i.e., 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 (QA/QC) of medicines, weak regulatory enforcement, manufacturers that are not compliant with Good Manufacturing Practices, availability of artemisinin monotherapy, and the presence of multiple brands on the market which 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 sub-standard and counterfeits over the past five years, in close collaboration with NMCPs, MRAs, 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 Practice with assistance from regional centers of excellence. Public education campaigns have occurred, using 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 types 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 a place vulnerable to the introduction and sale of counterfeit and substandard antimalarial drugs and artemisinin monotherapy. There have even been reports of counterfeits in Burma resulting in patients dying.¹⁸

The work of the PMI-supported antimalarial drug quality program in Burma is only beginning. WHO found in 2009 that most of the staff trained to use the three minilabs in the country were no longer present, nor were there sufficient supplies. 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

¹⁸ Newton PN, McGready R, Fernandez F, Green MD, Sunjio M, et al. (2006) Manslaughter by fake artesunate in Asia--Will Africa be next? PLoS Med 3(6): e197

These four countries have very active programs aimed at addressing the problems of sub-standard and counterfeit medications. Through the support of USAID and other donors, these countries have developed extensive networks of sentinel sites using portable minilabs to do field testing of drug quality. In addition, USP has worked with FDAs, MRAs, 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 QA/QC, Good Manufacturing Practices, and bioavailability testing.

China

Drug quality activities within China have been coordinated by Government of China officials and WHO. It has been determined that some of the counterfeit antimalarials coming into the GMS have originated from China; and WHO working with INTERPOL (with separate funding) and with national enforcement authorities has been successful in cracking down on some of the producers. The Mekong Malaria Program is interested in having China join other GMS countries in FY2011 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—particularly since China is often the origin of poor quality drugs in the region.

Progress to Date:

The MMP has made tremendous strides towards establishing a drug quality network, 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, fining and educating violators. They continue to strengthen medicine QA 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 International Organization for Standards (ISO) accreditation.

In the areas where the programs are sampling drugs, there has been a notable decrease in the presence of counterfeit or sub-standard malaria medications. Previous reports and studies reported that 10 to 35% of samples collected and tested from GMS countries were substandard and/or fake; yet statistically representative samples had been lacking. USP with USAID and BMGF funding developed a randomized sampling protocol to estimate the prevalence of poor-quality antimalarials and understand their use among villages in the provinces along the Cambodia/Thailand border. In 2009 in Thailand 1% (7/709) of the samples tested failed, while in Cambodia 12.3% (46/372) of the antimalarials failed.¹⁹

¹⁹ Antimalarial Medicines Quality Study – WHO ARC3 Project; Technical Report. United States Pharmacopeia Drug Quality and Information Program. September 10, 2009

USP collaborated with INTERPOL (waiver in place) 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.

To-date in China and Burma, there has been limited engagement with the sub-regional antimalarial drug quality program. With FY11 funding PMI will support procurement of vital equipment and training to enhance the work of the Burma FDA. 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.

Planned activities with FY 2012 funding (\$500,000)

- **Support drug quality surveillance:** Maintain the sub-regional network of drug quality surveillance with increasing attention paid to appropriately engaging China and Burma on this issue. Valid sampling strategies will be established. Continue to work with FDAs, MRAs, 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 the Asian Network of Excellence in Quality Assurance of Medicines, and will include a longer-term vision that entails building and supporting greater in-country capacity and perhaps extend beyond laboratories to regulatory officials.
- **Support regional and in-country enforcement:** Based on existing waivers, support collaboration with WHO/ INTERPOL for the ongoing enforcement of appropriate GMS laws and regulations, such as the recently concluded Operation Storm. PMI will also work with national and sub-national officials on inspection and enforcement of national policies on quality and substandard medications.
- **Support regional coordination:** Explore high-level diplomatic interventions to foster bilateral and multilateral cooperation on drug quality, counterfeits and substandard medicines between the GMS host governments through initiatives such as the Lower Mekong Initiative. As the largest producers of medicines used in GMS, engagement with China and India is essential.

BEHAVIOR CHANGE COMMUNICATION

Behavior change communication (BCC) is a key component of national malaria control strategies in all GMS countries. Migrant and mobile populations, workers on plantations and in forests and factories, and vulnerable and remote ethnic minorities bear the burden of malaria in the GMS. Behavior change communication strategies around malaria prevention and control are targeted to these hard-to-reach populations to educate and raise awareness about malaria and improve utilization of preventive and curative services. Although the appropriate medium and target populations vary across the countries, some form of interpersonal communication through the use of community-level workers, private sector providers, and mass media to reach a wider audience is used. Given the emerging issues with artemisinin drug resistance, use of sub-standard drugs, and inappropriate care seeking and treatment behaviors, BCC strategies also play

an important role in countering these problems by raising awareness and reinforcing adherence to correct treatment regimens using the most effective drugs. Because of the complexity of actors engaged in malaria treatment and diagnosis in the GMS as well as the challenges of reaching remote, transient populations, BCC interventions will target communities, individuals, and providers (community level workers and private sector).

Burma

WHO, UNICEF, and JICA 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 in Burma 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 draft WHO *Strategic Framework for Artemisinin Resistance Containment in Myanmar (MARC) 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 ACT, 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 identifies a need to develop a BCC strategy for Burma and in doing so, 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 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 non-traditional collaborations with hard-to-access workplaces such as factories, plantations, as well as with faith-based organizations. In both Thailand and Cambodia, extensive efforts to develop bilingual Thai and Khmer language BCC materials have been supported through the containment project. The lifestyle of the migrant and mobile population often precludes the effective use of conventional preventive measures. The containment effort is developing and attempting to maximize the use of preventive measures including LLINs and other innovative techniques. Behavior change communication supports these measures by 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 will build 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 targeting mobile/migrant populations (including Cambodians and various ethnicities from Burma, refugees in camps, Thai residents, students and teachers in border provinces, migrants, mobile populations, refugees in camps, people spending nights in the forest);
- implementation of mass health promotion and community mobilization activities targeting most at risk populations with radio broadcasts messages, annual Malaria Day campaigns, and training of malaria health volunteers and workers to provide personal counseling on the directly observed therapy strategy and reduce loss to follow-up;
- advocacy for migrant health by building political support through regular meetings of health committees at the national, provincial, and district levels; 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 and mechanisms for 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 bednets with insecticide and seeking early diagnosis and treatment, as well as rational drug use. BCC activities are also carried out by Village Health Workers 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. URC 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. New containment-related BCC materials will be designed to reach vulnerable groups, including women and ethnic minorities, on rational drug use, benefits of diagnosis, and the use of LLINs when going to the forest. For Cambodia, the containment of resistance raises new communications challenges, including the need for buyers as well as sellers of antimalarial drugs to understand which drugs are acceptable, the need to find out how to reach mobile populations in the border area with appropriate information, the need to develop and disseminate standard messages in different languages in collaboration with Thai counterparts, the need to inform people about new interventions such as IRS, and the need to locate undocumented mobile workers to inform them of available services. To respond to these challenges, the CNM is developing a comprehensive BCC strategy. Under this strategy, several organizations with expertise in different styles and communication channels and with varying geographical coverage and reach will work to bring consistent messages for behavior change to diverse population groups. Mass media will be developed and broadcast by BBC World Trust and Women's Media Center. Implementing partners will work with community networks for local communications. 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:

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 the 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 FY11 funds, PMI will support village health workers 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 targeted high risk groups and gather programmatic data on net coverage and use, diagnostic and treatment coverage, and other indicators.

Planned activities with FY 2012 funding (\$200,000)

The 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 mono-therapy and sub-standard 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 effective dissemination of BCC materials and messages, PMI will provide BCC technical assistance to implementation partners and support the development of a regional BCC strategy for the GMS countries and partners. (\$200,000).

EPIDEMIC SURVEILLANCE AND RESPONSE

With the progress made in the sub-region, larger geographic areas are now considered malaria-free or low-risk for malaria, resulting in waning immune status of the population. This biological vulnerability combined with large-scale movements of people harboring parasites to low-risk/ malaria-free areas and of non-immune populations into high-risk areas put the region at risk for epidemics. Furthermore, as many of the countries in the GMS are setting goals of elimination, soon even one local case would be considered an outbreak and a response would have to be launched. 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, and large *P. vivax* outbreaks have occurred in central China. 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 to any future outbreaks. For example, 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 funding, PMI is supporting surveillance and response in low transmission and elimination settings. From the lessons learned from maintaining a state of zero local malaria

transmission in Phuket, replicable approaches will be developed for scaling up MOPH surveillance and response capabilities in other elimination targeted provinces. A curriculum is being developed by BVBD to train rapid response teams. Private-public partnerships, e.g. with the tourism board and association of hotels, are being explored in Phuket to sustain funding for malaria elimination.

Planned activities with FY 2012 funding are as follows: (These costs are covered under the M&E section)

- **Maintaining surveillance and response in low transmission and elimination settings:**

The focus of the PMI's epidemic surveillance and response activities will be on strengthening surveillance and the rapid response efforts as well as maintaining quality diagnosis. Both RDT and microscopy testing capacity will be strengthened in the cross-border focus areas. In the cross-border focus areas, technical assistance will be 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. Although no regional stockpiles of commodities will be maintained for this purpose, there is some flexibility in the commodities procured for the region to respond to potential outbreaks or bottlenecks. (see Diagnosis and M&E sections)

MONITORING AND EVALUATION

PMI will work with NMCPs and partners to strengthen efforts to limit the spread 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.

Regional activities

USAID funded the development of the Regional Malaria Indicator Framework (RMIF) in order to create an updated, GMS-specific, M&E framework. 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 in February 2011. With the finalization of the RMIF, technical partners in the region have been and will continue to assist the NMCPs in adopting this framework and streamlining their various reporting requirements. The updated M&E framework is being used to guide the multiple existing donor driven M&E needs and is assisting countries in developing national M&E plans.

The RMIF includes indicators that require data generated through both the routine HMIS and from surveys. Malaria has been integrated into the HMIS in all six countries. The HMIS 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 common to

most surveillance systems exist throughout the countries in the GMS. These include delays in and completeness 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; and estimating the true burden of malaria remains challenging because of the high access to the private sector in both these countries. Other common 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, (e.g. age, gender, ethnicity, migrant status, or occupation) that are epidemiologically pertinent. The process of adopting and collecting the data for the RMIF indicators is likely to further highlight weaknesses and limitation of existing systems.

Progress to Date:

To assist NMCPs to effectively adopt the RMIF and to build M&E capacity, a regional M&E course was elaborated and training will be conducted in October 2011. The curriculum was developed by the M&E technical partners led by Malaria Consortium/CDC. The course aims to train a cadre of M&E experts and trainers within each country who will be able to adapt the curriculum to their country context and conduct national and sub-national 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. The PMI-supported technical partners will provide technical assistance to Thailand, Cambodia, Vietnam, and Laos as they undertake this activity. China and Burma have recently finalized new M&E plans. 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 consolidated Global Fund grant. Furthermore, Burma, Laos, and Vietnam are considering submitting Global Fund Round 11 proposals, which will be harmonized with the RMIF.

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, technical partners will support NMCPs to develop national/ sub-national and regional malaria bulletins. In an effort to monitor the geographic spread of artemisinin resistance, PMI will support efforts to collect information on the percentage of cases with parasites detected on Day 3 after treatment with an ACT in routine settings to supplement data collected at TES sites. These efforts have already begun in Thailand, where all clinical cases are monitored until Day 28, and Cambodia, where collection of a follow-up blood slide on Day 3 has become standard practice in Zone 1 and Zone 2 containment areas. Similar activities soon will begin at sentinel sites in the containment areas in Burma as part of the MARC project.

With FY11 funding, a long overdue update of the regional strategic information is underway. The output of this exercise will be a scientific and programmatic review and identification of strategic and programmatic priorities for regional partners. 'Mekong Malaria III' will update both epidemiological and entomological data and analyses on relationships with health systems, program costs and financing, community involvement, private sector engagement, and cross border collaboration. The analytical review will also project regional trends in socio-economic development, migration, and other factors likely to affect malaria transmission.

A sub-regional M&E network comprised of the technical partners i.e. CDC, Malaria Consortium, USAID, WHO-WPRO, WHO-MMP, and MEASURE Evaluation has been conducting regular calls and meetings to coordinate M&E activities in the sub-region. M&E focal persons have been identified from all the NMCPs and will shortly join the network.

Planned activities at the regional level with FY 2012 funding (\$200,000+ \$150,000)

- **Support to regional M&E activities and surveillance strengthening:** The PMI will continue to support the M&E Network of technical partners and NMCP M&E focal points to improve coordination and identify M&E needs for technical assistance in the sub-region. A technical workshop will be convened to adapt Global Surveillance Guidelines to the GMS; training manuals and standard operating procedures on malaria surveillance will be developed. PMI will provide capacity building support and technical assistance to NMCPs to strengthen routine collection and reporting of RMIF indicators, as well as data analysis, and use of data for decision making. PMI will explore methods for engaging with the private sector to help NMCPs track and gather their information. For countries such as Thailand and Cambodia, that are moving towards electronic data management systems, malaria bulletins will be produced. Additionally, a regional web-based database will be developed, which will focus on a few key indicators and generate a sub-regional malaria report. To continue to monitor signs of emerging artemisinin resistance more broadly, PMI will provide technical and analytic support to NMCPs to track their case follow-up data to map proportion of Day 3 positives cases at health centers throughout Thailand, Cambodia, and at sentinel sites in Burma. The implementation of this activity is supported by Global Fund in Thailand and Cambodia and the containment project in Burma. There will be limited TA provided for countries as they adapt the regional M&E curriculum and conduct in-country cascade training. (\$200,000+ \$150,000)

Activities in cross-border focus areas

Efforts to strengthen malaria control in areas with evidence of artemisinin resistance will be targeted to Tanintharyi-Ranong and Trat-Pailin, 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 geographic reach along these border areas. Potential areas could include Mon and Kayin States in Burma, Tak Province in Thailand and additional artemisinin resistance containment zones at the Cambodia-Thailand border. 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 than previous PMI targets as the areas with documented artemisinin resistance require intensive scale-up (See Goals and Targets). The GMS 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.

Progress to Date:

Monitoring of PMI's activities in the cross-border focus areas will require strengthening the collection of routine data, and collection of survey data from resident households and migrants. The majority of the indicators to be monitored by PMI will come from routine surveillance data except for key ITN ownership and use numbers. For 2009, Tanintharyi Division reported 31,947

cases of malaria of which 4,383 were confirmed to be due to *P. falciparum*. Between 2009 and 2010, Pailin, Cambodia reported a decrease in the number of malaria cases from 1,474 to 555 and the number of cases due to *P. falciparum* from 867 to 65. (See Table 5 in Current Status of Malaria Indicators section). The NMCP data from both Burma and Cambodia underestimate the true burden which is thought to be 3–4 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. M&E activities in the GMS have traditionally focused on routine surveillance systems and not cross-sectional surveys with the exception of Cambodia. Malaria Consortium has successfully supported national malaria surveys in Cambodia (most recently in 2010) which included household, health facility, and private sector questionnaires and provided the post-implementation survey data for the containment project. This survey provided national as well as containment zone-specific estimates. In the BMGF containment project areas, malaria prevalence was estimated to be 0.5% by microscopy and household ITN ownership was 77.6%.

With FY 2011 funding, PMI will provide technical assistance through the new regional project to strengthen surveillance systems and collect quality, timely data for RMIF indicators at the community level. This will also include Day 3 positive surveillance broadly in Thailand and Cambodia and at sentinel sites in Burma. PMI technical partners will work closely with this community-level intervention project to assist in data collection at health centers and pilot communities.

Additional baseline survey data for the cross-border focus areas will be collected with FY11 funding in conjunction with planned national surveys. For Thailand, household surveys assessing baseline coverage and malaria prevalence are planned for 2012, and FY11 funding will support oversampling costs for Ranong and Trat. Similarly, collection of baseline data for Tanintharyi will be coordinated with the MARC project survey plans for their containment zones. Since the high-risk groups are mobile and often unregistered, traditional survey methods may miss them; thus, respondent driven sampling has been conducted in the BMGF-funded containment project of Thailand and Cambodia and will be conducted in Ranong, Thailand in late 2011.

Planned activities in the cross-border focus areas with FY 2012 funding (\$200,000):

- **Support for surveillance/M&E data collection for the cross-border focus areas:** TA will be provided to ensure quality routine surveillance data collection at the community level. Development of data collection tools and streamlined reporting platforms will be designed (Burma) or adapted (Thailand and Cambodia) to improve community level reporting. (costs included in M&E regional budget)
- **Cambodia National Malaria Survey 2012:** Follow-up household survey data will be collected in Cambodia as they are planning to conduct a national malaria survey in 2012. PMI will provide technical assistance and funding support to ensure adequate sampling of the PMI focus areas. (\$100,000)
- **Case follow-up and active case detection:** PMI will support Thailand's strategy to conduct follow-up of all falciparum cases to day 28 and Cambodia's strategy to scale-up Day 3 follow-up surveillance. In addition, in the areas of very low transmission at the Thai-Cambodian border, PMI will support the NMCPs to implement active case detection

activities following the identification of any indigenous transmission during their case investigations. (\$100,000)

Surveillance: Drug Resistance and Therapeutic Efficacy Studies

Resistance to multiple antimalarial drugs has been a long-standing problem in the GMS. 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.²⁰ 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 several regional meetings to address this important issue starting from the *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.

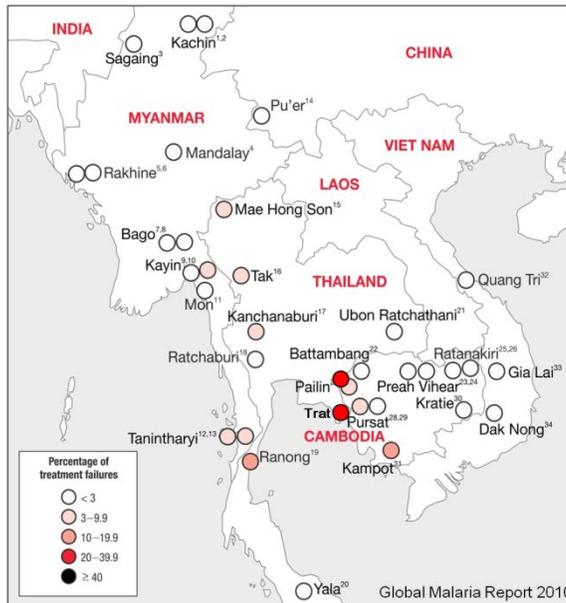
Progress to Date:

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- 2 sites in Yunnan; Lao PDR- 3 sites; Burma- 10 sites; Thailand- 9 sites; Vietnam- 5 sites). This network has been strengthened in the past few years to include chloroquine-resistance *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 early 2012. The network has focused on improving the quality of TES data by standardizing the protocol and operating procedures around microscopy QA, 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 the cascade of further research to characterize and confirm the resistance and subsequently to mount a containment response.

The most recent data from the Thai-Cambodia border show PCR-corrected failures to mefloquine plus artesunate at 25% in Trat, Thailand and of DHA-PIP at 27% in Pailin, Cambodia. Ranong, Thailand (13% failures; Day 42) and Kampot, Cambodia (18.8% failures; Day 42) have also historically shown failure rates above 10%. All other sites report failure rates less than this threshold.

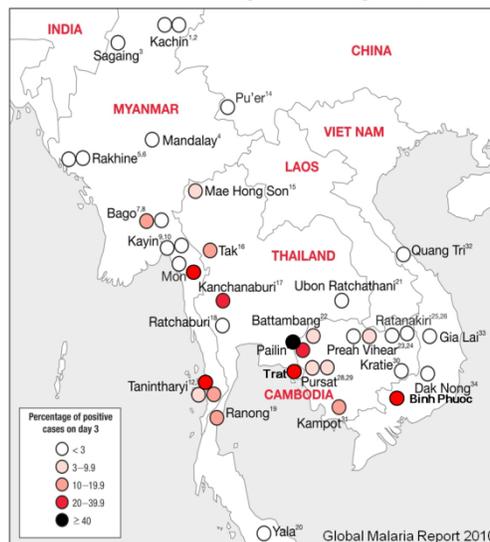
²⁰ World Health Organization. *Containment of malaria multidrug resistance on the Cambodia-Thailand border, Report of an informal consultation, Phnom Penh, 29-30 January 2007*. SEA-MAL-246.

Percentage of treatment failure of different ACTs in Greater Mekong Sub-region, 2006-2010



Through analysis of current and historical data, the NMCPs have learned 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. An analysis of previous and new TES data present a much more disturbing picture of the efficacy of artemisinins. Increased rates of prolonged parasite clearance have now been documented in many parts of the GMS, including the Thai-Burma border, southern Vietnam and Yunnan Province in China. Of great concern is that high Day 3 parasitemia rates are 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, 2006-2010



Although these sentinel sites have now been maintained for several year 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.

With FY11 funding, PMI also supported strengthening the capacity of the NMCPs to conduct molecular testing of parasites to distinguish reinfection from recrudescence among patients being followed by the TES sites. A capacity assessment, development of standardized operating procedures, and trainings have been conducted at the molecular testing laboratories. The molecular testing capacity of NMCP laboratories has been strengthened and a regional network of reference research laboratories established. PMI will conclude support for this time limited capacity building activity and will explore a sustainability plan.

Planned activities with FY 2012 funding are as follows: (\$1,000,000)

- **Regional TES network:** PMI will continue to support the NMCPs to conduct therapeutic efficacy studies at 35 sites across the six countries. PMI will explore additional donor support for expanding the network or conducting more in-depth *in vitro* or pharmacokinetic studies. 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 TA to the NMCP in protocol adaptation, data analysis and dissemination of results. (\$1,000,000)

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. In the GMS, the forested areas, and possibly some plantations, 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, particularly in Burma, 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 not often coordinated and the results are widely disseminated.

Given the high donor investments in LLINs, studies assessing the physical and insecticidal durability of LLINs are of importance. 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 personal protection OR study funds can be reprogrammed to explore this issue.

Progress to Date:

With FY 11 funding, PMI will support regional strengthening of entomologic surveillance for mapping and insecticide resistance monitoring. Working through the WHO-MMP network, and in collaboration with ACTMalaria, PMI will conduct an inventory of resources for entomologic monitoring in the region and convene a regional entomology workshop where common protocols and strategies for mapping and resistance monitoring can be developed.

In the cross-border focus areas, where PMI and other donors are supporting efforts to significantly scale up LLINs, it will be imperative that programs 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 FY2012 funding: (\$200,000)

- **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 on both sides of the Thai-Burma and Thai-Cambodia border where there will be more focused interventions by PMI implementing partners. In these 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. (\$200,000)

Operations Research

This region has been at the forefront of malaria research especially in the area of case management as the issues of drug resistance has forced the region to repeatedly introduce new regimens. The GMS faces additional challenges of exploring different surveillance strategies for lower transmission and elimination settings, vector control interventions that may or may not be effective for the vectors, as well as management of *P. vivax* in light of increasing chloroquine resistance and G6PD deficiency. Thus, OR is 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, many OR questions relevant to the control programs to improve decision making and efficiency in delivering malaria care and control go unanswered. Furthermore, research agendas can be fragmented and often not operationally relevant to the control programs.

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 assessment of their 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 directly aim to answer some of the priorities questions identified through this sub-regional forum.

Progress to Date:

With FY11 funding, PMI will support the evaluation of a point-of-care RDT 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, which has yet to be published, 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 FY11 evaluation will focus on the test performance and ease of use evaluation of the second generation RDT. It is hoped that the second generation RDT will safely guide the use of primaquine and a hemolytic sensitivity study is tentatively planned as a follow-on study for FY12.

The issue of preventing malaria in the setting of outdoor transmission continues to challenge this region. The RBM Vector Control Working Group has proposed to establish a network for outdoor transmission research in the Mekong countries to review research and other related activities to control outdoor transmission in these countries and discuss the strategic direction for research and development along the lines of entomological efficacy and community acceptability.

Proposed PMI activities with FY2012 funding: (\$350,000)

- **Primaquine use guided by a second generation point of care G6PD test:** Although all GMS countries are expected to provide radical treatment for *P. vivax*, only China and Thailand widely use primaquine. Most countries with concerns of severe variants of G6PD deficiency and lack of testing capacity at the peripheral setting do not provide primaquine therapy. The challenges of administering primaquine in settings of unknown G6PD status again arise in falciparum cases where ACTs are supplemented with primaquine in order to accelerate gametocyte clearance and thus reduce malaria transmission. Countries such as Lao PDR and Cambodia with known presence of Viangchan severe genotype do not administer primaquine without individual G6PD results. Assessing the test performance of the second generation G6PD RDT is planned with FY11 funds. If this second generation test is found to be sufficiently sensitive, a study to assess the hematologic response to primaquine therapy as guided by the RDT results will need to be conducted to provide the evidence for the programs to safely deploy primaquine treatment. (\$150,000)
- **Personal 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 entomologic efficacy of a personal protection measure e.g. insecticide-treated clothing and/or community acceptability of such measures. Once the

recommendations of this network are available, the priority research question, appropriate research design, and budgetary needs will be defined. (\$200,000)

CAPACITY BUILDING

Most countries in the GMS face many challenges related to human resources for healthcare, including the shortage of skilled health workers and technical staff, high turnover and lack of motivation to retain 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 inter-country training and communication network which includes 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 eleven member NMCPs.

Thailand under the Bureau of Epidemiology, MOPH began its Field Epidemiology Training Program 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. In 2004, Thailand mobilized its entire FETP and all its graduates to assist with tsunami relief in the region. This regional training program provides not only epidemiologic skills and field-work experience, but aims to build partnerships across international borders. PMI plans to support one to two Burmese FETP residents in FY2012 with professional support, including malaria projects that will provide professional experience with training and educational value.

Progress to Date:

With FY2011 funding, PMI is supporting regional training courses to build the capacity of NMCPs in the management of malaria field operations, diagnostics and case management and integrated vector management.

Planned activities with FY 2012 funding: (\$425,000)

- **Regional training courses** (\$275,000): 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, monitoring and evaluation, 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.
- **Field Epidemiology Training Program** (\$150,000): 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.

COORDINATION

Coordination and communication among PMI and partners is essential for the success of PMI in the GMS. This is now more important than ever, as there are a number of new partners, foundations, and agencies supporting activities in the sub-region, especially with the emergence of artemisinin resistance. There is a danger that partner strategies and investments developed in isolation could imbalance the overall regional efforts.

It is also imperative that countries in the GMS work together on cross-border issues and sharing of information. Coordinating GMS countries through the traditional mode of a WHO regional office is problematic since the sub-region is split into two separate WHO regions (SEARO and WPRO). Through the development of Roll Back Malaria-Mekong and later the Mekong Malaria Program (MMP), USAID and now PMI have supported an innovative bi-regional approach to GMS. The MMP is coordinated by WHO staff based in Bangkok but 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.”²¹ Support to the WHO-MMP provides a strong and well-established mechanism for coordination among the six NMCPs and the PMI implementing partners.

Progress to Date:

In FY2011, PMI will provide support for the WHO-MMP to serve as the central coordinating mechanism for activities in the sub-region. PMI will work with WHO-MMP to engage malaria partners and stakeholders, including universities, foundations, bi-lateral and international agencies on key technical issues, guidance and policies to ensure they are addressed in coordination with the national programs.

Planned activities with FY2012 funding are as follows: (\$550,000)

²¹ 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

- **Regional Coordination:** PMI will continue to support WHO-MMP to coordinate bi-regional offices of SEARO and WPRO, convene Mekong Malaria Program Partners' Meeting, and support WHO country programs (Cambodia and Burma). WHO country programs will support PMI in convening regular in-country and regional PMI malaria partner meetings with all partners and NMCPs to ensure strong coordination in country and regional malaria activities. WHO will provide technical assistance regionally and specifically in Burma and Cambodia, which includes partner coordination, technical oversight in the areas of M&E and drug efficacy monitoring, national policy and guidance development, and dissemination of findings. WHO-MMP also helps to coordinate and harmonize strategies in the region, provide countries with Global Fund technical assistance on proposal development as well as assist USAID-supported partners to engage with NMCPs. (\$550,000)

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 sero-prevalence 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 malaria activities because populations at risk for HIV differ from those at risk for malaria.

PMI continues to support an integrated, multi-disease platform, where appropriate. For example, USP not only works to strengthen anti-malarial drug quality, but also tests antibiotics and drugs for influenza and tuberculosis. Kenan's Greater Mekong Sub-Region Responses to Infectious Diseases (GMS-RID) Project focuses on cross-border collaboration to strengthen infectious disease detection and response, not only for malaria, but also for TB and influenza. With FY11 funding, PMI will undertake a review of LLIN strategies and delivery mechanisms. This evaluation should highlight further opportunities for integration of LLIN distribution with other health services e.g. distribution with deworming campaigns or through routine ANC visits.

Lower Mekong Initiative

The 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 initiatives. PMI supports surveillance and drug quality monitoring in all four LMI countries (Cambodia, Thailand, Laos and Vietnam), but control activities are concentrated in the first two.

USAID Forward

The PMI recognizes and is committed to meeting the goals of USAID Forward. Specifically, the PMI team will work closely to identify opportunities to promote implementation and

procurement reform. In particular, PMI will work to further the following Implementation and Procurement Reform objectives:

Objective 1—Increase Use of Partner Country Systems: The PMI is committed to building in-country capacity and use of host country systems to the extent possible. Within the GMS region, the PMI will specifically seek opportunities to engage with the Government of Thailand on technical cooperation and seek to use instruments such as Fixed Obligation Grants or work with the Mission on the chief financial officer's Public Financial Risk Assessment Framework if there is a need for any financial transfers.

Objective 2 —Strengthen Local Civil Society: The PMI recognizes that support to local non-governmental organizations and community based organizations is one of the most effective means to access difficult to reach migrant and mobile populations. There is great diversity in the population covered by the GMS strategy, and PMI is committed to ensuring reach through the use of community based organizations. The bilateral regional malaria project is designed to make sub-grants to local organizations. In addition, PMI will explore options for providing direct support to ACTMalaria, a regional malaria training institution that provides regional support to national malaria control programs in the region.

Objective 5—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 DfID and AusAID on other bilateral input 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 ACTWatch²², USP²³ and PSI²⁴ and the URC Project²⁵. 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 AMFm pilot country, these activities have been delayed due to challenges in procuring DHA-PIP. The details of how best to scale-up AMFm in the setting of emerging artemisinin resistance are being addressed currently.

²² http://www.actwatch.info/countries/general_information.asp?00=1&01=29

²³ <http://www.usp.org/worldwide/>

²⁴ <http://www.psi.org/cambodia>

²⁵ <http://www.urb-chs.com/news?newsItemID=105>

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 (Round 3), 3DF 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 treated mosquito nets

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 sale of LLINs in the region. If these can be overcome, and a local market, especially for workplace programs by institutional buyers established, there may also be engagement with the commercial LLIN sector for broader, region-wide, 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, URC works with commercial farms in Western Cambodia to test a model of loaning out LLINs to seasonal farm workers through farm owners. In Thailand, Kenan works with rubber plantation owners in Phuket to provide 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 (which is also on the Country Coordinating Mechanism) will partner with the VBDC as a sub-recipient, 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, who 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, care, 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 3DF.

Possibly the most important workplace programs will be related to major development projects e.g. 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 should be emphasized.

Planned activities with FY 2011 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 should be further explored.

STAFFING AND ADMINISTRATION

Planned FY2012 Activities: (\$1,495,000)

Two Resident Advisors will oversee PMI-supported activities in the RDMA, one representing USAID and one representing CDC. They will be provided space within the RDMA offices in Bangkok, but are expected to travel widely within the sub-region. In addition, one Foreign Service National will be hired to support the PMI team in Bangkok and two others to support work in Burma and Cambodia. 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, DfID, 3DF, BMGF and the private sector.

Locally-hired staff to support PMI activities in the RDMA will be approved by the USAID RDMA 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 RDMA Director and Controller.

ANNEX

Table 1: Year 2 (FY2012) Budget Breakdown by Partner

Partner	Geographical Area	Activity	Budget (\$)
CDC IAA/ Malaria Consortium	Cross-border Focus Areas/ GMS (6 countries)	a) Technical assistance and data analysis support to strengthen routine surveillance at the periphery supporting the RFA implementing partner; b) Develop national/sub-national malaria bulletins ; c) Support to Cambodia's National Malaria Survey 2012 and data collection for the focus areas ; d) TA for in-country M&E cascade training; e) Assess primaquine safety with the use of a second generation G6PD RDT; f) Assess personal protection efficacy and acceptance; g) FETP support for 1-2 Burmese fellows	\$800,000
Deliver	Cross-border Focus Areas/ GMS (6 countries)	a) LLIN/LLIHN, RDTs and ACT procurement; b) Strengthening the pharmaceutical management systems	\$2,750,000
GMS-Malaria Project	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	\$4,200,000
TBD-BCC partner	Cross-border Focus Areas	BCC technical assistance for community-level implementation	\$200,000
USP-PQM	GMS (6 countries)	Maintain drug quality surveillance network including strengthening enforcement measures	\$500,000
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) Develop surveillance training manuals and SOPs; e) Regional web-based database developed; f) Development of sub-regional malaria bulletins and annual country malaria framework; g) Conduct TES studies	\$1,700,000
WHO/ACT Malaria	Southeast Asia	a) Coordinate and facilitate training courses; b) Provide microscopy/RDT QA/QC training and accreditation	\$355,000
Total			\$10,505,000

* Does not include budget for USAID and CDC staffing/administration/TDYs of \$1,495,000

Table 2: President’s Malaria Initiative— Greater Mekong Subregion Planned Obligations for FY2012 (\$)

Proposed Activity	Mechanism	Budget		Geographical area	Description
		Total \$	Commodity \$		
Preventive Activities					
Insecticide Treated Nets					
LLIN procurement and distribution	DELIVER	1,500,000	1,500,000	Burma, Cambodia, Thailand, Regional	Support for LLINs and LLIHNs (hammocks) for focus areas and to fill potential gaps in the region
Community level distribution and promotion of ITNs	GMS-Malaria Project	700,000		Burma, Cambodia, Thailand	LLIN distribution, promotion and IEC/BCC in targeted focus areas
SUBTOTAL ITNs		2,200,000	1,500,000		
Indoor Residual Spraying					
SUBTOTAL IRS		0	0		
Intermittent Preventive Treatment in Pregnancy					
SUBTOTAL IPTp		0	0		
SUBTOTAL PREVENTIVE		2,200,000	1,500,000		
Case Management					
Diagnosis					
Procure RDTs	DELIVER	500,000	500,000	Burma, Cambodia, Regional	RDT procured for focus areas for use by community level health volunteers or workers
Training and supervision of RDT/microscopy	GMS-Malaria Project				Support for focus areas in Burma and Cambodia - see case management

Training and accreditation for microscopy	WHO to ACTMalaria	80,000		Thailand, Regional	Support for microscopy training in the region and for Thailand where microscopy skills in the low transmission areas are waning
SUBTOTAL Diagnosis		580,000	500,000		
Treatment & Pharmaceutical Management					
Procure antimalarials	DELIVER	500,000	500,000	Burma, Cambodia	Antimalarials procured for use by community level health volunteers or workers
Case management at the community level, including implementation, training and supervision	GMS-Malaria Project	3,200,000		Burma, Cambodia, Thailand	Includes training and supervision of 140 VMWs in Cambodia, 300 VMWs in Burma, and technical support for malaria posts and volunteers in Thailand (neighboring provinces)
Support for supply chain and pharmaceutical systems	DELIVER	250,000		Burma, Cambodia, Regional	Technical assistance in supply chain management to the region. Strengthening the pharmaceutical management system, forecasting, management and distribution of pharmaceuticals and RDTs.
Drug quality monitoring	USP PQM	500,000		Burma, Cambodia, Thailand, Regional	Strengthen post- marketing surveillance and response for drug quality.
SUBTOTAL - Treatment & Pharmaceutical Management		4,450,000	500,000		
SUBTOTAL CASE MANAGEMENT		5,030,000	1,000,000		
Behavior Change Communication					
BCC technical assistance for community-level implementation	TBD	200,000		Burma, Cambodia, Thailand	Support implementing partners with developing and implementing effective BCC/IEC approaches

SUBTOTAL BCC		200,000	0		
Monitoring and Evaluation					
General M&E					
Surveillance and M&E strengthening	Malaria Consortium (through CDC)	200,000		Regional	Technical assistance and data analysis support to strengthen routine surveillance at the periphery supporting the RFA implementing partner, Develop national/sub-national malaria bulletins, M&E cascade training
M&E Coordination at regional level	WHO	150,000		Regional	Develop surveillance training manuals and SOPs; Regional web-based database; development of sub-regional malaria bulletins and annual country malaria reports
Cambodia National Malaria Survey 2012	Malaria Consortium (through CDC)	100,000		Cambodia	Follow-up survey to be conducted by CNM in 2012. Provide TA to CNM for protocol development and cost of oversampling PMI focus areas
Active case investigation and response	GMS-Malaria Project	100,000		Cambodia, Thailand	Implement case investigation and active case detection activities in focus areas
Surveillance					
Therapeutic Efficacy Surveillance Network	WHO	1,000,000		Burma, Cambodia, Thailand, Regional	Conducting TES studies in 6 countries (approximately 35 sites- 10 sites in Burma, 9 sites in Thailand, and 5 in Cambodia), technical assistance (P4), microscopy QA, slide bank, drug policy review
Entomological monitoring (basic package)	GMS-Malaria Project	200,000		Burma, Cambodia, Thailand	Support for entomological monitoring
Operations Research					

Primaquine safety	CDC IAA	150,000		Regional	Assess the hematologic response to primaquine therapy as guided by the second generation RDT results
Personal protection	CDC IAA	200,000		Regional	Assess entomologic efficacy of a personal protection measure e.g. insecticide-treated clothing and/or community acceptability of such measures following RBM outdoor transmission network's recommendations
SUBTOTAL MONITORING AND EVALUATION		2,100,000	0		
Capacity Building					
Strengthen NMCP capacity	ACT Malaria (through WHO)	275,000		Regional	Coordinate and facilitate training courses e.g. Management of Malaria Field Operations; support to the development of financial sustainability plan
FETP	CDC IAA	150,000		Burma	Support 1-2 Burmese fellows to participate in FETP
SUBTOTAL CAPACITY BUILDING		425,000	0		
Regional Coordination					
Regional coordination	WHO	550,000		Burma, Cambodia, Regional	Coordinate the Mekong Malaria Program within the bi-regional offices of SEARO and WPRO and support WHO country programs (support to WHO-MMP, 50% Burma, 100% Cambodia)
SUBTOTAL REGIONAL COORDINATION		550,000	0		
In-country Staffing and Administration					

USAID Staffing	USAID	909,000		Burma, Cambodia, Regional	USAID Resident Advisor, PMI FSN Bangkok, Health FSN Burma, Malaria FSN Cambodia
CDC Staffing	CDC IAA	550,000		Regional	CDC Resident Advisor
CDC TDYs	CDC IAA	36,000		Regional	3 TDYs (2 for M&E support; 1 for entomologic support)
SUBTOTAL IN-COUNTRY STAFFING		1,495,000	0		
GRAND TOTAL		12,000,000	2,500,000		